easy. And they ought to, for nowhere in this sober extolling of anger is an angry expression or word to be found.

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Modern Cell Biology

Molecular Cell Biology. JAMES DARNELL, HARVEY LODISH, and DAVID BALTIMORE. Scientific American Books, New York, 1986 (distributor, Freeman, New York). xxxvi, 1187 pp., illus. $42.95.

Only a few years ago cell biology was a discipline dominated by the use of electron microscopy and biochemistry to unravel the structure and function of subcellular organelles. Today, with the infusion of techniques from molecular biology, genetics, and immunology, cell biology emerges as a broad, unifying discipline that permeates many disciplines and draws its experimental material from many species and cell types. It is difficult nowadays to approach a problem strictly from a molecular, genetic, or immunological perspective without simultaneously considering its cell biological consequences, or *vice versa*.

To educate a student in such a broad spectrum of disciplines while simultaneously emphasizing cell biological principles is no mean feat. It is a formidable task to write an authoritative textbook on the subject that is both deep in experimental detail and principle and broad enough to educate the reader from first principles. In many respects this book is one of the boldest and most successful undertakings of its kind to date. It stands above many of its predecessors in the extent to which it presents biological facts through the experiments that made them such. It also has the attribute of pointing out where knowledge is lacking and where experimental results are equivocal. It thus gives the student an appreciation of how modern experimental cell biology has emerged, where it stands, and where it is going and invites him or her to participate in the process of unraveling the mechanisms that make cells function.

Molecular Cell Biology begins by taking the reader on a short journey through the history of modern cell and molecular biology. The fundamentals of biochemical structure, function, and energetics and the principles of cell structure and function are then developed. This approach renders the book self-contained, but more advanced students may wish to use these chapters only for reference. The book then introduces current and now standard techniques in cell and molecular biology before it embarks on the experimental evolution of modern molecular cell biology. The diversity of eukaryotic organisms is brought to reality by the programmed expression of genes during differentiation. From this philosophical and realistic perspective the book develops the process of RNA biosynthesis and regulation of gene expression before it turns to describe how proteins are made and how they work. The student will be fascinated by the wealth of knowledge that has been amassed on this subject over the past few years and will be quickly made aware that what regulates the expression of genes in specific cells during development is a fundamental concern of modern cell biology. The book then concentrates on describing how proteins work together to make a living cell. It emphasizes that it is the integration of structural detail with molecular function that allows a cell to function as an entity and develops in depth the experimental approaches that have led to this realization. Finally the book turns to the molecular description of growth control and its relation to cancer, the immunological response, and evolution, areas in cell biology that have profited immensely from recent advances in molecular biology. Overall the themes the book touches on are superbly integrated, which speaks highly of the care that went into its execution. Without oversimplifying complicated issues, the book is remarkably accurate and up to date in its facts, and it includes an excellent bibliography at the end of each chapter to back them up.

Undoubtedly aficionados of certain disciplines may wish their particular subjects had been developed in more detail. This seems inescapable in a book with such a broad mandate. What is remarkable is that the authors have succeeded in highlighting a vast array of subjects, species, and cell types, emphasizing their encounter with modern molecular biology but also pointing to areas for future investigation.

It would be impossible to review this book without comparing it with the equally excellent *Molecular Biology of the Cell* by Alberts, Bray, Lewis, Raff, Roberts and Watson (Garland, 1983). Similarities between the two books are many. Among the most obvious are in their covers, both of which depict the distribution of major cytoskeletal elements in a cell as revealed by immunofluorescence, and in the way the material is organized. More important, both books are superbly illustrated, making extensive use of diagrams to guide the user through the massive amount of information they contain. There are also some notable differences. *Molecular Biology of the Cell* treats plant biology as a distinct subject and devotes a chapter to it, whereas the treatment of plants is scattered through the pages of *Molecular Cell Biology*. *Molecular Cell Biology*, being published three years later, is more up to date in certain subjects such as RNA processing and oncogenes. It also contains an excellent historical account of major experimental accomplishments in molecular genetics that provides a good introduction to modern molecular biology, and it has the added attribute of relating a lot of the recent advances in molecular biology to human pathobiology. Overall both textbooks do a superb job in summarizing the import of modern molecular biology to cell biology, providing the student and the teacher with a timely chance to participate in the making of modern molecular cell biology and setting the standard for the way the subject should be taught. Now that there is competition in this regard, the respective sets of authors may feel compelled to undertake frequent revisions, thus guaranteeing us an up-to-date textbook in molecular cell biology.

