geologic lore. Adjust one's expectations and one will find the volume to be an important and valuable reference. Some of the chapters certainly will become required reading for all students of the earth sciences.

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Plant Population Biology

Genetic Differentiation and Dispersal in Plants. P. JACQUARD, G. HEIM, and J. ANTONOVICS, Eds. Springer-Verlag, New York, 1985. xviii, 452 pp., illus. $65. NATO Advanced Science Institutes Series G, no. 5. From a workshop, Montpellier, France, May 1984.

The title of this work is somewhat misleading since it implies a specific focus on dispersal and its genetic consequences. Instead the volume represents a sample of current research in plant population biology; some papers examine genetic differentiation and others examine various dispersal phenomena, but these topics are often incidental to their main themes. The main merit of the volume for a North American audience is its strong European, and particularly French, flavor. Fifteen of the 28 contributions are from France, with four each from the Netherlands and the United States and the remainder from Belgium, Germany, Japan, and the United Kingdom. Since all papers are in English, the work serves to introduce the North American reader to current research projects being undertaken in some of the major European laboratories.

The work is organized into four sections, commencing with genetic differentiation, first at the level of molecular variation and single gene polymorphisms and second at the phenotypic level. This is followed by treatments of dispersal, first involving gene flow and second by what is termed phenotype dispersal. The editors have not provided any significant introductory material, conceptual or otherwise. This lack, the scant subject index, and the large number of typographical and translation errors combine to give the impression of a hastily assembled volume.

Over a third of the contributions present electrophoretic data on enzyme polymorphisms both at a local scale and from regional surveys. The technique provides a rich source of markers for studies of mating systems and gene flow, but attempts to characterize the genetic variation and heterozygosity of populations on the basis of a few loci are of doubtful value and undermine the biological significance of a number of contributions. In their examination of the scale of population substructure in the clonal plant *Trifolium repens* Gliddon and Saleem demonstrate how electrophoretic techniques can be most profitably used by population biologists. A novel aspect of their contribution concerns the recognition that in clonal plants the vegetative "dispersal" of inflorescences as plants grow laterally can have an important influence on neighborhood size. Plants of different sizes will tend to disperse their genes by varying amounts. This contribution and a model by Van Dijk on neighborhood sizes in plantains highlight some of the difficulties in the application of Sewall Wright's nieghborhood models to plant populations.

Despite a strong surge of interest in the quantitative genetics of plant populations in North America, relatively few contributions in this volume examine the genetic basis and heritability of life history traits. An exception is Roach's study of phenotypic and genetic correlations between juvenile and adult characters in *Geranium*. Although population ecologists have long been aware that the magnitude of juvenile mortality has important consequences for the evolution of life history patterns, there has been little work on the nature of genetic variation during the prereproductive phase of the life cycle. Roach concludes that despite the presence of considerable genetic variation for fitness during this period in natural populations, response to selection of juvenile traits may be constrained because of maternal effects, negative genetic correlations with adult fitness components, and the enormous microsite heterogeneity of most plant habitats. A short review of interactions between environment and genotype by Kelley, including the "rediscovery" of Finlay and Wilkinson's regression methods for analyzing the performance of genotypes over a range of environments, may presage the emergence of a major field of inquiry in experimental quantitative genetics. It is surprising that despite the long tradition in plant biology of using clonal transplants for examining ecotypical differentiation, population biologists have been slow to take advantage of the clonal nature of many plants to examine how the fitness of genotypes can vary from place to place within patchy environments.

Another poorly understood topic in plant population biology is covered by Hayward in his review of the genetic organization of quantitative traits in rye grass populations. Long-term studies at the Welsh Plant Breeding Station have demonstrated both nuclear and extranuclear control of genetic variation. The latter involves somatic variation, which in rye grass is selectable at the vegetative level. Selection experiments for rate of tiller production within clones indicate that responses are both age- and genotype-specific. Whether somatic selection is an important evolutionary phenomenon in natural populations of clonal plants is not known, but the problem certainly deserves more attention than it has been given. Cytoplasmic variation is also examined in Van Damme and Graveland's study of gynodioecism in *Plantago* in relation to ecological differentiation. The remaining three contributions from the Netherlands also involve studies of plantains, which seem to have become the experimental organism of choice in that country. Similarly, the long-standing interest in *Thymus vulgaris* (thyme) by French workers at Montpellier is reflected by two contributions on the species. Dommee and Jacquard examine the influence of environmental disturbance on female frequency, and Mazzoni and Gouyon describe horizontal structure and covariation of terpene polymorphisms with the floristic composition of vegetation. Both papers emphasize the difficulty of providing conclusive evidence about the nature of selection on plant traits in long-lived perennial plants without the use of experimental transplants and demographic techniques.

In a short but thought-provoking general commentary, Antonovics suggests that the use of summary population statistics has obscured the complexity and internal dynamics of plant populations. The contributions in this volume emphasize this point and indicate how the contrasting spatial and temporal scales involved in population studies can make integration of ecological, genetic, and physiological approaches to the study of populations a difficult but challenging problem.

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Paleoclimatology

Late Cainozoic Paleoclimates of the Southern Hemisphere. J. C. VOGEL, Ed. Balkema, Rotterdam, 1984 (U.S. distributor, International Publishers Service, Accord, MA). xii, 520 pp., illus. $40. From a symposium, Swaziland, Aug. 1983.

The symposium of which this book is the proceedings was motivated partly by marine evidence of a phase shift in climatic change of the two hemispheres, with the southern leading by 3000 years. Australian and New Zealand Quaternists had previously found little evidence for such a phase shift, and there is not much in this book. Most authors