Book Reviews

The Origin of the Planets

Protostars and Planets. Studies of Star Formation and of the Origin of the Solar System. Papers from a meeting, Jan. 1978. TOM GEHRELS, Ed. University of Arizona Press, Tucson, 1978. viii, 756 pp., illus. $17.50.

The riddle of the origin of the planets has challenged thinkers since earliest times. A rational assault on the problem in the present epoch is complicated by the fact that it requires a high degree of interaction between disciplines: astrophysics, which analyzes the interstellar medium and models processes by which it might be transformed into stars (with, presumably, planets as by-products); chemistry and mineralogy, which assess the evidence in meteorites of condensation and other complex processes in the hypothetical primordial solar nebula; dynamics, which considers why and how an orbiting swarm of small particles would collect itself into a small number of planets and satellites; and nuclear physics, which tries to read from the meteorites a record of pre-solar-system element formation and details of the time scale of deployment and degree of mixing of newly formed elements in the infant solar system. Workers in the field have accommodated themselves to this requirement in varying degrees, but the need to be interdisciplinary usually comes as a rude surprise to students.

Protostars and Planets is intended to serve as a source book on the subject, bringing together authoritative reviews and a selection of more topical papers that are all up to date, are comprehensible (perhaps with some effort) to a graduate student, and cover the required range of disciplines.

The book contains three major review papers and 35 shorter, more focused papers, organized into five topical sections. The review papers, averaging about 20 pages in length, are concerned with interstellar matter and pre-solar-system nucleosynthesis (D. D. Clayton), star formation (R. B. Larson), and planet formation (W. K. Hartmann). The topical sections address observational and theoretical aspects of interstellar grains and chemistry; the collapse and fragmentation of interstellar clouds, an early stage of star formation; the relationship between supernovae, nucleosynthesis, star formation in general, and solar-system formation in particular; the solar nebula and planet formation; and observations of stars in the process of formation.

Clearly each paper could not contain all the introductory material needed to make it understandable to a nonspecialist, so the editor thoughtfully included a cross-disciplinary glossary of terms, printed on gray-toned paper at the end of the book. Here one finds defined (to take the C's as an example) *c*, C3V, CAI, CCF, chondrite, chondrules, CIS, cm, comminution, *Copernicus*, Coriolis effect, CPM stars, and CRVS. It is hard or impossible to make such a compilation comprehensive, however; I tested it with a few terms from the book and found photoheating, homologous contraction, and T_K missing.

The review papers are comprehensive and well written. They are at the right level, and they take a broad view. Quite a large proportion of the topical papers are also appropriate to the purpose of *Protostars and Planets*: they address major questions, are written for nonspecialists, and are reasonably objective. In the astrophysical sector, the selection of topics and authors seems to me well balanced and remarkably comprehensive. The book is by no means a loose and uneven collection of divergent points of view. It is carefully edited and nicely produced, its price puts it within easy reach, and it is as up to date as publishing technology allows.

Those are its good points. The one bad one is that it is deficient in coverage of the chemical, mineralogical, and isotopic side of the subject. Hartmann's review largely omits these aspects, and the four papers that are concerned with chemical processes in the solar nebula address specific points and grind particular axes. They do not add up to a comprehensive treatment. The very nature of the problem—meshing the evidence in meteorites of condensation and other high-temperature effects with astrophysical models of star formation and the solar nebula—is never clearly stated. There is no paper by a mass spectrometrist descriptive of the recent important discoveries of stable isotope anomalies and very short-lived radioactivity in the solar system, though several papers refer to the data and attempt to rationalize them. This is not a trivial omission; the community and literature of cosmochemistry are substantial, and the properties of meteorites are our principal source of evidence (enigmatic though it may be) of events in the solar nebula.

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A Nucleic Acid

Transfer RNA. SIDNEY ALTMAN, Ed. MIT Press, Cambridge, Mass., 1978. xviii, 356 pp., illus. $29.95. Cell Monograph Series, 2.

Transfer RNA has always occupied a large share of attention in nucleic acid research. There may be several reasons for this, including the small size of tRNA molecules and the relative ease of isolation of large amounts of pure isoaccepting tRNA species, which have made tRNA the nucleic acid most amenable to biophysical structural studies. The determination of the high-resolution crystal structure of yeast phenylalanine tRNA by several laboratories within the last few years and the probable generality of this structure have dramatically stimulated and refocused tRNA research. The book *Transfer RNA*, a group of ten papers edited by Sidney Altman, is a timely effort to review the results of various types of investigation of this molecule in the era immediately following the elucidation of its three-dimensional structure.

Many of the functions of tRNA are by no means obvious from its crystal structure, and the main concern of the book is with a reanalysis of tRNA function in the light of this structure. There are chapters on sequence comparisons, biosynthesis, messenger RNA and ribosome interactions, modified nucleosides, suppression, "other roles" of tRNA, and possible modes of specific discrimination of individual tRNA species by aminoacyl-tRNA synthetase enzymes. The fine details of the crystal structure are reviewed by Kim, and Crothers and Cole contribute a provocative chapter on the functional implications of tRNA conformational changes in solution. The book is given an elegant send-off by an interesting account of the "coming of age" of tRNA from a personal and historical point of view by Hans Zachau, who has been engaged in research on tRNA since

its discovery a little over 20 years ago.

Altman's book is a commendable effort to document and bring up to date this fast-moving field. The level is moderately advanced and the references are extensive, so that the book is an essential addition to the library of those working with tRNA; the book can also be used as a starting point for a graduate student making his or her first venture into the field.

