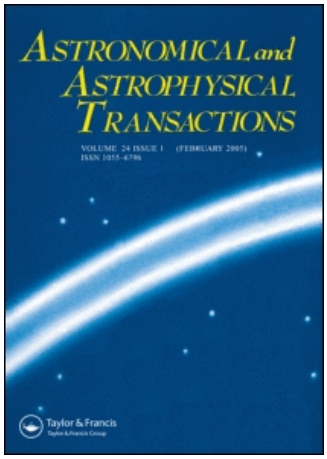

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A review of: "Protostars and Planets III"

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BOOK REVIEW

PROTOSTARS AND PLANETS III

Eds E. H. Levy and J. I. Lunine. Tuscon: The University of Arisona Press. 1993. pp. 1610.

This book was long awaited by many of us. It is really a king's book because of both its huge volume and a great authors team. It is the latest volume in the internationally acclaimed Space Science Series with Tom Gehrels as the General Editor. In the brilliant collection of astronomical reviews published by the University of Arizona Press since 1974, there are many well-known books on planetary science and stellar physics. The editors of the new volume are Eugene H. Levy, the Director of the Lunar and Planetary Laboratory at the University of Arizona and Jonathan I. Lunine, Associate Professor of Theoretical Astrophysics at the Lunar and Planetary Lab; Mildred S. Matthews is the Senior Editor of the Space Science Series; and M. Guerrieri is the bibliographer. The book has been prepared by 91 collaborating authors. It contains more than 100 illustrations, including 7 color plates and an interesting color-picture cover.

There are 5 parts in the book:

1. Clouds.

   Giant molecular clouds – their formation, structure and evolution; the chemical evolution of interstellar matter; contributions of classical novae to the interstellar medium.

2. Star formation.

   Magnetic fields in star-forming regions (theory and observations); the relationship between molecular clouds, dense cores and young stars; pre-main-sequence evolution and the initial stellar population; the origin of multiple stellar systems; activity of young stars.

3. Disks and outflows.

   The nature of circumstellar disks; the properties of disks around young stars; T Tauri stars and their accretion disks; the origin of the outflows and winds of young stars.

4. Disk processes and planetary matter.

The theory of the disk evolution; the tidal interaction between protostellar disks and companions; formation of the Protosolar nebula; chemistry of gaseous circumstellar disks; meteoritic constraints on the conditions in the solar nebula.

5. Planetesimals and planets.

Formation of planetesimals and growth of planets; planetary accretion in the solar gravitational field; comets and the origin of the Solar system; main-sequence stars with circumstellar solid material (the Vega phenomenon); origins of the outer-planet moons; the long-term dynamical evolution and stability of the Solar system.

These are the main topics of the book. As we can see, following "Protostars and Planets I" (1978) and "Protostars and Planets II" (1985), the new book continues to address fundamental questions concerning the formation of stars and planetary systems in general and of our Solar system in particular. Drawing upon recent advances in experimental, observational, and theoretical research, it has summarized our current understanding of these processes and addresses major open questions and research issues.

Eight years (between each consecutive volumes of "Protostars and Planets") – is it much or not so in stellar and planetary science? Eight years ago, when "Protostars and Planets II" was published, the nature of T Tauri objects as forming large amounts of surrounding gas and dust was understood, but little else was known about these curious systems. Today there is a whole taxonomy of T Tauri stars (classical, weak, and naked), various members of which may represent different stages of accretion and dissipation of the surrounding material.

At the time of "Protostars and Planets II", significant chemical and isotopic data on the Solar system had already been accumulated, but little was yet known about the chemistry of the objects in the outer Solar system. Studies over the last eight years have produced inventories of molecular species in comets, Pluto, and the atmospheres and satellites of Uranus and Neptune. Complementing these are increasingly sensitive observations of abundances in interstellar clouds including, for example, the first, and long-awaited, identification of methane in molecular clouds.

Multi-dimensional hydrodynamic and magnetohydrodynamic computer codes have advanced rapidly since "Protostars and Planets II", facilitating calculations of molecular cloud dynamics, clump formation, cloud collapse, disk or binary star formation, disk evolution and dissipation, wind mechanics, giant planet formation through a nucleated collapse of gas, grain and planetesimal accretional dynamics, tidal effects on disks, energetic plasma processes in disks, and impact-driven escape and evolution of atmospheres.

Shortly to say, this volume summarizes a field in which progress has been substantial since the publication of its predecessor. Each of its parts might be a very interesting separate book. Then we have "five in one" (the total price $90 only)!

Among other useful features of the book, there is a Glossary for the beginners, and not only for them. Naturally, many are familiar with the "Drake equation" and

the "Brownian motion", but what is, for example, "ANEOS equation", "DEIS", "CDW", "CHON", "FMS", "IKS", and many other acronyms? Another very useful thing is the Bibliography of the book: more than 150 pages containing more than 3500 references. This part of the book is especially important for graduate students.

A close interaction between observations, measurements, theory, and numerical modeling plays an important role in advancing our understanding of star and planet formation. During next eight years "Protostars and Planets III" will be our most authoritative source in this field.

V. G. SURDIN