**MICHAEL J. SHELLEY**

**Michael J. Shelley, Ph.D.**

**Lilian and George Lyttle Professor of Applied Mathematics, Courant Institute, NYU**

**Scientific Director, Center for Computational Biology, Flatiron Institute**

Michael Shelley's interests lie in the modeling and simulation of complex systems arising in biology and soft-matter physics. His earlier work included free-boundary problems in fluids and materials science, singularity formation in partial differential equations, modeling visual perception in the primary visual cortex, non-Newtonian fluid dynamics, and fluid-structure problems such as the flapping of flags, stream-lining in nature, and flapping flight. Shelley's current research interests are in understanding complex collective phenomena arising in active matter and its biophysical settings, and in related fluid-structure problems. This has involved, for example, the development of coarse-grained "active-matter" models and analyses that explain how suspensions of microswimmers, or assemblies of biopolymers and molecular motors, self-organize to develop large-scale coherent structures sustained by energy consumption. It also involves the development of specialized methods for the direct large-scale simulation of such assemblies. These have, for example, been applied to understand the positioning of subcellular organelles during cell development. In other, related work, Shelley has studied the structure and hydrodynamic stability of swimming or flying collectives. While his tools are mathematical, much of his work is in close collaboration with experimental biophysicists.

Dr. Shelley is a member of the National Academy of Sciences and the American Academy of Arts and Sciences. He was named lecturer at the 2017 Reiss Memorial Lecture at the University of Delaware and named plenary speaker at the 2015 National Meeting of the Australian Mathematical Society.

Dr. Shelley earned his B.A. in Mathematics from the University of Colorado, Boulder, and his Ph.D. in Applied Mathematics from the University of Arizona, Tucson.

**Education**

1985 University of Arizona, Tucson, Arizona, Ph.D., Applied Mathematics

1981 University of Colorado, Boulder, Colorado. B.A., Mathematics

**Academic and Professional Appointments**

2019- Scientific Director, Center for Computational Biology, Flatiron Institute, Simons Foundation.

2016- Senior Research Scientist and Group Leader in Biophysical Modeling, Flatiron Institute, Simons Foundation.

2015 Acting Director, Courant Institute, NYU.

2009-2016 Deputy Director, Courant Institute, NYU,

2009 - Associated Faculty Member, Department of Mechanical Engineering,

Polytechnic Institute of NYU.

2007- Lilian and George Lyttle Professor of Applied Mathematics,

Courant Institute of Mathematical Sciences, New York University.

1999- Associated Faculty Member, Center for Neural Science,

New York University.

1996- Co-Director, Courant Applied Mathematics Laboratory,

New York University.

1995- Professor of Mathematics, Courant Institute of Mathematical Sciences,

New York University.

1992-1995 Associate Professor of Mathematics, Courant Institute of Mathematical

Sciences, New York University.

1991-1992 Member of the Institute for Advanced Study, Faculty of Mathematics,

Princeton, New Jersey.

1988 – 1992 Assistant Professor, Department of Mathematics, University of Chicago.

1986-1988 Postdoctoral Research Associate, Program in Applied &

Computational Mathematics, Princeton University.

1983 NASA Computational Fluid Dynamics Fellowship

**Awards and Honors**

Elected, National Academy of Sciences, 2022.

Elected, American Academy of Arts and Sciences, 2019.

Reiss Memorial Lectures, University of Delaware, 2017.

Plenary Speaker, National Meeting of the Australian Mathematical Society, 2015

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AMSI-ANZIAM Lecturer, Australia, 2015.

Pelz Memorial Lecture, Rutgers University, Mechanical Engineering, 2014.

Librescu Memorial Lecture, Virginia Tech College of Engineering, 2012.

Inaugural Fellow of the Society of Industrial and Applied Mathematics, 2009.

Elected Fellow of the American Physical Society, 2007.

The George Batchelor Lecture, Cambridge University, May 2007.

