tation patterns on maize kernels could reflect the changing transcriptional activity of the element providing transposase.

The transposable Ty elements of yeast (Roeder and Fink) exhibit sequence heterogeneity that correlates with differential phenotypic effects, and their expression is modulated by other loci in the genome; both are features first proposed in the maize system. Similarly, the phenotype of some mobile elements in *Drosophila* (Rubin) can be influenced by unlinked genes and may be developmentally moderated. The discussion of hybrid dysgenesis in *Drosophila melanogaster* (Bregliano and Kidwell) concludes with an exciting discussion of the evolution of the phenomenon in which it is proposed that mobile P and I elements have recently invaded the species and spread worldwide, perhaps in response to the selective pressure imposed by intensive insecticide use, though it is unclear that any such selective pressure is necessary.

Several structurally distinct classes of elements emerge that are, however, widely distributed phylogenetically. For example, the retroviruses (Varmus), which have been most closely studied in birds and mammals, can be viewed as transposable elements using a viral RNA intermediate. The *copia*-like elements of *Drosophila* and the Ty elements of yeast bear striking similarities, at least structurally, to the retroviruses. The P elements of *Drosophila* closely resemble the Tn*3* family and the IS elements of prokaryotes, and sequences similar in form to the foldback elements of *Drosophila* are widespread in nature. It is likely that these distinct classes of mobile elements have differing mechanisms of transposition. Most of them are characterized by at least a short inverted repeat sequence at their borders, and all create a short direct repeat at the site of insertion.

The random aspects of mobile element transposition and the uncertainties surrounding the functional importance of mobile elements are contrasted by the specialized and clearly adaptive DNA rearrangements involved in the bacteria-plant gene transfer system of *Agrobacterium* (Zambryski, Goodman, Van Montagu, and Schell), the DNA inversions involved in phase variation and related systems (Silverman and Simon), and the gene-conversion–like events occurring in yeast mating-type switching (Haber) and trypanosome antigen variation (Borst).

Considering all of these mobile genetic systems side by side offers a valuable perspective. Though the field is moving rapidly and further molecular details are eagerly awaited, this book, up-to-date through 1982, should prove useful for many years to come.

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Drosophila in Its Ecosystem

Ecological Genetics and Evolution. The Cactus-Yeast-*Drosophila* Model System. Proceedings of a workshop, Oracle, Ariz., Jan. 1982. J. S. F. BARKER and W. T. STARMER, Eds. Academic Press, New York, 1982. xiv, 362 pp., illus. $38.

A thorough understanding of evolutionary mechanisms requires detailed knowledge in almost all areas of biology, of which genetics (in its broadest sense) and ecology are most important. It is an oft-heard lament that the higher organism most amenable to genetic study, *Drosophila*, has not been, and perhaps cannot be, subjected to ecological studies. This volume clearly shows that such sentiments are not well founded.

The *repleta* group of the genus *Drosophila* breed primarily in rotting cactus, the larvae and adults feeding on yeasts growing on the necrotic tissue. The primary person responsible for developing ecological understanding of this group has been William Heed of the University of Arizona; indeed, if he were not a contributor himself this might be considered a festschrift in his honor. Many of the contributors were his students and collaborators, including outstanding yeast and cactus systematists and a natural products chemist. The variety of fields of expertise represented by these contributors reflects the multifaceted approach emphasized in this volume. With few exceptions, the 21 chapters are very well done.

Some of the contributions will be of interest only to those working specifically with the system. A few have much broader appeal, however. For example, Throckmorton's typically critical and insightful observations on the evolutionary origin of the group contain important new information on the origin of the whole family. Wasserman's phylogenetic analysis based on polytene banding patterns is a classic example of the exploitation of the information contained in these chromosomes. Starmer's work emphasizes the interaction of cactus chemistry, yeast growth, and fitness of the *Drosophila*; Vacek adds the complicating factor of interactions with bacteria. Barker ably reviews a large amount of work done on cactophilic *Drosophila* in Australia. Markow makes some fascinating observations about the reproductive behavior of the flies. (A chapter on mating behavior and speciation would have been a useful addition.)

