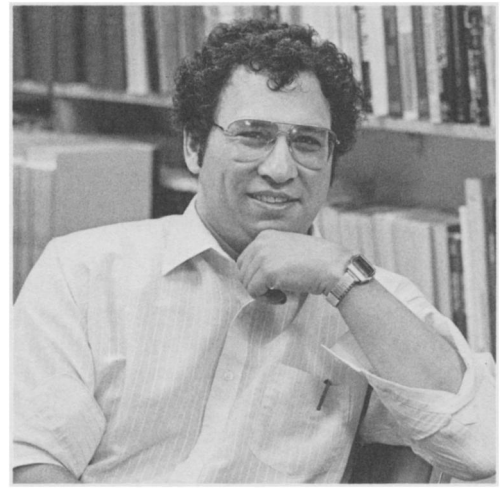
Simon A. Levin



The Robert H. MacArthur Award honors significant contributions to ecology by a scientist in mid-career. This year the award was given to Simon A. Levin, the Charles Alexander Professor of Biology at Cornell University, for his seminal papers on a wide variety of fundamental questions in ecology. As a mathematical theoretician, Simon tends to view things in terms of processes that cut across the boundaries of ecological subdisciplines, with the result that his work has served to link population and ecosystem concepts and blur distinctions between basic and applied interests.

Simon received his training in mathematics at Johns Hopkins University (B.A. in 1961) and the University of Maryland (Ph.D. in 1964). While he was an Assistant Professor in the Department of Mathematics at Cornell, he was drawn to attend the lectures in introductory ecology by his desire to work on something relating to environmental problems. He soon became intrigued by the possibilities that might stem from expanding on the theory behind the competitive exclusion principle (1970 in the *American Naturalist*). In particular, he observed that the models current at that time failed to consider two important factors, genetic change in the interacting populations, and the spatial pattern of the environment. These topics drew Simon deeper into ecology and formed the themes for two lines of investigation that he continues to pursue.

By the time that Simon was planning his first sabbatical leave, he had concluded that he required thorough, first-hand knowledge of a natural system to help him frame theory that was interesting and useful to most ecologists. For this reason he chose to spend a year working with Robert T. Paine (who was, incidentally, the first recipient of the MacArthur Award) on the role of disturbance and patch dynamics in determining the structure of intertidal communities. The two men became close friends and their collaboration has yielded several important insights (1974 in *Proceedings of the National Academy of Sciences* and 1981 in *Ecological Monographs*). This early work on the patchiness of environments led Simon in a number of directions, most notably to thinking about the spatial scale at which systems might be expected to reach an equilibrium (this line of investigation is reflected in the address Simon delivered upon receiving the MacArthur Award) and to work on dispersal between patches. On this latter topic his fruitful collaborations with Peter Karieva, Akira Okubo, Lee Segel, and others have been especially important in developing diffusion models for several ecological processes in a variety of ecosystems (e.g., his recent paper in *Ecology* with Okubo on wind dispersal of pollen and seeds).

The line of investigation that grew out of his early interest in the genetic dimension of interspecific competition led Simon to collaborate with David Pimentel and his students on developing a theoretical framework for understanding coevolution and genetic feedback (Simon's foundation paper on this topic was published in 1972 in the *American Naturalist*). In pursuing this topic, Simon started working on the evolution of parasite–host interactions, which, in turn, led to his current general interest in epidemiology and the evolution of infectious disease.

In 1974, while he was still an Associate Pro-

fessor, Simon became Chairman of the Section of Ecology and Systematics at Cornell. The Section prospered greatly under his direction, with the outcome that Simon's leadership talents have been much in demand ever since. He was Director of the Ecosystems Research Center at Cornell from 1980–1987. Currently he is Director of the Center for Environmental Research, where he has responsibility for a diverse set of programs involving an independent staff and faculty drawn from departments in three different colleges at Cornell. In his capacity as the leader of these centers, he has become deeply involved with a number of important environmental issues. He has co-authored or edited several influential reports on nutrient cycling, fisheries management, and ecotoxicology. He was a member of a National Academy of Sciences committee that issued a widely discussed report on the key issues involved with the introduction of recombinant DNA-engineered organisms into the environment. Much of Simon's effectiveness in both science and administration stems from his ability to identify the basic structure of problems and to discover what elements are common to a whole class of problems. This aspect of his concern with environmental issues is best reflected in his writings and speeches on risk assessment which, since they are largely directed to audiences of decision-makers, are unfamiliar to many ecologists.

Perhaps the feature of Simon's work that will have the most lasting impact on ecology is something less tangible than the results reported in specific papers. I refer to his efforts to define and perfect the role of the theoretician in ecology. This goal is reflected in all that he has done. For instance, he takes care to make his mathematics as accessible and relevant as possible when he is writing for ecologists. (Simon has a bibliography of over 150 publications, many of which are in mathematical journals seldom consulted by ecologists.) He is a skillful and dedicated teacher who has inspired several biologists to delve more deeply into mathematics. He has been the Managing Editor since the 1970s of a series of monographs and texts on mathematical biology, and he is a member of the editorial boards of several journals concerned with theoretical biology and mathematical modeling. He has also arranged numerous conferences that have brought biologists and applied mathematicians together. Through these activities he has encouraged many outstanding mathematicians to take up ecological problems. The trait that is most fundamental to Simon's effectiveness in developing theoretical ecology, however, is his willingness to take the true complexities of nature into account. He appreciates the concerns of field ecologists about the assumptions and oversights of theories and he has given much thought to finding the proper relationship between empirical and theoretical approaches. Some of these ideas are expressed in his papers in the *Auk* (1980) and the *American Zoologist* (1981).

Simon has won many distinctions. These include a Guggenheim Fellowship in 1979 and his election to the Charles A. Alexander Chair (held previously by Robert H. Whittaker) in 1985. He has served the Ecological Society of America in a variety of capacities: he has been a member of the Public Affairs Committee since 1985, he is founding Editor-in-Chief of *Ecological Applications,* and will be President in 1990–1991.

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