

ing the appearance of Tilman's system of theory which predicts from equilibrium assumptions the pattern (for instance) of maximum diversity at low-to-medium resource supply levels.

The structure of classical population genetics is grafted to traditional, animal-oriented population models; the definitions and variables assume that life histories return to zygotes at regular intervals. But the plant world is thick with species made up of clones, centuries or even millennia old, each living in several independent pieces, never reaching a stable distribution of ages or life-history stages, with recruitment of new recombinants at the lower margin of detectability, and perhaps with substantial somatic mutation rates. The treatments of selection in population genetics textbooks do not suggest sensible programs for investigating the evolutionary ecology of such plants. Plant demographers are beginning to shed the mental habits of animal ecology—an easy step, because population ecologists have never been able to agree what the questions are, never mind the answers—but have not yet got up the nerve to challenge population genetics. Tilman's book reflects plant demography as a whole in this. Throughout, he calls success "growth," a natural word to use of plant competition. But in asides he explains that growth can be strictly interpreted as "the long-term instantaneous per capita reproductive rate when a stable age or stage distribution has been reached." I should have been glad to see him dispense with this obeisance to a formal definition of fitness. Growth is a sensible measure of evolutionary success; the first imperative of success for a piece of genetic information is that tissue containing copies of it be made at least as fast as tissue containing it is lost. Whether a net profit of growth is accumulated within the individual or as multiplication of individuals all much the same size is a second-order question.

The book moves along purposefully; it is recognizably from the Princeton Monographs stable. The sequence of argument is outlined both before and after, and each chapter is clearly summarized; when sinking in a particular passage the reader knows in which direction to jump for solid ground. The method is graphical rather than algebraic. More ecologists will believe the argument as a result, because we can tell at a glance whether a conclusion changes when a line has a bend put in it. Tilman brings plants to stage front, where they belong. He strips away peripherals and concentrates on the basis of evolutionary success: use of energy and materials to build tissue con-

taining one's genes at a rate no slower, on average, than such tissue is lost. His model makes many predictions, plenty of them quite testable. His book deserves to be widely read.

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Embryonic Development

Cell Interactions and Development. Molecular Mechanisms. KENNETH M. YAMADA, Ed. Wiley-Interscience, New York, 1982. xii, 288 pp., illus. \$39.95.

This collection of ten reviews by well-chosen authors summarizes and evaluates current knowledge of the molecular mechanisms underlying some of the cell interactions occurring during development. It was designed for advanced undergraduate and graduate students and for scientists who are not specialists in the subject. The intent of the editor and authors to create a thoroughly readable treatment of the subject is eminently achieved, for the papers provide current, understandable, and sometimes simplified accounts of research progress.

The first paper, by Wassarman, reviews sperm-egg interactions during fertilization, with special attention to the sea urchin and to studies by the author of the mouse zona pellucida. The paper is complemented by a treatment of the mating processes of yeast and of *Chlamydomonas* by Goodenough and Thorner. This paper contains a more detailed and comprehensive treatment of a narrower subject than any of the other papers does.

Roth gives a relatively brief but insightful account of the biochemistry of cell adhesion among vertebrate cells, and Barondes adds a discussion of developmentally regulated lectins and their possible roles in both intracellular and intercellular recognition. An interesting addition on a subject too often omitted in discussions of cell interactions is a paper by Dazzo on recognition involving plant cells. He reviews the mechanisms underlying selectivity in the fertilization process and those responsible for recognition and rejection of grafts. The emphasis of the paper, however, is on recognition between plants and microbes, including both pathogenic bacterial infections and the symbiosis between nitrogen-fixing *Rhizobium* and legumes.

Four papers deal with migrating cells and their interactions with the extracel-

lular matrix. Harris reviews cell migration and its directional guidance. He gives only a superficial account of the proteins responsible for movement but thoughtfully discusses chemotaxis and the molecular mechanisms underlying contact guidance. The composition and morphogenetic roles of the pericellular matrix are discussed by Toole and Underhill, and Yamada reviews the structure and functions of fibronectin. The information presented in these three papers is integrated into the life history of a single group of cells in Weston's account of the migration of the neural crest cells. Weston's paper also includes an enlightening discussion of the roles of environmental influences in determining the phenotypes expressed by crest cells and of the prospects for analysis of the "conversation" between crest cells and their surroundings. This theme is further explored by Kratochwil in an excellent review of embryonic induction.

The strength of this collection comes from its coherence and from the authors' success in promoting understanding. The authors are aided in this endeavor by a wealth of superior illustrations and a substantial index. The book could serve well as the basis for a seminar or as a supplemental textbook in developmental biology courses, since many of the widely used textbooks are deficient in precisely the subjects covered by the book. The sole drawback to its wide use in this role is the book's price, which, if added to the price of a classical textbook, would make for an expensive, though exciting, course.

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Books Received

Geochemical Exploration in Deeply Weathered Terrain. Papers from a workshop, Floreat Park, Western Australia, June 1982. Raymond E. Smith, Ed. CSIRO Division of Mineralogy, Wembley, W.A., Australia, 1982. vi, 190 pp., illus. Paper, \$A12.

Handbook of Stress. Theoretical and Clinical Aspects. Leo Goldberger and Shlomo Breznitz, Eds. Free Press (Macmillan), New York, and Collier Macmillan, London, 1982. xxii, 804 pp. \$49.95.

Hankel and Toeplitz Matrices and Forms. Algebraic Theory. I. S. Iohvidov. Translated from the Russian edition (1974) by G. Philip A. Thijssen. Birkhäuser, Boston, 1982. xiv, 232 pp. \$24.95.

Health and the Law. A Handbook for Health Professionals. Tom Christoffel. Free Press (Macmillan), New York, and Collier Macmillan, London, 1982. xiv, 450 pp. \$29.95.

Heat Pipes. P. Dunn and D. A. Reay. Pergamon, New York, ed. 3, 1982. x, 308 pp., illus. Paper, \$20.

Heat Pipes and Thermosyphons for Heat Recovery. Papers from a conference, London. D. A. Reay, Ed. Pergamon, New York, 1982. iv pp. + pp. 259-348, illus. Paper, \$64. *Journal of Heat Recovery Systems*, vol. 1, No. 4.

Insect Behavior. A Sourcebook of Laboratory and Field Exercises. Janice R. Matthews and Robert W.

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