subject became as fashionable as it is today. It consists of 31 papers divided into three groups: general, on the orogenic systems in the Mediterranean region, and on orogenic systems in North America.

The general section begins with three papers on the global aspects of tectonics by Press, Jacoby, and Schuiling. Press advocates gravitational instability arising from the lower density that may be associated with partial melting in the low-velocity zone as the cause of plate motion; Jacoby favors the gravitational instability that causes sliding of the plates away from the midocean ridges toward the trenches; Schuiling too favors gravitational sliding and sees the thermal blanketing effect of a continental mass as resulting in uplift of the continent, which starts the drift cycle. There is, of course, a fundamental difference between the type of convection advocated in these three papers and the mantle-wide convection currents suggested by many as the driving mechanism for continental drift. In mantle-wide convection it is the viscous drag on the bottom of the lithospheric plates that produces the movement. In the convection postulated by Press, Jacoby, and Schuiling the viscous drag impedes the motion of the plates. I find the gravitational instability hypotheses more plausible than mantle-wide convection, but I think we still have much to learn about the mechanics of plate tectonic processes.

The remainder of the general section is concerned with processes on a smaller scale: Ramberg's beautifully illustrated description of his elegant scale-model experiments using centrifuge techniques, Durney and Ramsay's account of observations of the evidence for strain and deformation in the rocks themselves, and Voight's analysis of a major slide during the Alaskan earthquake and comparison of it with the Heart Mountain overthrust in Wyoming. One of the more intriguing of Ramberg's model experiments is that for the midocean ridges. The experiment implies a much higher viscosity for the spreading lens below the ridge than that which would correspond to a silicate melt. This suggests that the melt occupies only a small portion of the spreading lens zone.

In the second and longest section of the book, gravity tectonics concepts are applied to structures in the Mediterranean region ranging from the Pyrenees to the islands of the Aegean, with, of course, several discussions on the Alps. Almost all the authors agree that gravity plays some part in the tectonic process, for example, diverticulation in the pre-Alps, but some, in particular Lemoine and Laubscher, emphasize the paradoxes.

The section on the orogenic systems of North America ranges across almost the entire continent, from Newfoundland (Kay) to the California Coast Ranges (Hsü) and from the southern Canadian Rockies (Price) to the Ouachitas (Viele). In many of these papers, gravity sliding plays a prominent role. As Hsü remarks, "The pendulum has begun to move in an opposite direction. Theoreticians speculating on the motor of the plate motion are leading us back to gravity tectonics."

This is, of course, a book with a definite point of view, the importance of gravity in tectonic processes, and most of the contributors share that point of view. Nevertheless, the evidence for the effect of gravity in tectonics at all scales is impressive and the analyses reasonably critical, so the book provides excellent material for seminars and courses in structural geology and tectonics.

The book lacks an index.

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Localizing Big Problems

Our Environment. The Outlook for 1980. ALFRED J. VAN TASSEL, Ed. Lexington (Heath), Lexington, Mass., 1973. x, 590 pp., illus. $20.

What an excellent idea. Design a graduate seminar around a necessary and novel project and assign each student a portion of the report to write. Then not only will the students experience a sense of working and thinking together, but the results can be published to be read by the public at large, rather than only the archivists. A. J. Van Tassel did this once before, in *Environmental Side Effects of Rising Industrial Output* (Heath, Lexington, 1970). Now he tries again. His goal in this latest effort is to predict "the state of the environment in the United States in 1980. Is there any way in which we [can obtain] a quantified answer to that question?" Van Tassel's approach is to assign each of his students a specific water or air basin. The students attempt to ascertain the environmental conditions of these various areas in 1970 and then, on the basis of the population and industrial growth of the preceding decade, to project environmental improvement and deterioration into the coming decade. Such an approach focuses on the factors unique to each particular region rather than on some homogenized national norm.

Both the potentialities and the pitfalls of the scheme show up in this monograph. Approximately 20 students, all candidates for a master's degree in business administration, contribute chapters. An academic exercise of this sort demands a strong, if not ruthless, guiding hand. The editor must insist that each author provide certain basic information, which in some instances may amount to no more than filling in blanks with statistics. Each author must describe his procedures, and these of course tend to be repetitive from chapter to chapter. For the reader this treatment becomes monotonous after a while, and there are times when he wishes the book had been reduced by as much as a quarter. The more resourceful authors in the class, such as Martin in his chapter on the Hudson, Matern on San Francisco Bay, French on the Savannah River, Carmichael on recycling, and Seaman on solid waste disposal in four eastern cities, manage to say something novel and interesting that goes beyond the standard form. Others have apparently been unable to find the required data; chapters 7 (on Lake Erie) and 24 (waste disposal in five midwestern cities) are weak and the statistical work in them far inferior to that of the other chapters.

Some of the procedures described may leave the reader uneasy. For example, the main measure the group uses for environmental stress in water pollution is BOD (biological oxygen demand). As some of the authors point out, this omits the nonorganic impact of industrial pollution. The general discussions of the effects of mercury, DDT, and oil from the water bodies and the environment by some of the authors do not fill the gap.

There are also some errors. Thus in a summary the editor remarks that "water pollution is of little concern to Atlanta since it has no major waterways." If anything, the absence of major waterways near a large city is almost inevitably a signal that the city will have a sewage disposal problem. Indeed Atlanta, along with Cleveland

and Detroit, was sued by the Environmental Protection Agency for its failure to clean up its waters. Although the suits were settled, the fact remains than an industrial city the size of Atlanta puts an enormous burden on the sewage absorption capacity of a river the size of the Chattahoochee no matter how advanced its treatment facilities are.

