

# 1995 Norbert Wiener Prize in Applied Mathematics

The Norbert Wiener Prize in Applied Mathematics was established in 1967 in honor of Professor Norbert Wiener (1894-1964) and was endowed by a fund from the Department of Mathematics of the Massachusetts Institute of Technology. Since 1970, the prize has normally been awarded every five years jointly by the AMS and the Society for Industrial and Applied Mathematics (SIAM). The \$4,000 prize honors outstanding contributions to applied mathematics in the highest and broadest sense. Previous recipients of the Wiener Prize are Richard E. Bellman (1970), Peter D. Lax (1975), Tosio Kato (1980), Gerald B. Whitman (1980), Clifford S. Gardner (1985), Michael Aizenman (1990), and Jerrold E. Marsden (1990).

The 1995 Wiener Prize is awarded to HERMANN FLASCHKA of the University of Arizona and to CIPRIAN FOIAS of Indiana University. The prize was presented at the 101st Annual Meeting of the AMS in San Francisco in January 1995. The prize is awarded by action of the Councils of the AMS and of SIAM on recommendation of a selection committee consisting of Thomas Kailath, Peter D. Lax, and Jerrold E. Marsden.

The following text contains the committee's citations for the prize, the recipients' responses upon receiving the prize, and a brief biographical sketch of each recipient.

## Hermann Flaschka

### Citation

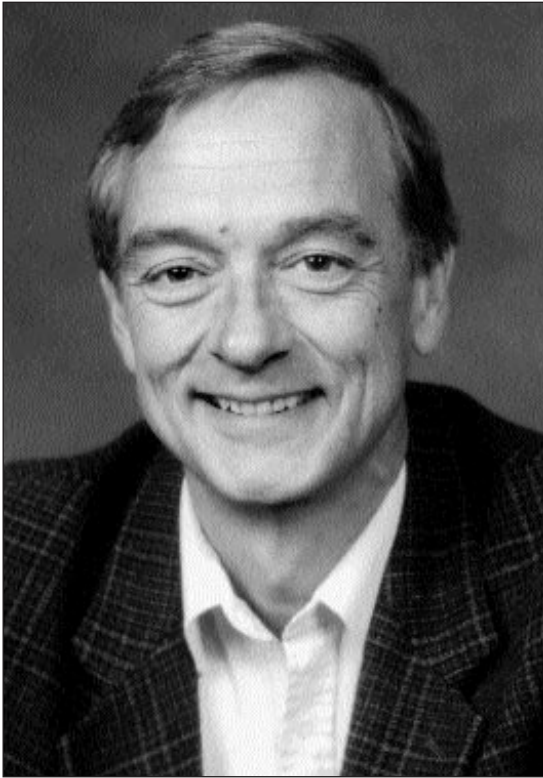
Hermann Flaschka has made deep and original contributions to our understanding of completely integrable systems. Starting with his discovery of the complete integrability of the Toda chain, Flaschka furnished an explanation for the

appearance of a critical shock speed, discovered earlier by Holian through numerical calculation. He helped show how to derive averaged equations for multiphase oscillations for solutions of the KdV equation. His recent work brings the methods of modern differential geometry and algebra to bear on the study of completely integrable systems, as in his infinite-dimensional extension of the Schur-Horn-Kostant convexity theorem.

### Response

This award came as a great surprise. I thank the Societies for complimenting my work—but the prize really recognizes a rich area more than anything I might have added to it. It is difficult to ask a question about the Toda lattice that has a boring answer. Professor Morikazu Toda has made a wonderful contribution to mathematics. His “Toda chain” reaches back to the great classic studies of Jacobi and Stieltjes, while constantly making contact with the newest ideas. It led me to think about such diverse topics as discrete shock waves, modulation equations, Riemann surfaces, theta divisors, toric varieties, momentum maps, semisimple and affine Lie algebras, Szegő's theorem, and measurable rearrangements; as an interested spectator, I have seen the Toda chain appear in many more mathematical settings too numerous to try to list. I have enjoyed using integrable systems as the vehicle to learn a little about interesting fields with which I was not familiar.

It was pure chance that I drifted into this area and then my good fortune to have been able to work with so many creative colleagues. I can't mention them all, but at least I want to thank the ones with whom I have collaborated over pe-



**Hermann  
Flaschka (above)  
and Ciprian Foias  
(right)**

riods of many years: Tony Bloch, Nick Ercolani, Luc Haine, Dave McLaughlin, Alan Newell, and Tudor Ratiu. Thank you for up to twenty years of fun with mathematics, and again, thank you, AMS and SIAM, for the honor.

#### **Biographical Sketch**

Hermann Flaschka was born on March 25, 1945, in Oeblarn, Austria. He received his Ph.D. from the Massachusetts Institute of Technology (1970) under the direction of Gilbert Strang. He was a cofounder

of and now is co-coordinating editor of *Physica D: Nonlinear Phenomena* (1980–). He was a visiting professor at the Research Institute for Mathematical Sciences, Kyoto (1980–1981).

#### **Ciprian Foias**

##### **Citation**

Ciprian Foias's basic contributions to operator theory, analysis, and dynamics and their applications have had a large impact in pure and applied mathematics. His fundamental investigations include important contributions to dilation and interpolation theory, skew Toeplitz operators, and dynamical systems methods in partial differential equations. The applications are both deep and remarkably broad-ranging, including control theory, geophysical signal processing, Ramsey equilibria in economics, welfare economics, statistical solutions of the Navier-Stokes equations, and dimension estimates for attractors in fluid dynamics.

##### **Response**

I am highly honored to be one of the recipients of the Norbert Wiener Prize of the American Mathematical Society and the Society of Industrial and Applied Mathematics, and I am very grateful to these learned Societies as well as to the Norbert Wiener Prize Committee. Most of the work referred to in the citation was done in collaboration. Therefore I share, at least in spirit, this award with all my collaborators, among whom I cite B. Sz.-Nagy, H. Bercovici, A.E. Frazho,

A. Tannenbaum, G. Zames (applied operator theory), G. Prodi, P. Constantin, O.P. Manley, G. Sell and R. Temam (dynamical systems in partial differential equations), and R.E. Becker (mathematical economics). As for me, this world has a purely mathematical texture, and, as many a mathematician, I was happier when I felt that my contribution was a mathematical discovery rather than a mathematical invention. Regardless, I am now very happy, and I thank all of you for that.

#### **Biographical Sketch**

Ciprian Foias, a graduate of the University of Bucharest, received his Ph.D. at the Institute of Mathematics of the Romanian Academy (1962) and Doctor-Docent title at the University of Bucharest (1968). He was a tenured professor at the University of Bucharest (1966–1978) and the University of Paris at Orsay (1979–1983). In 1979 he joined the faculty at Indiana University, where he has held the title of Distinguished Professor of Mathematics since 1983. While Foias's work has involved many collaborators, he is best known for his long scientific collaboration with Bela Sz.-Nagy and for their monograph *Harmonic analysis of operators on Hilbert space*.

Foias was elected a fellow of the American Association for the Advancement of Science (1987) and an honorary member of the Hungarian Academy of Science (1993) and of the Romanian Academy (1994).

