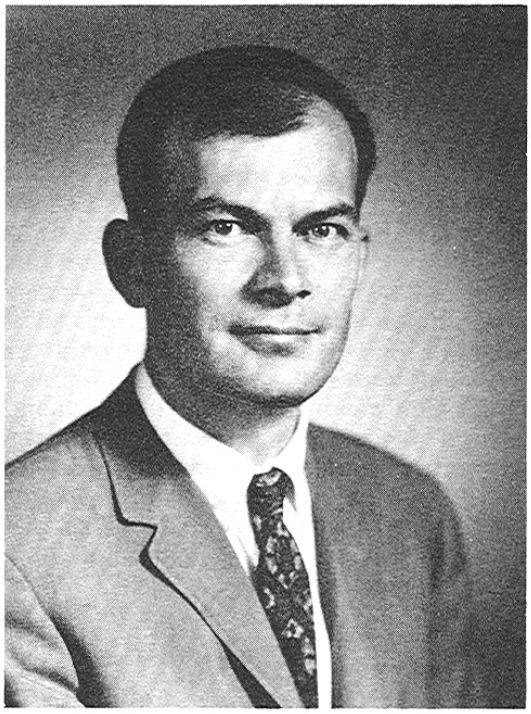
eminent ecologist, 1973

Robert Helmer MacArthur

Robert MacArthur, who died on November 1, 1972, at the age of forty-two, will be remembered as one of the founders of evolutionary ecology. It is his signal distinction to have brought population and community ecology within the reach of genetics. By reformulating many of the parameters of ecology, biogeography, and genetics into a common framework of fundamental theory, MacArthur, more than any other person who worked during the decisive decade of the nineteen sixties, set the stage for the unification of population biology.

MacArthur began his career with three articles that revealed an unusual power and originality of approach. The first (1955) was the proposal of a measure of community stability taken from information theory, formalizing for the first time a concept that previously had been the subject of simple verbal description. Soon afterward (1957) came the celebrated "broken-stick" model of the relative abundance of bird species. Although the specific hypothesis of competition embodied in the broken-stick distribution has been disputed, and the approach was later dismissed as obsolete by MacArthur himself, we should not overlook the real significance of this contribution. In three short pages MacArthur audaciously confronted a central problem



of community ecology that had scarcely been put in words by previous writers. He characterized the issue in such a way as to suggest that the deepest remaining mysteries of natural history can be reached by light vaults of the imagination if they are disciplined by the postulational-deductive

method. Reviewers sometimes forget that the broken-stick hypothesis was only one of three frequency distributions presented in the article, each derived from a different, competing set of biological hypotheses. The method of multiple working hypotheses was thereby introduced to this branch of ecological theory. The 1957 article set the tone for all of MacArthur's later work. Inevitably, his approach was condemned by some ecologists as oversimplification, but right or wrong in particular applications, it has energized a generation of young population biologists and transformed a large part of ecology.

MacArthur's third early contribution was an elegant analysis of niche division in warblers (1958). For this somewhat more conventional study he received the Mercer Award of the Ecological Society of America. In a sense the warbler study revealed the real secret of MacArthur's success, namely his almost unique status as a mathematician-naturalist. He was a mathematician of professional grade, having been trained in the discipline to the master's level before going to Yale to work on ecology under Evelyn Hutchinson. He had the convictions of a pure mathematician, which according to G.H. Hardy (whom he resembled very much in temperament and philosophy) are simply "that a mathematician was a maker of patterns of ideas, and that beauty and seriousness were the criteria by which his patterns should be judged." MacArthur would say in conversation that the best science comes to a great extent from the creation of *de novo* and heuristic classifications of natural phenomena. Art, he enjoyed quoting Picasso, is the lie that helps us to see the truth. But MacArthur was also a born naturalist. He watched birds with the patience and skill of a professional ornithologist, visited the tropics as often as he could, and delighted in the endless facts of natural history, which were temporarily exempted from his cartesian scalpel. The store of random information thus accumulated, and the shadowy play of its many patterns, were the real inspiration of his theoretical work.

The nineteen sixties were a period of intense activity for Robert MacArthur. While serving on the faculty of the University of Pennsylvania and then at Princeton, he began a parallel series of investigations, many in collaboration with colleagues and students, that touched on a wide range of topics around the central problem of species diversity. Part of his special genius was an ability to work closely with persons of widely varying talents and interests, turn them into fast friends, and bring out the best in their scientific labors. MacArthur and his coworkers analyzed the evolution of the demographic parameters, established the environmental correlates of bird diversity, formulated and partly solved the species packing problem, and created species equilibrium theory. As time passed MacArthur spoke of himself increasingly as a biogeographer, and he made the subject the focus of his teaching at Princeton. In 1971, when he learned he had only a year or two left to live, he quickly brought the many threads of his work together in the single book *Geographical Ecology: Patterns in the Distribution of Species*. The clarity and incisiveness of this synthesis show him at the height of his powers. *Geographical Ecology* is both the reflective memoir of a senior scientist and the prospectus of a young man whose creative effort ended, to our immeasurable loss, at the point of its steepest trajectory.

MacArthur was a scientist's scientist, to whom gifted biologists of all ages turned for advice and encouragement. "Doing science," he wrote, "is not such a barrier to feeling or such a dehumanizing influence as it is often made out. It does not take the beauty from nature. The only rules of scientific method are honest observations and accurate logic. To be great science it must also be guided by a judgment, almost an instinct, for what is worth studying. No one should feel that honesty and accuracy guided by imagination have any power to take away nature's beauty." Robert MacArthur did great science, he was an extraordinary human being, and he will be missed.

E.O. Wilson