ROBERT P. LANGLANDS RECEIVES FIRST NAS AWARD IN MATHEMATICS

On April 25, 1988, The National Academy of Sciences (NAS) will present the first NAS Award in Mathematics to Robert P. Langlands of The Institute for Advanced Study. This award, established by the AMS in commemoration of its Centennial, is one of eighteen awards honoring outstanding contributions to science that will be presented at the Academy's 125th annual meeting. The $5000 award recognizes Langlands' "extraordinary vision that has brought the theory of group representations into a revolutionary new relationship with the theory of automorphic forms and number theory."

The major sources of funds for the award are generous gifts to the Society from Morris Yachter and the late Sidney Henry Gould. The award will be given every four years in recognition of excellence in the mathematical sciences published within the past ten years and will have no other restrictions concerning age, citizenship, or branch of mathematical study.

Yachter, an applied mathematician and engineer, has degrees in civil engineering and aeronautical engineering from New York University and a Ph.D. in mathematics from the Courant Institute of Mathematical Sciences. Yachter worked in the defense industry for about thirty-five years and is now retired, but he has continued to pursue his research in mathematics. He has been an AMS member since 1957.

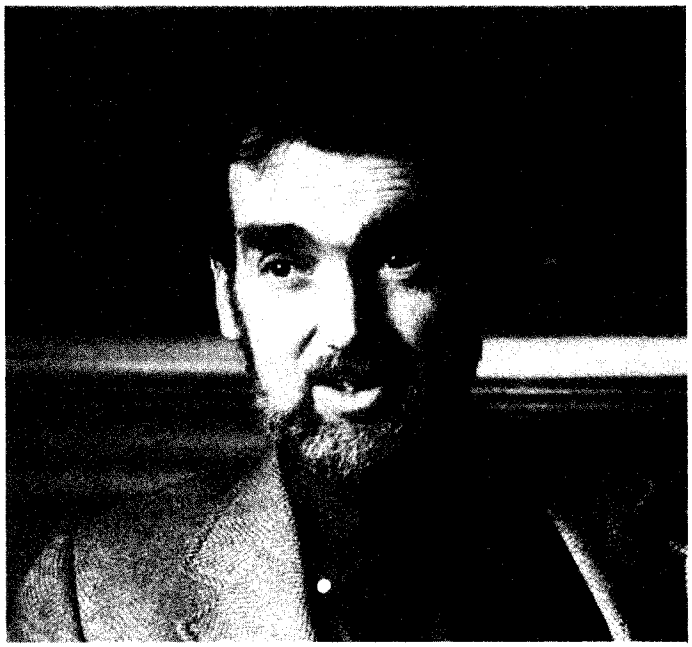
Gould had a long history of association with the Society as Executive Editor of *Mathematical Reviews* and then as Editor of Translations. With a B.A. and M.A. in mathematics and a Ph.D. in classics, Gould pursued his interest in mathematics as well as in languages. In 1972, he became a research associate at the Mathematics Institute of the Academia Sinica in Taipei, Taiwan. In 1982, he returned to Providence, where he remained until his death in 1986.

The committee that chose this year's award recipient is: Felix R. Browder (chairman), Hyman Bass, Henry P. McKean, G. D. Mostow, I. M. Singer, and Shmuel Winograd.

The Work of Robert P. Langlands

William Casselman was asked by the Editors of *Notices* to comment on Langlands' contributions. He responded:

Robert Phelan Langlands' contributions to representation theory began soon after his graduate work with a long and formidable paper which applied recent results of Harish-Chandra to give a formula for the dimension of certain spaces of automorphic forms. This was followed within a couple of years by his nearly incredible work on Eisenstein series, notoriously difficult and a veritable *tour de force*. Proceeding rather differently from his