The Julian Cole Lectureship, Society of Industrial and Applied Mathematics, 2006.

The Richard C. DiPrima Lecture, Rensselaer Polytechnic Institute, April 2006.

Distinguished Chair of the Pacific Institute for the Mathematical Sciences, 2001.

Francois N. Frenkiel Award of the American Physical Society, 1998.

Presidential Young Investigator, The National Science Foundation, 1991-1996.

NSF Mathematical Sciences Postdoctoral Research Fellowship, 1989-1991.

NASA Computational Fluid Dynamics Fellowship, 1983-1984.

**Service**

2022 Conference organizer, *Mechanics of Life*, FI-SF.

2019 Conference organizer, *Universality:* *Turbulence across vast scales*, FI-SF.

2019 Conference organizer, *The 3D Nucleome,* FI-SF.

2018 Principal Lecturer, *Hydrodynamics of active particles, from one to many*, Les

Houches Summer School on Active Matter.

2018 Lecturer, *Fluid-Structure interactions in Biology*, Summer School at Imperial

on Active Matter

2017 Conference organizer, *Active Structures in the Cell,* Simons Foundation.

2016 Principal Lecturer (w. A. Hosoi), *Fluid-Structure Interaction in the Living*

*Environment,* GFD Summer School, WHOI.

2015 Lecturer and Organizer, *Interaction of Microscopic Structures and Organisms*

*with Fluid Flows****,*** CISM Summer School, Udine, Italy.

2012-2016 Chief Editor (w. John Lowengrub), Advances in Computational Mathematics

2011 Lecturer and Organizer, *Boulder School for Condensed Matter Physics.*

Themes: Hydrodynamics, Active Matter, and Biophysical Fluid Dynamics.

2009-2012 Member, Board of Editors, Physics of Fluids

2009 Lecturer, *New Trends in the Physics and Mechanics of Biological Systems*

Les Houches Summer School, Les Houches, France

2007-2011 Director, Doctoral Program in Computational Biology, New York University.

2007 Co-Organizer, *Notions of Locomotion,* Aspen Center for Physics Workshop.

2006 Principal Lecturer (w. R. Goldstein), *Biophysical Fluid Dynamics*,

Institute for Mathematics and its Applications, University of Minnesota.

2005 Co-Organizer (w. P. Palffy-Muhoray), *Modeling the Dynamics of Liquid*

*Crystal Elastomers*, Institute for Mathematics and its Applications,

University of Minnesota.

2005 Principal Lecturer, *Modeling Large-Scale Dynamics of the Visual Cortex*,

Centre de Recerca Mathematica, Barcelona, Spain.

2003 Lecturer, *Modeling Large-Scale Dynamics of the Visual Cortex,*

Les Houches Summer School on Methods and Models in Neurophysics.

2001 Principal Lecturer, *The Interaction of Bodies, Boundaries, and Fluids*, Pacific

Institute for the Mathematical Sciences, Vancouver, Canada.

2000-2004 Member, Board of Editors, European Journal of Applied Mathematics

1999-2001 Member, Board of Editors, The Journal of Computational Physics

1996- Co-Director, Courant Applied Mathematics Laboratory, a physical

laboratory designed and founded with Stephen Childress.

1996-2001 Director, Masters Degree Program in Scientific Computing.

1994-2003 Member, Board of Editors, The Journal of Nonlinear Science.

1994-1996 Member, Defense Science Study Group, Institute for Defense Analysis.

1989-1992 Organizing Member of the Computational & Applied Mathematics Program at

the University of Chicago.

**Specializations**

Applied Mathematics, Mathematical Modeling, and Scientific Computation; Cellular Biophysics; Active Materials & Matter; Fluid-Structure Interactions; Biological Fluid Dynamics; Biophysics; Fluid Dynamics; Vision and Computational Neuroscience; Nonlinear Optics; Numerical Analysis.

**Trained 13 PhD students and 42 postgraduate researchers**

**Published ~200 scientific articles**

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