Two Bôcher Prizes Awarded in Louisville

The Bôcher Prize is awarded every five years for a notable research memoir in analysis which has appeared in the previous five years. The prize honors Maxime Bôcher (1867–1918) who was the Society's second Colloquium Lecturer (1896) and tenth President (1909, 1910), and one of the founding editors of the *Transactions*. The fourteenth and fifteenth awards of the Bôcher Prize were made at the Society's ninetieth Annual Meeting, in Louisville, Kentucky, on January 26, 1984.

The 1984 recipients are Luis A. Caffarelli of the University of Chicago and Richard B. Melrose of the Massachusetts Institute of Technology, each of whom was presented with a certificate and a check for $1500.

The Prizes were awarded by the Council of the Society acting on the recommendation of the Committee to Select the 1984 Recipients of the Bôcher Prize, consisting of Alberto Calderón, Chairman, I. M. Singer, and Peter D. Lax. The Committee's report to the Council follows:

The Bôcher Prize was established in 1923 to honor distinguished contributions to mathematical analysis in the United States. Since that time, through natural growth and through the injection of new problems from mathematical physics, geometry, and probability, mathematical analysis has expanded beyond anyone's wildest expectations. Functional analysis, several complex variables, partial differential equations, harmonic analysis, global analysis, in their infancy in the 1920s, are today thriving areas of research. In view of this great variety of mathematical activity, it seemed reasonable to the Committee to recommend that two Prizes be awarded. The two Prize winners recommended by our committee, Richard Melrose and Luis Caffarelli, have made their contributions in different fields and in different styles; the one tackling linear problems, the other nonlinear ones, the one a hedgehog, the other a fox (in Isaiah Berlin's eloquent paraphrase of Archylochus.)

Luis A. Caffarelli

Citation

To Luis A. Caffarelli for his deep and fundamental work in nonlinear partial differential equations, in particular his work on free boundary problems, vortex theory and regularity theory.

Biographical Sketch

Luis Angel Caffarelli was born December 8, 1948 in Buenos Aires, Argentina. He was educated at the University of Buenos Aires (M.S., 1969, and Ph.D., 1972). From 1973 to 1979 he was at the University of Minnesota (fellow, 1973–1975; asssistant professor, 1975–1977; associate professor, 1977–1979; professor, 1979–1980). From 1980 to 1982 he was professor of mathematics at the Courant Institute of Mathematical Sciences, New York University, returning to Minnesota for the 1982–1983 academic year. He is currently professor of mathematics at the University of Chicago. In 1982 he was one of the recipients of the Guido Stampacchia Prize awarded by the Scuola Normale Superiore in Pisa (see the October 1982 *Notices*, page 520).

Response on Receiving the Prize

The developments in the study of free boundary problems and nonlinear second order elliptic equations in recent years are the consequence of discoveries in two important areas of research from the last twenty years. On one hand we have the theory of generalized minimal surfaces as developed by De Giorgi, Federer, Fleming,

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Almgren and others by which one considers surfaces that minimize area among a wide class of admissible ones (for instance: an admissible surface is the boundary of a set). On the other hand, there is the regularity theory for equations of divergence and nondivergence form with bounded measurable coefficients, as developed by De Giorgi, Nash and Moser, and by Krilov.

These problems are naturally coupled in the nonlinear theory, when one has to study the interplay between the regularity of solutions, u, to an elliptic equation $Au = 0$ in a given domain Ω, the regularity (and geometry) of the boundary data $f = u|_{\partial\Omega}$, and the geometry (curvature properties, capacity properties, etc.) of the boundary itself, $\partial\Omega$.

For instance; if $f = 0$, and $A(u) = \Delta u = \sum D_{ii}u = 0$, the boundedness of ∇u is related to the generalized mean curvature of $\partial\Omega$.

If Ω is a half space and $A(u) = \Delta u = 0$, there are relations between the subharmonicity of f, the regularity of f, and the one side boundedness of u_ν.

Or, more generally, if $A(u) = \sum a_{ij}D_{ij}u = 0$, with a_{ij}, bounded measurable, strictly elliptic, the natural relations associate the regularity and convexity of f with the boundedness of u_ν.

We were driven to study these relations, motivated by the nonlinear problems.

But our knowledge is still very basic and recent developments in problems arising from several complex variables and geometry indicate that the study of the delicate relations between the geometry of domains and the solutions of elliptic equations is a fundamental question we should consider.

Richard B. Melrose

Citation

To Richard B. Melrose, for his solution of several outstanding problems in diffraction theory and scattering theory and for developing the analytical tools needed for their resolution.

Biographical Sketch

Richard B. Melrose was born April 8, 1949 in Sydney, Australia. He received the degree of Bachelor of Science from the University of Tasmania in 1969 and the degree of Bachelor of Science with Honors from the Australian National University in 1970. In 1974 he received his Ph.D. from the University of Cambridge with thesis advisor F. Gerard Friedlander. He was a research fellow at St. John's College in Cambridge from 1974 to 1976, spending 1974-1975 on leave as visiting scholar at Massachusetts Institute of Technology. In 1976 he returned to M.I.T. as assistant professor and is currently professor of mathematics there. He was a visiting member at the Institute for Advanced Study in the fall of 1977 and at the Mathematical Sciences Research Institute in Berkeley in the spring of 1983. He presented an invited address at the AMS meeting in Providence in October 1980, he spoke at the Symposium on the Geometry of the Laplace Operator, Hawaii, March 1979, and at the Special Session on Scattering Theory in New York, March 1978. He gave a forty-five minute talk at the International Congress of Mathematicians at Helsinki in 1978.

He was one of the participants in the meeting which laid out the original plans for the series of week-long summer research conferences which the Society has sponsored, with NSF support, for the past two years, and is currently one of the AMS representatives on the Editorial Board of the *American Journal of Mathematics.*

Response on Receiving the Prize

I am very honored to receive this the fifteenth Bôcher Prize. I regard it as recognition that the theory of micro local boundary problems has achieved a certain maturity due, of course, to the work of many mathematicians especially over the last ten years. But, rather than review that theory, I would like to make a few remarks of a historical type, perhaps crypto historical would be better, to indicate the position about ten or fifteen years ago. The micro local theory of linear differential operators in general can be traced back to Hadamard—for micro local one should simply read detailed. Hadamard had, by the mid twenties, achieved a very elegant and beautiful theory of second order elliptic and hyperbolic equations and he also, I think, deserves to be the originator of the micro local theory of boundary problems although, perhaps, in the sense of the false dawn. In a monograph in the twenties, he remarked that his methods could be applied very easily to the theory of boundary problems for hyperbolic equations without giving any details, it was perhaps forty years before the enormity of his error was fully realized. During that forty years, there was a lot of excellent work in mathematics, of course, and, in particular, in partial differential equations. But it is not until the later years of the sixties that Donald Ludwig, in part in collaboration with Cathleen Morawetz and also Gerard Friedlander actually tackled the serious problems Hadamard had omitted. With the geometrization of partial differential equations in the early seventies, those of us who were lucky enough to be in approximately the right place at the right time were able to carry the theory through to its almost natural position now. Thank you.