Robert P. Langlands

partial predecessors Maass, Roelcke, and Selberg—who worked on rank one groups around 1950—he obtained for arithmetic groups of rank greater than one the analytic continuation of general Eisenstein series as well as a description of the discrete spectrum of arithmetic quotients as their residues. His first excursion into number theory was then to use Eisenstein series to prove for split groups the conjecture of Weil regarding Tamagawa measures. But even this result, striking though it was, gave no hint that in 1967 he was to formulate a collection of far-reaching and uncannily accurate conjectures relating number theory, automorphic forms, and representation theory. These have formed the core of a program still being carried out, and have come to play a central role in all three subjects. Almost simultaneously with the conjectures, he defined a whole new family of zeta functions and demonstrated their meromorphic continuation by using Eisenstein series. In a few years following this he proposed a generalization of both local and global class-field theory to account for non-abelian representations of Galois groups; completed work of Dwork and Artin on local factors of Artin's L-functions; continued work of Eichler and Shimura in conjecturing—and proving in a large class of cases—the nature of the reduction at singular primes of the arithmetic curves $\Gamma(N)\backslash\mathfrak{H}$; completed (with Jacquet) work of Eichler and others on the nature of classical cusp forms arising from θ-functions of quaternion algebras; and (also with Jacquet) pointed out how eventually a suitable Trace Formula might lead to a complete proof of Weil's conjecture on Tamagawa numbers (a prophecy that has essentially been fulfilled recently in work of Arthur and Kottwitz).

The arithmetic problems 'thrown up' (as I think he once wrote) by Shimura varieties seemed to intrigue him particularly from then on—it was by this route that he first met the intricate problems of L-indistinguishability that continue to occupy him and others; also by which he came first to conjecture, and later to have a hand in proving, the structure of certain moduli varieties in characteristic p. One product of this line of work was his description in the mid 70's of the Hasse-Weil zeta function of certain moduli varieties of dimension greater than one. And around the same time, as a by-product of his interest in the Trace Formula, building on some original ideas of Saito and Shintani, came his proof of Artin's conjecture for certain non-abelian extensions. More recently of note is the proof in some cases (by Langlands with Harder and Rapoport) of Tate's conjecture relating the poles of the Hasse-Weil zeta function to algebraic cycles, and the extremely difficult results (with Shelstad) on orbital transfer. His originality and versatility have continued to display themselves in his current pursuit of statistical mechanics.

His astounding insight has provided a whole generation of mathematicians working in automorphic forms and representation theory with a seemingly unlimited expanse of deep, interesting, and above all approachable problems to work away on.

Biographical Sketch

Robert P. Langlands was born in New Westminster, British Columbia, on October 6, 1936. He received a B.A degree in 1957 and an M.A. in 1958, both from the University of British Columbia, and a Ph.D. from Yale University in 1960. He taught at Princeton University from 1960 to 1967 and was professor at Yale University from 1967 to 1972. He has been professor of mathematics at the Institute for Advanced Study since 1972. His research interests include group representations and automorphic forms.

Professor Langlands has served on the AMS Organizing Committee for the Summer Institute on Automorphic Forms, Representations, and L-functions (1977); the Interim Editorial Committee for Research Announcements (1978); and the *Bulletin* Editorial Committee (Associate Editor, Research Announcements) (1979-82). He has given addresses at the Summer Research Institute on Algebraic Groups and Discontinuous Subgroups (Boulder, Colorado, 1965); the Symposium on Mathematical Developments Arising from the Hilbert Problems (DeKalb, Illinois, 1974); the 1977 Summer Research Institute on Automorphic Forms, Representations and L-functions. He has presented Invited Addresses at the International Congresses in Nice (1970) and in Helsinki (1978), and the AMS Annual Meeting in Cincinnati (1982).

Professor Langlands was a Miller Foundation Fellow at the University of California, Berkeley, in 1964-65, and an Alfred P. Sloan Fellow in 1964-66. In 1975, he received the Wilbur Cross Medal of Yale University. In 1982, he was awarded the AMS Cole Prize in Number Theory for his pioneering work on automorphic forms, Eisenstein series, and product formulas. He received the Commonwealth Award in 1984, and, the following year, was awarded honorary D.Sc. degrees from the University of British Columbia, McMaster University, and the City University of New York, Graduate Center.

In 1972, Professor Langlands was elected Fellow of the Royal Society of Canada and of the Royal Society of London in 1981. He has been a member of the editorial board of *Annals of Mathematics* since 1979 and has held visiting positions at Orta Doğu Teknik Universitesi in Ankara, 1967-68, Universität Bonn in 1970-71 and 1980-81, and École Normale Supérieure de Jeunes Filles in 1980.