Whatever its flaws, however, the study merits attention. It is a pioneering attempt that offers much promise. Indeed the chapter by Caulson presents a methodology that is useful and adaptable to the purpose for which it was intended. Moreover, even if not all the chapters are presented, as promised, in quantifiable terms, they contain some interesting qualitative material. If nothing else, this is a useful handbook of regional environmental efforts. It also shows how existing material prepared by organizations such as the Environmental Protection Agency and various regional government groups can be utilized in a creative way.

The comparative nature of the study leads to some noteworthy observations. While big cities with their greater waste disposal loads are likely to have more serious environmental problems than small cities, they need not have if their authorities exercise enough foresight. Thus waste disposal in Los Angeles is more successful than it is in many smaller American cities. Conversely smaller cities, like Savannah, Georgia, and Green Bay, Wisconsin, can have very serious water problems if they have had the misfortune to attract polluting industries.

Van Tassel points out that, wherever they can, large cities try to export their waste (Chicago sends its water down the Illinois River) and import the resources they need so as to transfer their environmental burdens to other places. New York imports its water from upstate, and Los Angeles its electrical energy from the Four Corners. Observations of this sort do much to enliven the volume.

Finally, the difficulty students had in quantifying the environmental future of some regional air and watersheds, because of both the unavailability of data and the unpredictability of technological and human development, suggests how fragile prediction for the country at large must be.

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Population Dynamics

The Mathematical Theory of the Dynamics of Biological Populations. Proceedings of a conference, Oxford, England, Sept. 1972. M. S. BARTLETT and R. W. HIORNS, Eds. Academic Press, New York, 1973. xii, 348 pp., illus. $21.50.

In his graceful introduction to this collection of conference papers, Coulson writes: "The mathematician needs the restraining hand of the experimental biologist, and the biologist needs the rigorous competence and analytic power of the mathematician. Without this mutual interaction we have all too often bastard mathematics or 'sloppy' biology. Nowhere is this more clear than in the study of population dynamics: nowhere is it more necessary to establish an effective liaison." The fostering of such a liaison was the aim of this conference, held under the auspices of the (British) Institute of Mathematics and Its Applications, in association with the Institute of Biology.

The papers are grouped under five headings: Population Processes in Time (mainly simulation of fisheries); Population Processes in Space; Population Genetics (the most mathematically sophisticated section); Estimation and Simulation Problems (largely mark-recapture methodology); and Population Distribution and Community Structure.

The first chapter is a crisp survey of "Equations and models of population change" by Bartlett. Formal and telegraphic in style, and equipped with a good bibliography, this chapter will be useful to a mathematician seeking a signposted entry to the literature. Bartlett emphasizes problems involving stochastic processes, and makes no mention (except in the bibliography) of models involving competition, predator and prey, patterns of species distribution and abundance, or community structure. This by and large sets the tone of the book. Another notable paper is by Skellam, who lucidly discusses the way diffusion equations may be used to describe invasions, seasonal migrations, and other movements of biological populations. Williamson gives a constructive review of the baroque literature on measures of species diversity, and argues for the need to go beyond such static measures of diversity to study the ebb and flow of interacting populations.

Most of the senior mathematicians deployed at this conference have their background in mathematical statistics. This is indeed the branch of mathematics relevant to most of the papers in the collection: for example, those on population genetics (Bodmer, Karlin, Robertson, Hiorns), technical aspects of mark-recapture methods (Cormack, Bishop and Sheppard), epidemiology (Bailey), spatial patterns in host-parasite relations (Pielou), statistics of cell proliferation (Macdonald), and stochastic formulations of life tables (Gani). However, there remain many central problems in theoretical population biology where the tools of classical applied mathematics, or even of electrical engineering, are likely to be more helpful than those of mathematical statistics: for example, problems concerning energy flows in, and other dynamical aspects of, food webs; or in the theory of the niche; or in comparatively realistic models of host-parasite systems. These areas are essentially unrepresented in the collection, the exceptions including some interesting but specialized simulation studies, Murdie and Hassell's elegant laboratory study of predators' searching behavior, and the contributions of Skellam and Williamson mentioned above. Overall, I have the impression that the conference was organized by first selecting good people, and letting their interests dictate the choice of topics, as opposed to first agreeing on a balanced program reflecting the broad sweep of "the mathematical theory of the dynamics of biological populations." The former strategy is of course sound; it has produced a strong book of limited scope.

These general observations may be illustrated by some specific instances.

The chapter by Jones and Hall includes numerical simulations that explore the dynamical consequences of various assumptions about egg production and recruitment in fish populations. The authors make the empirical observation that such simulations can show stable patterns of periodic oscillation, and they give a perceptive discussion. It is noteworthy that apparently no one at the conference was equipped to point out that their model may be shown, rigorously and generally, to possess stable limit cycle solutions, and furthermore that such stable limit cycles are as ubiquitous and natural in nonlinear systems as are the stable equilibrium points that we learned to love in elementary (linear) mathematics and physics courses.

One crass, but usually reliable, way to form a view of a book is to look at the author index. The text contains *no* reference to MacArthur, Levins, or