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Astronomical Distance Scales

Galaxy Distances and Deviations from Universal Expansion. BARRY F. MADORE and R. BRENT TULLY, Eds. Reidel, Dordrecht, 1986 (U.S. distributor, Kluwer, Norwell, MA). xviii, 301 pp., illus. $64. NATO Advanced Science Institutes Series C, vol. 180. From a workshop, Kona, HI, Jan. 1986.

The universe is still expanding. It would not be fair to say that this is the only issue upon which participants in the workshop whose proceedings are reviewed here agreed, but there are still substantial disagreements about the rate of the expansion (Hubble constant, H_0), the scale on which it becomes smooth, and the relationship between non-smoothness and the processes that form galaxies and larger structures in the universe. The proceedings address many of these questions, and J. P. Ostriker provides a thoughtful summary of the issues in his concluding remarks.

Of the 49 contributions, about three-eighths deal directly with distance indicators (from RR Lyrae stars to line widths and surface brightnesses of galaxies) and the scales implied by them. Different indicators (or at least different astronomers) continue to give scales differing by a factor of two, corresponding to a Hubble constant of 50 or 100 km sec^{-1} Mpc^{-1}, and so to age limits of 20 or 10 billion years. Curiously, this difference persists even after long-standing disagreements about distances within our own Local Group have been reconciled (with Andromeda at 685 kpc and the Large Magellanic Cloud at 50 kpc, known to within about 10% in each case). Long distance scales (small H_0 and large age) come from supernovae (Wheeler and Harkness) and 21-cm line widths of spiral galaxies (Huchtmeier; Kraan-Korteweg *et al.*) and short distance scales (large H_0) from a variety of stellar and galactic properties (summarized by de Vaucouleurs).

Three contributions pertain to the closely related issue of the oldest objects in the universe and concur that globular clusters (Renzini), elliptical galaxies (Windhorst *et al.*), and radioactive nuclides (Thielmann and Truran) all seem to be at least 13 ± 3 billion years old and are, therefore, very difficult to understand in a universe with the short distance scale and no cosmological constant.

Optimism continues to be expressed that the ancient H_0 controversy will be resolved by the Hubble Space Telescope (studying, for instance, Cepheids in the Virgo clusters) or even earlier from ground-based observations of novae in Virgo (van den Bergh). Unfortunately, as addressed by Burstein *et al.*, Collins *et al.*, J. Mould, and Meiksin and Davis and in about eight other contributions, it now seems exceedingly unlikely that a definitive global value of H_0 can be extracted from observations extending out only as far as Virgo (10 or 20 Mpc on the two scales). The problem is that these groups have assembled a considerable body of evidence indicating that there are large scale deviations from smooth Hubble expansion, amounting to at least 500 to 700 km sec^{-1} and applying coherently to regions as large as 50 (100 H_0^{-1}) Mpc. Lumpiness in the space density of galaxies also persists out to scales at least as large, according to data presented by Haynes and Giovanelli and by N. Bahcall (whose contribution unfortunately did not make it into the proceedings), and perhaps out to 400 (100 H_0^{-1}) Mpc, which would take in some 10^{18} solar masses (Tully). The extent to which the large scale velocity structure is associated with, produced by, or the cause of the large scale density structure remains to be determined, although the motion of the Local Supercluster may be attributable to the gravitational effects of the even larger adjacent Hydra-Centaurus supercluster.

In any case, as emphasized by Vittorio, Bond, and other participants, most current, popular models of galaxy formation have difficulties in accounting for this very large scale structure and streaming without at the same time producing larger inhomogeneities in the microwave background radiation than data (summarized by Lubin and Villela) permit.

A third major issue addressed at the workshop is the amount of gravitating mass implied by superclusters and larger structures and how close it comes to the critical density needed to close the universe. Most optical studies (Shaya and others) concur that scales up to superclusters contain only 20% ± 10% of the critical density, though the robustness of this conclusion is still under active debate (Melott and others). But data from the IRAS satellite imply a much larger baseline density upon which these structures are superimposed (Yahil) and so a total density within striking distance of closure. This is a real discrepancy that will require further study.

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Reprints of Books Previously Reviewed

The Anatomy of a Scientific Institution. The Paris Academy of Sciences, 1666–1803. Roger Hahn. University of California Press, Berkeley, 1986. Paper, $14.95. *Reviewed* **173**, 804 (1971).

The Birth of Particle Physics. Laurie M. Brown and Lillian Hoddeson, Eds. Cambridge University Press, New York, 1986. Paper, $18.95. *Reviewed* **226**, 38 (1984).

