Large Centers, Small Science

Fifty Years of Neutron Diffraction. The Advent of Neutron Scattering. G. E. BACON, Ed. Published with the assistance of the International Union of Crystallography by Hilger, Bristol, U.K., 1987 (U.S. distributor, Taylor and Francis, Philadelphia). xiv, 280 pp., illus. $66.

The history of the evolution of the present-day large-scale particle accelerator facilities, which began with E. O. Lawrence's table-top cyclotron, is well known. The particle physics groups that use them have grown in size, power, and annual budgets to rival medieval principalities, complete with princes, courtiers, and palace intrigues. But there is another class of large facility, with no less pervasive impact in contemporary science. I refer to the neutron and x-ray scattering centers that have grown to accommodate the materials scientists, chemists, and biologists working in traditional small university research groups, who for several weeks a year forsake their basement laboratories and teaching duties for the around-the-clock work schedules and take-out-Chinese cuisine that constitute the hard realities of large-facility research. That users continue to show up in increasing numbers testifies to the power and sophistication of these diffraction techniques. This book, edited by a distinguished senior member of the neutron scattering community, and comprising 36 individual papers by other active participants, chronicles the growth of this field.

It all began with the demonstration of diffraction of thermal neutrons from crudely moderated radium-beryllium sources in 1936. The promise of these early experiments was realized very slowly, because it has been strongly coupled to the advent of high-performance nuclear reactors. Depending on the nation involved, these facilities were developed to meet either the imperatives of nuclear armament or the dream of "electric power too cheap to meter," but in any event in the early days neutron scattering got a free ride. Remarkably, the pioneering scientists who used the first humble facilities proved them useful enough to spawn a second generation of more powerful sources, optimized for producing beams of thermal neutrons for scattering experiments in sufficient numbers to serve a growing user community. Perhaps the culmination of this present stage is the Institut Laue-Langevin in Grenoble, the most ambitious, most generously funded, and by many criteria the most successful neutron scattering center in existence.

As is common in such multiauthored works, there is a considerable variation in the style and content of the contributions, which range from personal reminiscences to concise nontechnical summaries of progress in neutron scattering research in biology, chemistry, lattice dynamics, and magnetism. Even more powerful neutron scattering facilities, based both on traditional reactor and newer pulsed accelerator sources are planned, and they are briefly described in the final section of the book.

This volume will provide interesting light reading for the community of international neutron scatterers, who will have direct associations with the persons and events described. It is also the source of some unique historical material, although I suspect that it is too casually referenced to be considered a "serious" historical document. Finally, the book provides a useful prospective for science policy-makers as they review the accomplishments and present priorities for the large facilities that small science finds increasingly necessary.

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Pathogens and Populations

Diseases and Plant Population Biology. JEREMY J. BURDON. Cambridge University Press, New York, 1987. viii, 208 pp., illus. $49.50; paper, $19.95. Cambridge Studies in Ecology.

A survey of the contents of leading ecology journals, reviews, and textbooks will attest that far more attention has been given to herbivores, especially insects, than to microparasites such as fungi, bacteria, and viruses as regulators of plant distribution and abundance. The premise of *Diseases and Plant Population Biology* is that the impact of plant diseases on plant populations has been much underrated by plant ecologists, especially population ecologists.

The rarity of published research dealing with the role of plant disease in the population dynamics of plants may explain in part why this book is so short, despite the broad potential of the topic. The text is only 177 pages, including numerous figures and an exposition early in the book of "nuts and bolts" of plant pathology. This brevity also results from the author's concise and direct style. The book is an appeal for greater attention to the topic, not a compendium. Its purpose is to excite and to incite population biologists with interest in ecological or genetic approaches.

The perspective is chiefly autecological. It has been difficult enough to assess the epidemiological consequences of single pathogens on artificial mixtures of narrowly varying genotypes (multilines) within crop monocultures without taking on such consequences in mixed vegetation. As a result, community ecology is scarcely touched. Burdon suggests that the principal mechanism through which pathogens affect the composition of plant communities is differential susceptibility among plant species to various pathogens under different environmental conditions. There is little actual evidence to support such a contention, however.

Plant ecologists have emphasized the great genetic variability of plants' responses to biotic and abiotic stresses. Plant pathologists have focused on such variation within the usually narrower genetic resources of crop or timber species. But they also have documented great variability within pathogen populations. The principles of the gene-for-gene theory of H. H. Flor should be as fruitful for studies of the population genetics of natural vegetation as they are in the case of crop plants, yet such applications have been rare and peripheral.

Plant pathologists have enthusiastically—although selectively—adopted basic ecological theory and terminology. Burdon's book will not provide many unfamiliar examples or arguments for plant pathologists. But the science of plant pathology has been focused on agricultural and forest diseases, primarily those with the greatest visual and economic impact. This has undoubtedly restrained studies of the impact plant pathogens might have on populations of wild plants. There has been no comparable borrowing of ideas from plant pathology by plant ecologists. *Diseases and Plant Population Biology* presents a concise demonstration of why this is probably a serious oversight.

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