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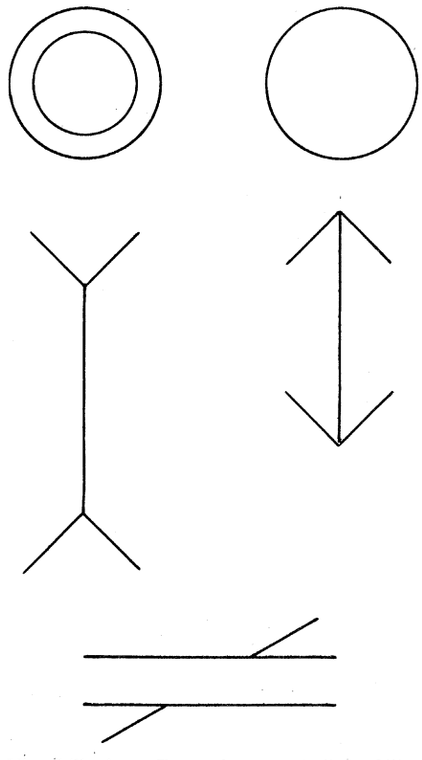
Perceptual Phenomena

Seeing Is Deceiving. The Psychology of Visual Illusions. STANLEY COREN and JOAN STERN GIRGUS. Erlbaum, Hillsdale, N.J., 1978 (distributor, Halsted [Wiley], New York). xvi, 256 pp., illus. $18.

Our senses do deceive us. The objects of interest are easy-to-draw two-dimensional line drawings whose illusory effects are not at all easy to explain. Venerable examples are the Delboeuf illusion, the Müller-Lyer illusion, and the Poggendorff illusion, producing the misperception of circle size, line length, and transversal collinearity, respectively (see illustration).

Seeing Is Deceiving provides comprehensive coverage of the wide array of visual geometrical illusions. With its introductory chapters on relevant historical issues and a systematic presentation in words and drawings of the major illusion families, the book can serve as a primer. The layperson or student will find the exposition interesting and informative. The prose is straightforward and relatively free of extraneous technical jargon.

Be not misled. The study of visual illusions has come of age, and succeeding chapters are meat for the expert. The authors are long-time collaborators in illusion research who have made sustained and significant contributions to data and theory. Having brought the reader's background up to snuff, they forge ahead, conveying in broad strokes what the 1000 or so articles that have been published on visual illusions collectively have to say. In comparison to J. O. Robinson's 1972 book, *The Psychology of Visual Illusion, Seeing Is Deceiving* is more readable, contains less detail, presents information in a more coherent fashion, and strongly presses a point of view. The Robinson treatise is closer to a handbook, while the Coren and Girgus volume sacrifices detail in the cause of conveying the underlying theoretical principles, critically comparing theories, coming to conclusions, and thus providing badly needed structure and integration. One knows where to turn for further details; nearly half the total illusion output is referenced.



Visual illusions. *Top to bottom*: Delboeuf illusion, Müller-Lyer illusion, and Poggendorff illusion.

For the specialist what is different? First, there is an insistence on multiple causation. The fact that a few simple pen strokes suffice to create an illusion does not imply that simplicity extends to causes. Second, there is an emphasis on a spectrum of causes that begins with the error characteristics of the eye (for example, spherical aberration), considers neurophysiological mechanisms, both peripheral and central, and includes the cognitive factors dear to the hearts of certain psychologists. Third, the study of individual differences is touted as an important approach to the delineation and understanding of causes. Fourth, the diminution in measured perceptual error that results from merely looking at an illusion display is attributed to changes in the judgmental strategy of subjects. Although the book is light on data, the authors do present tables and graphs of their own individual-difference correlation studies and decrement studies.

In summary, the work is a readable, coherent presentation of the state of the art in visual-illusion research and theory. Coren and Girgus have chosen to define an illusion as "an *apparently inexplicable* discrepancy between the appearance of the stimulus and its physical reality" (p. 23). They go on to say, "Ultimately, when we know exactly how the visual system works, visual illusions should no longer exist" (p. 23). Have they managed to put themselves (and the rest of us) out of business? By no means. They have, however, made significant progress. The book is indispensable for student and specialist. To the specialist: You will not see eye to eye with the authors, but I can promise widened horizons. As in many other fields, progress in illusion research has suffered because investigators are afflicted with tunnel vision.

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Archeological Summary

European Prehistory. SARUNAS MILISAUSKAS. Academic Press, New York, 1979. xiv, 336 pp., illus. $18. Studies in Archeology.

Europe has a long history of archeological research, with considerable changes in techniques and aims through time. Moreover, there is tremendous regional variation in the available data owing to differing local or individual research priorities and methods. Much of the European research has been conducted with the primary goal of establishing regional chronologies and distribution patterns. As a result, the literature of European prehistory is often frustrating to archeologists grounded in anthropological theory and concerned with processes of cultural adaptation and evolution.

In writing this much-needed synthesis of European prehistory, consequently, the author has faced the problems not only of a large and heterogeneous data base but also of significant differences in background and research interests between many European archeologists on the one hand and much of the English-speaking audience for the book on the other. Milisauskas has handled the difficulties remarkably well.

It must be emphasized that the book is narrower in scope than the title suggests. It focuses on Central and Eastern Europe from the Neolithic through the Iron Age, and there is only brief discussion of the Paleolithic and Mesolithic and little coverage for any period of Spain, Por-