The volume contains no final chapter synthesizing the diverse contributions; one reason is that at the present time such an undertaking would be very difficult. This is more a progress report summarizing currently and potentially available information on this group of *Drosophila*. Any evolutionary biologist hunting around for a good group of organisms to study should read this book and carefully consider the cactophilic *Drosophila*. My research is on a different group of *Drosophila* and I was given pause to seriously consider whether I was working on the best material for significant breakthroughs in understanding evolutionary mechanisms; the contributors to this volume very well may be.

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Stratigraphic Analysis

Quantitative Stratigraphic Correlation. J. M. CUBITT and R. A. REYMENT, Eds. Wiley-Interscience, New York, 1983. xii, 302 pp., illus. $54.95.

Quantitative Stratigraphic Correlation is a collection of papers from the Geological Correlation Programme of the International Geological Congress. These papers apply numerical methods in correlation, biostratigraphy, and lithostratigraphy. They are part of IGC's Project 148, which is the development of computer-based mathematical theory and the use of geological information in correlation. Although most of the papers are biostratigraphically oriented, they demonstrate a variety of techniques applicable to stratigraphy in general. With a single exception, the papers do not summarize available techniques but are actual applications of one or more methods. The results of the analyses are usually contrasted with information derived through non-numerical methods. This publication cannot be considered a "cookbook" or a user's guide to techniques of quantitative correlation.

In the book several fundamental issues are addressed such as numerical matching of rocks as opposed to correlating formal stratigraphic units. Also the possible lateral and vertical relationships between lithologic units and how these relationships can be entered into a database are briefly discussed. L. E. Edwards provides an excellent overview of quantitative biostratigraphy as categorized into four concepts: tally (presence), event (highest and lowest), morphology (species morphology), and ecostratigraphy (abundance of particular taxa). Edwards notes that most multivariate, seriation, and relational strategies implicitly are concerned with the stratigraphic event concept. However, in seriation, the matrix in which species and samples are compared has the rows rearranged to minimize the ranges of species. Thus the occurrences, not the events, are emphasized. Seriation is discussed by J. C. Brower and W. A. Burroughs as a simple method of generating meaningful and informative range charts in which it is possible to group most similar samples. Edwards discusses the different techniques for depicting species ranges and how seriation produces ranges that are neither maximum nor average ranges. She notes that probabilistic and multivariate techniques produce average ranges.

Some other contributions in the book include discussions of the conceptual basis for lateral tracing of biostratigraphical units and of properties of composite sections constructed through least-squares fitting, a probabilistic model of foraminiferal stratigraphy, a time-series analysis based on species abundance to determine features of climatic fluctuations, and a paleoecological study using correspondence analysis. The papers generally appear to have been written for the mathematically knowledgeable stratigrapher. However, there is a considerable amount of information for those not well versed in such methods. Most of the papers document the methods and indicate the available computer programs that were used in doing the analyses. There are extensive lists of references to sources of further information on many of the subjects discussed. The techniques used are of importance to all stratigraphers. Certain of these methods allow a large quantity of data to be examined in a relatively short time. One of the most attractive features of such analyses is that they are extremely powerful in finding the major trends in the data. They automate what are otherwise tedious manual tasks. Also they enable the researcher to summarize a large quantity of data objectively and to put them forth in an easily understood graphical format. One of the shortcomings of this book is that many of the figures are mathematically too technical in their labeling and captions. There should have been more general or user-friendly labeling to make the papers suited to the average stratigrapher and to show the amount of graphical information provided through such analyses. Many geologists have not used quantitative techniques because mathematical geologists and statisticians often do not communicate in plain language.

The principles of quantitative stratigraphic correlation take some dedication to learn but are essential because of the increasing quantity of data being accumulated about stratigraphic sequences and the amount of information being published using these techniques.

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