In the Name of Eugenics. Genetics and the Uses of Human Heredity. Daniel J. Kevles. University of California Press, Berkeley, 1986. Paper, $9.95. *Reviewed* **232**, 531 (1986).

Radiant Science, Dark Politics. A Memoir of the Nuclear Age. Martin D. Kamen. University of California Press, Berkeley, 1986. Paper, $8.95. *Reviewed* **228**, 845 (1985).

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Charge Transfer Reactions in Electrochemical and Chemical Processes. L. I. Krishtalik. R. G. Compton, translation ed. Consultants Bureau (Plenum), New York, 1986. xviii, 326 pp., illus. $65. Translated from the Russian edition (Moscow, 1979) by R. S. Wadhwa and N. V. Deineko.

Chemical Applications of Ultrafast Spectroscopy. Graham R. Fleming. Clarendon (Oxford University Press), New York, 1986. x, 262 pp., illus. $49. International Series of Monographs on Chemistry, 13.

Chemical Bonds Outside Metal Surfaces. Norman H. March. Plenum, New York, 1986. xii, 284 pp., illus. $52.50. Physics of Solids and Liquids.

Classification Algorithms. Mike James. Wiley-Interscience, New York, 1986. xii, 211 pp., illus. $34.95.

Cleft Lip and Palate. Aspects of Reproductive Biology. Krishna R. Dronamraju. Thomas, Springfield, IL, 1986. xiv, 165 pp., illus. $24.75.

Coal Science. An Introduction to Chemistry, Technology, and Utilization. Rita K. Hessley, John W. Reasoner, and John T. Riley. Wiley-Interscience, New York, 1986. xii, 269 pp., illus. $35.

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Computers in Medicine. Michael Anbar, Ed. Computer Science Press, Rockville, MD, 1986. vi, 314 pp., illus. $29.95. Applications of Computer Science Series.

Conceptions of Giftedness. Robert J. Sternberg and Janet E. Davidson, Eds. Cambridge University Press, New York, 1986. x, 460 pp., illus. $49.50; paper, $15.95. Based on a conference.

Data for Biochemical Research. Rex M. C. Dawson *et al.* 3rd ed. Clarendon (Oxford University Press), New York, 1986. xii, 580 pp., illus. $59.

The Day the Universe Changed. James Burke. Little, Brown, Boston, 1986. 352 pp., illus. $27.50.

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Development and Management of University Research Groups. Robert V. Smith. Illustrations by Sally Blakemore. University of Texas Press, Austin, 1986. xiv, 135 pp. $17.50.

Developmental Neurobiology of the Autonomic Nervous System. Phyllis M. Gootman, Ed. Humana, Clifton, NJ, 1986. xx, 416 pp., illus. $64.50. Contemporary Neuroscience.

Diagenetic Bedding. A Model for Marl-Limestone Alternation. Werner Ricken. Springer-Verlag, New York, 1986. x, 210 pp., illus. Paper, $18. Lecture Notes in Earth Sciences, vol. 6.

Differentiation of Protoplasts and of Transformed Plant Cells. J. Reinert and H. Binding, Eds. Springer-Verlag, New York, 1986. viii, 157 pp., illus. $49. Results and Problems in Cell Differentiation, 12.

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The Dilemma of Difference. A Multidisciplinary View of Stigma. Stephen C. Ainlay, Gaylene Becker, and Lerita M. Coleman, Eds. Plenum, New York, 1986. xxiv, 262 pp., illus. $29.50. Perspectives in Social Psychology. Based on an institute, Stanford, CA, July and Aug. 1982.

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Grazing Research at Northern Latitudes. Olafur Gudmundsson, Ed. Plenum, New York, 1986. xii, 374 pp., illus. $62.50. NATO Advanced Science Institutes Series A, vol. 108. From a workshop, Hvanneyri, Iceland, Aug. 1985.

Hazardous Chemicals Data Book. G. Weiss, Ed. 2nd ed. Noyes, Park Ridge, NJ, 1986. xxiv, 1069 pp. $98.

Hazardous Substances. A Reference. Melvin Berger, Enslow, Hillsdale, NJ, 1986. 128 pp. $12.95.

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Herpes and Papilloma Virus. Their Role in the Carcinogenesis of the Lower Genital Tract. G. DePalo, F. Rilke, and H. zur Hausen, Eds. Raven, New York, 1986. xiv, 368 pp., illus. $70. Serono Symposia Publications, vol. 31. From a symposium, Milan, Italy, March 1985.

Pest Control. Operations and Systems Analysis in Fruit Fly Management. Marc Mangel, James R. Carey,

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