

of the themes behind the conceptual advances in the field. For example, one chapter details the roots of bacterial genetics in classical genetics and the following chapter its roots in bacteriology. Rather than presenting a personalized view of key players in the story, this book focuses on the science itself. It divides the development of the field into topics (mutation, mating, phage, lysogeny, transduction, transformation, gene expression and regulation, from bacterial genetics to recombinant DNA) and then traces the history of each, going back to the 19th century.

Perhaps the best way to understand the scope of *The Emergence of Bacterial Genetics* is to look at how a typical section is organized. In the chapter "Phage," Brock begins with the early history of phage research, discussing the discovery, by Frederick Twort in England in 1915 and Felix d'Herelle in France beginning in 1917, of a virus that attacked bacteria and the skepticism of the Belgian immunologists Gratia and Bordet regarding d'Herelle's interpretation. The studies of Burnet and of Northrop in the 1930s are reviewed as a prelude to a detailed account of Max Delbrück's entry into the field and the profound influence he had on modern phage research. Delbrück is one of the most important figures in early phage and bacterial genetics research, and it is fitting that a significant part of this chapter is devoted to his biography, the influences on his thinking that led him from physics into biology, and the effect he had on students and postdoctoral researchers who became pioneers in their own right. The chronological account of how each scientific paper and advance fitted into the development of the phage field represents the strength of this book. Delbrück's collaboration with Luria and their involvement with Cold Spring Harbor Laboratory, the work of Hershey, and the first steps in phage genetics are covered, and some of the key experiments are analyzed in detail, with tables reprinted from the original research papers. The Hershey-Chase experiment is given a particularly detailed treatment. Benzer's classic work on genetic fine structure is also nicely summarized. A consideration of the biochemistry of phage replication, including the prejudice of the phage group against biochemistry, and a treatment of the restriction-modification phenomenon close out the chapter.

One of the pleasures of reading the book lies in the treasure house of experiments that are not widely appreciated today. For instance, even though I myself have worked with the *lac* system of *Escherichia coli* for almost 25 years, I had not previously realized that in 1951 Joshua Lederberg had

actually isolated the first constitutive (I^-) mutants, in which the *lac* enzymes were synthesized without the aid of an inducer. Lederberg had isolated mutants that could grow on the sugar neolactose, since it was thought that the specificity of β -galactosidase was such that neolactose was not cleaved by this enzyme. In reality, neolactose (somewhat in analogy to the sugar more widely used today, phenyl β , D-galactoside) is a good substrate for β -galactosidase, but it is not recognized as an inducer by the *lac* repressor. Therefore, mutants that could utilize lactose turned out to have high constitutive levels of β -galactosidase. The account of Lederberg's experiments is also interesting because of Brock's argument that they might be considered forerunners of the work by Jacob and Monod.

It should be stressed that the value of this book does depend somewhat on the audience. As a thorough and exhaustively referenced history of bacterial genetics through the beginning of the 1960s it is indispensable for the serious student of the history of this field. It is less accessible to the casual reader, however, because of its very completeness. As a work for students, it appears to be at the graduate level. In my opinion, it would require several modifications, most notably the inclusion of additional explanatory figures, to be considered as a supplementary text for an undergraduate course.

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Reprints of Books Previously Reviewed

The Emperor's New Mind. Concerning Computers, Minds, and the Laws of Physics. Roger Penrose. Penguin, New York, 1991. xiv, 466 pp., illus. Paper, \$12.95. *Reviewed* 245, 880 (1990).

Mind, Brain, and Adaptation in the Nineteenth Century. Cerebral Localization and Its Biological Context from Gall to Ferrier. Robert M. Young. Oxford University Press, New York, 1990. xxvi, 278 pp. \$39.95. *History of Neuroscience*, no. 3. *Reviewed* 173, 1013 (1971).

Science as a Process. An Evolutionary Account of the Social and Conceptual Development of Science. David L. Hull. University of Chicago Press, Chicago, IL, 1990. xiv, 586 pp., illus. Paper, \$19.95. *Reviewed* 242, 1182 (1988).

Books Received

Current-Induced Nonequilibrium Phenomena in Quasi-One-Dimensional Superconductors. Reinhard Tidecks. Springer-Verlag, New York, 1990. x, 341 pp., illus. \$89. Springer Tracts in Modern Physics, vol. 121.

The Curse of Icarus. The Health Factor in Air Travel. F. S. Kahn. Routledge (Routledge, Chapman, and Hall), New York, 1990. xiv, 180 pp., illus. \$19.95.

Cytochromes c. Evolutionary, Structural and Physicochemical Aspects. Geoffrey R. Moore and Graham W. Pettigrew. Springer-Verlag, New York, 1990. xvi, 478 pp., illus. \$98. Springer Series in Molecular Biology.

Density Functional Theory. An Approach to the Quantum Many-Body Problem. R. M. Dreizler and E. K. U. Gross. Springer-Verlag, New York, 1990. xii, 302 pp., illus. \$89.

