Embryogenesis in Mammals

Experimental Approaches to Mammalian Embryonic Development. JANET ROSSANT and ROGER A. PEDERSEN, Eds. Cambridge University Press, New York, 1987. xiv, 558 pp., illus. $70.

The recent surge of progress in the study of mammalian embryology, accelerated by refinements in embryo micromanipulation and the application of genetic tools and molecular technology, has generated excitement among those who work in the area. This book reflects that progress and conveys that excitement. Its chapters define current knowledge and future prospects for understanding the problems of cell lineage, cell-to-cell interactions, and the regulation of gene expression during development.

The book is somewhat arbitrarily divided into three parts: Cellular Aspects, Molecular and Biochemical Aspects, and Toward a Genetic Understanding of Development. Part 1 combines descriptions of the dynamics of early embryo development with an evaluation of results obtained by the latest sophisticated methods for assessment of cell lineages. The first chapter, by Roger Pedersen, sets the tone of the book with its clear writing, good illustrations, and questions for the future. Related chapters follow by Martin Johnson and Bernard Maro, Janet Rossant, and Rosa Beddington on critical cellular events such as the development of polarity and the initial development of embryonic and extraembryonic lineages. Part 1 also contains a chapter by Virginia Papaioannou and Karl Ebert on the experimental manipulation of embryos from a variety of laboratory, domestic, and primate species.

Part 2 contains chapters on spermatogenesis by Norman Hecht and oogenesis by Richard Schultz. These are followed by a chapter by Gilbert Schultz on the utilization of genetic information by preimplantation embryos. Peter Kaye summarizes information available on the metabolism of preimplantation embryos. Such studies are important not only for elucidating the basic physiology of embryogenesis but also for developing systems that support embryogenesis in vitro. This part also includes chapters on cell-surface molecules in early development by Jean Richa and Davor Solter and regulation of the X chromosome by Verne Chapman. A chapter by Eileen Adamson on cell-lineage–specific gene expression complements chapters in part 1.

The third part of the book is a potpourri. Besides describing the elegant studies by his own and other groups using embryo micromanipulation techniques that indicate different roles of maternal and paternal genomes in embryogenesis, Azim Surani reviews pertinent genetic data related to this fascinating phenomenon. Unfortunately, the photographs of trophoblasts are poorly reproduced. In a thoughtful chapter, Terry Magnusson explores ways in which genetic tools could be utilized in the future, taking up potential problems as well as suggesting exciting possibilities such as identifying homologous genes in different species. Elizabeth Robertson and Allan Bradley describe the production of permanent cell lines from early embryos and their use in studying development. The book ends with a chapter by Erwin Wagner and Colin Stewart on the integration and expression of genes introduced into mouse embryos.

The "mammalian" of the title notwithstanding, all but one of the chapters focus primarily on studies utilizing the mouse. This emphasis reflects the relative ease of experimental manipulation of this species and its value as a genetic resource. Nevertheless, it is important that it be understood that the mouse is a model and starting point for similar studies using other species.

From beginning to end this is a book of highest quality in content and readability. Moreover, it defines many areas for future research in mammalian embryology.

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Cosmic High-Energy Physics

High Energy Phenomena Around Collapsed Stars. F. PACINI, Ed. Reidel, Dordrecht, 1987 (U.S. distributor, Kluwer, Norwell, MA). viii, 368 pp., illus. $69.50. NATO Advanced Science Institute Series C, vol. 195. From an institute, Cargèse, France, Sept. 1985.

During the past two decades, exploration of the electromagnetic spectrum in segments other than the optical has resulted in new views of celestial objects. The high-energy windows have been difficult to open. Because Earth's atmosphere absorbs most of the ultraviolet and x-ray light, high-energy rays cannot be adequately examined with ground-based telescopes and must therefore be studied from space. In recent years, the use of ultraviolet rays, x-rays, and gamma rays as probes of the emission mechanisms associated with cosmic high-energy phenomena has become possible thanks to satellites such as the International Ultraviolet Explorer, the Einstein (x-ray) Observatory, and EXOSAT. Although increasingly expensive, the astronomy of the highest energy regions of the electromagnetic spectrum is being nurtured by researchers through difficult technical and budgetary periods, for it provides fundamental information that is unavailable to other branches of astronomy. The questions that it can address relate to the physics of astronomical sources of violent activity such as supernovae, pulsars, black holes, x-ray binary stellar systems, and even the very distant quasars. High-energy radiation from such sources provides clues to massive explosions and to the age, density, and temperature of the sources.

Though still in its infancy, the study of cosmic high-energy phenomena is growing rapidly and offers exciting prospects for the next generation of astrophysicists. This collection of review papers, from lectures delivered at a NATO Advanced Science Institute, provides students and young researchers with a relatively up-to-date account of galactic high-energy astrophysics. Many of the papers are by leading astrophysicists in their respective fields, exemplified best, perhaps, by Edward van den Heuvel, who gives a masterful and thorough account of the mechanisms for the formation of neutron stars in binary systems. This subject is crucial to our theoretical investigation of the progenitors of x-ray binaries, many of which are as luminous as 10,000 suns—in x-rays alone.

At least five of the reviews deal directly with the observation, dynamics, and progenitors of supernovae and their association with pulsars (all with extensive reference to the published literature). This discussion is timely, particularly with regard to the occurrence of Supernova 1987A, which made possible the first detection of neutrinos originating outside the solar system. The papers in this volume contain good theoretical discussions of the impact of such an event on questions dealing with, for example, the formation of neutron stars.

Finally, the review by Martin Rees is a gem for anyone wishing to learn about the astrophysical relevance of black holes. Its level, like that of the other papers, is such that a graduate student with a background in basic physics and a particular interest in astrophysics can get from it a firm introduction to an exciting subject.

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Small Mammals

The Natural History of Badgers. ERNEST NEAL. Croom Helm, London, and Facts on File, New York, 1986. xviii, 238 pp. + plates. $19.95.

Ernest Neal's third magnum opus on badgers appropriately commemorates the 50th