

# Rao and Stein Receive National Medal of Science

Photograph courtesy of Penn State.



**Calyampudi R. Rao**



**Elias M. Stein**

On May 9, 2002, President Bush awarded fifteen National Medals of Science. Among the awardees were two mathematical scientists, CALYAMPUDI R. RAO, emeritus holder of the Eberly Family Chair in Statistics and director of the Center for Multivariate Analysis at Pennsylvania State University, and adjunct professor at the University of Pittsburgh; and ELIAS M. STEIN, Albert Baldwin Dodd Professor of Mathematics at Princeton University.

Calyampudi Rao's pioneering work in multivariate analysis has become the foundation of statistics and has had a significant impact on applications in medical diagnosis, evolutionary genetics, and signal detection theory. Rao has focused equally on the application of statistical methods to real-world problems. One of his early books, *Advanced Statistical Methods in Biometric Research* (1952), was written to assist biomedical researchers who were not equipped to develop the new methods of analysis their data demanded. In response to the needs of industry, he introduced a new method of experimentation through combinatorial arrangements, known as orthogonal arrays, which has become widely used to control and improve the quality of manufactured goods. He developed estimation theory in small samples, which greatly extended the scope of statistical methods in

practical work. Rao was the first to introduce differential geometric techniques in discussing problems of statistical inference, based on Rao's Distance Function, which is now an active field of research. Rao was born in Hadagali, India, on September 10, 1920, and received his Ph.D. from the University of Cambridge.

Elias Stein has shaped the field of mathematical analysis and has changed the way mathematicians approach problems in nearly every subarea of the field. He was among the first to appreciate the interplay among partial differential equations, classical Fourier analysis, several complex variables, and representation theory. He was the first to perceive the fundamental insights in each field arising from that interplay. Stein is the world's leading authority in harmonic analysis. He and his colleagues introduced a generalization of analytic functions in higher dimensions known as  $H^p$ -spaces. This theory led to important connections between harmonic analysis and probability theory and facilitated the solution of numerous problems. In his studies Stein also showed the power of using square functions to control error terms, a technique that he invented and that is now fundamental in harmonic analysis. Stein was born in Belgium on

January 13, 1931, and received his Ph.D. from the University of Chicago.

The National Medal of Science was established by Congress in 1959. It was intended to be bestowed annually by the president of the United States for outstanding contributions to knowledge in the physical, biological, mathematical, or engineering sciences. Congress expanded this definition in 1980 to recognize outstanding work in the social and behavioral sciences. In 1962 President John F. Kennedy awarded the first Medal of Science to the late Theodore von Karman, professor emeritus, California Institute of Technology. A committee of twelve scientists and engineers is appointed by the president to evaluate the nominees for this award. The National Science Foundation (NSF) administers the National Medals of Science for the White House.

Including the current awardees, 401 individuals have received the National Medal of Science. The awardees in mathematics and computer science are: Raoul Bott, Richard D. Brauer, Felix E. Browder, Alberto P. Calderón, George F. Carrier, Shiing-shen Chern, John Cocke, Paul J. Cohen, Ronald R. Coifman, George B. Dantzig, Joseph L. Doob, William Feller, Michael H. Freedman, Kurt Otto Friedrichs, Kurt Gödel, Herman H. Goldstine, Ralph E. Gomory, Samuel Karlin, Richard M. Karp, Joseph B. Keller, Stephen C. Kleene, Donald E. Knuth, Martin D. Kruskal, Peter D. Lax, Saunders Mac Lane, John McCarthy, John W. Milnor, Cathleen Synge Morawetz, Allen Newell, Jerzy Neyman, Louis Nirenberg, Isadore M. Singer, Stephen Smale, Donald C. Spencer, Marshall H. Stone, John Griggs Thompson, John Wilder Tukey, Karen K. Uhlenbeck, Hassler Whitney, Norbert Wiener, Shing-Tung Yau, Oscar Zariski, and Antoni Zygmund.

—Compiled from NSF news releases