Field Geology of High-Grade Gneiss Terrains. C. W. Passchier, J. S. Myers, and A. Kröner. Springer-Verlag, New York, 1990. x, 150 pp., illus. Paper, \$19.50. From a workshop, Kandy, Sri Lanka, Aug. 1987.

The Fine Structure of the Nervous System. Neurons and Their Supporting Cells. Alan Peters, Sanford L. Palay, and Henry deF. Webster. 3rd ed. Oxford University Press, New York, 1991. xx, 494 pp., illus. \$65.

Four Neotropical Rainforests. Alwyn H. Gentry, Ed. Yale University Press, New Haven, CT, 1991. xvi, 627 pp., illus. \$57.50. From a symposium, Columbus, OH, Aug. 1987.

Fractional Statistics and Anyon Superconductivity. Frank Wilczek. World Scientific, Teaneck, NJ, 1990. x, 447 pp., illus. \$68; paper, \$28.

Handbook of Pesticide Toxicology. Wayland J. Hayes, Jr. and Edward R. Laws, Jr., Eds. Academic Press, San Diego, CA, 1990. 3 vols. xlvii, 1576 pp., illus. \$395.

Imaging Anatomy of the Newborn. Ernst Richter and Werner Lierse. Alan E. Oestreich, Transl. Ed. Urban and Schwarzenberg, Baltimore, MD, 1991. xii, 280 pp., illus. \$175.

Mathematical Models of Hysteresis. I. D. Mayergoyz. Springer-Verlag, New York, 1991. xx, 207 pp., illus. \$59.50.

Protein Purification Applications. A Practical Approach. E. L. V. Harris and S. Angal, Eds. IRL (Oxford University Press), New York, 1990. xiv, 179 pp., illus. Spiral bound, \$54; paper, \$36. Practical Approach Series.

Proto-Oncogenes in Cell Development. Greg Bock and Joan Marsh, Eds. Wiley, New York, 1990. x, 295 pp., illus. \$63.50. Ciba Foundation Symposium 150. From a symposium, London, Sept. 1989.

Quantitative Methods in Landscape Ecology. The Analysis and Interpretation of Landscape Heterogeneity. Monica G. Turner and Robert H. Gardner, Eds. Springer-Verlag, New York, 1991. xvi, 536 pp., illus. \$98. *Ecological Studies*, vol. 82.

La Science pour Tous. Sur la Vulgarisation Scientifique en France de 1850 à 1914. Bruno Bégout, Ed. Bibliothèque du Conservatoire National des Arts et Métiers, Paris, 1990. 168 pp., illus. Paper, F 230.

The Scientific Letters and Papers of James Clerk Maxwell. Vol. 1, 1846-1862. P. M. Harman, Ed. Cambridge University Press, New York, 1990. xxviii, 748 pp., illus., + plates. \$195.

The Second Fifty Years. Promoting Health and Preventing Disability. Robert L. Berg and Joseph S. Cassells, Eds. National Academy Press, Washington, DC, 1990. xii, 332 pp., illus. \$29.95.

Semantic Structures. Ray Jackendoff. MIT Press, Cambridge, MA, 1990. xiv, 322 pp., illus. \$34.95. *Current Studies in Linguistics*, 18.

Shaping the Earth. Tectonics of Continents and Oceans. Readings from *Scientific American Magazine*. Eldridge Moore, Ed. Freeman, New York, 1990. x, 206 pp., illus. Paper, \$11.95.

The Silent Countdown. Essays in European Environmental History. P. Brimblecombe and C. Pfister, Eds. Springer-Verlag, New York, 1990. xii, 265 pp., illus. \$78. From a workshop, Bad Homburg, F.R.G., March 1988.

Spectral and Scattering Theory for Wave Propagation in Perturbed Stratified Media. Ricardo Weder. Springer-Verlag, New York, 1991. viii, 188 pp. \$39. *Applied Mathematical Sciences*, vol. 87.

Spores of the Pteridophyta. Surface, Wall Structure, and Diversity Based on Electron Microscope Studies. Alice F. Tryon and Bernard Lugardon. Springer-Verlag, New York, 1991. xii, 648 pp., illus. \$98.

Stars and Planets. The Sierra Club Guide to Sky Watching and Direction Finding. W. S. Kals. Sierra Club, San Francisco, CA, 1990. viii, 244 pp., illus. Paper, \$14.95.

Statistical Inference and Analysis. Selected Correspondence of R. A. Fisher. J. H. Bennett, Ed. Clarendon (Oxford University Press), New York, 1990. xviii, 380 pp., illus. \$90.

Women, the State, and Welfare. Linda Gordon, Ed. University of Wisconsin Press, Madison, WI, 1991. xii, 311 pp. \$35; paper, \$12.95.

The World of Pastoralism. Herding Systems in Comparative Perspective. John G. Galaty and Douglas L. Johnson, Eds. Guilford, New York and Belhaven, London, 1990. x, 436 pp., illus. \$45.