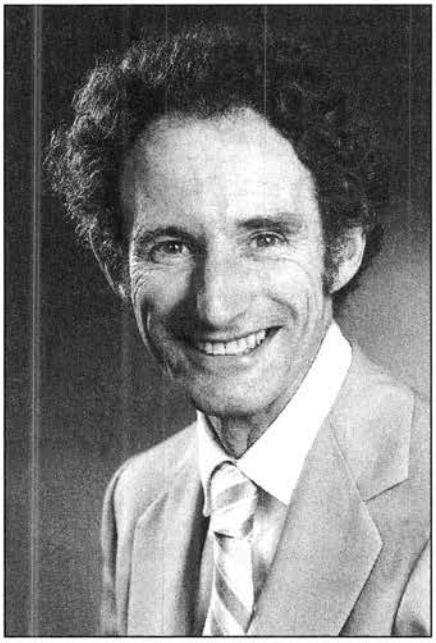
Robert May Receives Balzan Prize

Robert May has received the 1998 Balzan Prize for Biodiversity. He was awarded the prize "for his seminal contributions to the mathematical analysis of biodiversity, in particular his pioneering work on chaos theory and ecological systems, and the development of a variety of methods for estimating the total number of species alive on earth today and their rates of extinction." Presented by the International Prize Foundation E. Balzan, the prize carries a monetary award of 500,000 Swiss francs (about $370,000). Together with two other prize winners, historian Andrzej Walicki and geochemist Harmon Craig, Robert May received the prize in a ceremony held on November 23, 1998, in Rome.

Laudation

May's work has been hugely influential in illuminating fundamental biological problems relevant to the causes and consequences of biological diversity. His earliest contributions are drawn together in the influential book *Stability and Complexity in Model Ecosystems*, which changed the way ecologists think about complex versus simple ecosystems. No longer is the ability to cope with disturbance (or "stability") seen as an automatic consequence of diversity (or "complexity"), as it was in the texts of the 1970s and earlier. Rather, it is now understood that communities with high biological diversity, such as a tropical rainforest, are often likely to be dynamically fragile and typically more vulnerable to disturbance than are simpler temperate systems. This has led to a still-expanding program of research on how the persistence and ultimate conservation of communities depends on food web structures of particular kinds. May's work has emphasized the differences between different environments and helps explain why we may be likely to lose a larger fraction of species in disturbed tropical environments than have been lost in the past in correspondingly disturbed temperate or boreal environments. More generally, this work has set the agenda for a new generation of research on the difference between "demographic stochasticity" and "environmental stochasticity" (terms introduced by May), on food chains, on the relative abundance and rarity of species, on the relation between numbers of species or of individuals and their physical size, and on the dynamical response of complex ecosystems to specific kinds of disturbance.

Motivated by such problems arising from the study of natural populations, May showed that simple nonlinear difference equations can exhibit an astonishing array of dynamical behavior ranging from stable points, to period-doubling bifurcations that produce a cascade of stable cycles, to apparently random or "chaotic" fluctuations (his 1976 *Nature* review paper is still the most cited paper in this general subject). This seminal work raises important and as yet largely unresolved questions about how we gather and analyze data about populations. Especially when spatial patchiness is important, populations can easily show erratic fluctuations, even in environmentally predictable settings. Such phenomena have major implications for the coexistence of species or for protection against invasion of communities and therefore can help to explain patterns of biodiversity.



Sir Robert May

In collaboration with Roy Anderson, May has combined theoretical and empirical studies to explore the circumstances under which infectious diseases (defined broadly to include viruses, bacteria, protozoans and fungi, along with helminth and arthropod parasites) may influence the numerical abundance, geographical distribution, or other ecological features of their plant or animal hosts. This work has advanced our understanding both of how infectious diseases can influence biological diversity and of their importance in conservation biology.

In recent years May has been a leader in developing a variety of rigorous methods for estimating the total number of species alive on earth today. Since 1994 he has also developed several new ways of assessing rates of species extinction in the recent past and likely future. This work is mainly based on comparisons between recent data sets and fossil record data; by comparing rates one can gain a degree of precision absent from attempted estimates of total numbers of extinctions. His other recent work has developed quantitative measures of the taxonomic or evolutionary uniqueness of individual species or groups. Taken together, this general body of work pioneers a new "calculus of biodiversity" (May's phrase), which is an increasingly important tool for conservation planners.

Biographical Sketch

Robert McCredie May was born in Sydney, Australia, on January 8, 1936. He received his bachelor's degree in 1956 and his doctoral degree in theoretical physics in 1959, both from the University of Sydney. He held the position of Gordon Mackay Lecturer in Applied Mathematics at Harvard University before taking a position at the University of Sydney, where he remained during 1962–73. From 1973 to 1988, he was Class of 1877 Professor of Zoology at Princeton University. Currently he holds a Royal Society Research Professorship in the Department of Zoology at the University of Oxford and at Imperial College, London. For the period 1995–2000, he is on leave from those positions while serving as chief scientific adviser to the U.K. government and head of the U.K. Office of Science and Technology. He was awarded a knighthood in 1995 and the Companion of the Order of Australia in 1998. He was elected a fellow of the Royal Society, London (1979), a foreign member of the U.S. National Academy of Sciences (1992), an Overseas Fellow of the Australian Academy of Sciences (1991), and a fellow of Academia Europaea (1994). In 1996 he received the Crafoord Prize of the Royal Swedish Academy of Sciences. May delivered the AMS Josiah Willard Gibbs Lecture at the AMS Annual Meeting in January 1994.

About the Balzan Prize

The Balzan Prize is among the most important humanistic and scientific awards in the world. The winners are selected by a General Prize Committee made up of eighteen prominent scientists and academics. The committee evaluates candidate proposals from universities and academies all over the world. The Italian-Swiss Balzan Foundation, which has headquarters in Milan and Zurich, was started in 1956 with funds from the daughter of Eugenio Balzan, who inherited a large estate from her father and decided to use it to honor his memory. Balzan was born in 1874 and was a proofreader, reporter, and manager for *Corriere della Sera*, the most important Italian daily newspaper. He also became a shareholder in the paper, lived parsimoniously, and invested his earnings shrewdly. In 1933 he settled in Switzerland, mostly because of his opposition to Fascism. He died in 1953 in Lugano. Among previous recipients of the Balzan Prize are the following mathematicians: Andrej Kolmogorov (1962), Enrico Bombieri (1980), Jean-Pierre Serre (1985), Otto Neugebauer (1986), and Armand Borel (1992).

—from Balzan Foundation news release