Binghamton Math Graduate awarded Norbert Wiener Prize

The 2019 Norbert Wiener Prize in Applied Mathematics was awarded to Marsha Berger for her fundamental contributions to adaptive mesh refinement (AMR) and to Cartesian mesh techniques for automating the simulation of compressible flows in complex geometry.

Berger received her B.S. in mathematics from State University of New York at Binghamton in 1974. She went on to receive an M.S. and a Ph.D in computer science from Stanford University in 1978 and 1982, respectively. Marsha Berger is currently a Silver Professor in the Computer Science Department at the Courant Institute of Mathematical Sciences at NYU. She is a frequent visitor to NASA Ames, where she has spent every summer since 1990, and several sabbaticals. Her honors include membership in the National Academy of Sciences, the National Academy of Engineering, and the American Academy of Arts and Sciences. She is a Fellow of the Society for Industrial and Applied Mathematics. Berger was a recipient of the IEEE Fernbach award, and was part of the team that won the 2002 Software of the Year Award from NASA for its Cart3D software.

Marsha Berger is one of the inventors of AMR algorithms, used in solving partial differential equations to improve the accuracy of a solution by locally and dynamically resolving complex features of a simulation. Berger provided the mathematical foundations, algorithms, and software that made it possible to solve many otherwise intractable simulation problems, including those related to blood flow, climate modeling, and galaxy simulation. Her mathematical contributions include local error estimators to identify where refinement is needed, stable and conservative grid interface conditions, and embedded boundary and cut-cell methods. She is part of the team that created CART3D, a NASA code based on her AMR algorithms that is used extensively for aerodynamic simulations, and which was instrumental in understanding the Columbia Space Shuttle disaster. She also helped build GeoClaw, an open source software project for ocean-scale wave modeling. It is used to simulate tsunamis, debris flows and dam breaks, among other applications.