BROWN

Department of Computer Science
115 Waterman Street, 3rd floor
Providence, Rhode Island

MAY 12–15
2015

# Brown University 250th Anniversary Symposium: The Next 250 Years

We acknowledge with tremendous gratitude former President Ruth Simmons' many valuable contributions to the organization of the previous two Symposia in this series, hosted by the Computer Science Department and organized together with the Office of the President. The symposium "John von Neumann Days at Brown University" (http://www.brown.edu/Research/Istrail_Lab/symp_2010.php) was organized by the von Neumann professor "cluster" in 2010, and "The Genome and the Computational Sciences: The Next Paradigms" symposium (http://www.brown.edu/Research/Istrail_Lab/symp_2006.php) in 2006. In particular, with funding from the Office of the President, room 368 of the CIT has just been renovated into a modern 21st-century classroom. We are delighted to have former President Simmons cut the ribbon to the new classroom on the occasion of this Symposium, which continues a tradition co-founded with her office and now enthusiastically supported by President Christina Paxson. These symposia were designed as an "academic cathedral" unified by von Neumann's vision of "computation as a scientific lens." We want to express our admiration and thanks to both Presidents Simmons and Paxson for their inspiring leadership and most generous support.

Organized by the von Neumann professors "cluster" together with
the Office of the President Cristina Paxson
Hosted by the Department of Computer Science
Supported in part by the National Science Foundation

We acknowledge with gratitude the financial support for our symposium from:
Office of the President, Office of the Provost, Office of the Vice President of Research, Office of Brown's 250th Anniversary, Department of Computer Science, Department of Economics, Department of Neuroscience, Department of Physics, Center for Computational Molecular Biology, and Department of Biostatistics.



"Johnny was here*"

## John Von Neumann Distinguished Lecture Series

Organized by

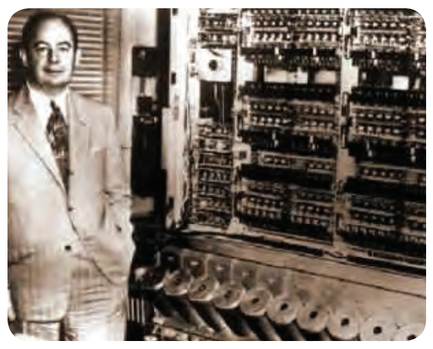
Leon Cooper
Thomas J. Watson Sr. Professor of Science and Director, Institute for Brain and Neural Systems (Department of Physics)

Stuart Geman
James Manning Professor of Applied Mathematics (Division of Applied Mathematics)

Sorin Istrail
Julie Nguyen Brown Professor of Computational and Mathematical Sciences and Professor of Computer Science (Department of Computer Science)

Roberto Serrano
Harrison S. Kravis University Professor of Economics, Brown University (Department of Economics)

*John von Neumann lectured at Brown University the week before April 17, 1934, exactly 80 years ago. The information is from his letter to Rudolf Ortvay on April 17, 1934. "We are well, although I am a bit pumped dry, for I held three lectures last week at Yale, Harvard and Brown Universities." From *John von Neumann: Selected Letters*, Miklos Redei, editor, American Mathematical Society, History of Mathematics volume 27, 2005.



Nima Arkani-Hamed

Kenneth Arrow

David Berson

Patricia S. Churchland

Leon Cooper

Vincent Crawford

Freeman Dyson

Michael Jordan

Tom Leighton

Christos Papadimitriou

Mark Satterthwaite

Susanne Schennach

Leslie Valiant

Frank Wilczek

### History of the Sweatbox Concept

Funded by the National Science Foundation as a workshop called "Q&A Boot Camp at Brown University: Asking Tough Scientific Questions," the "Sweatbox" session as a didactic concept was inspired by the famous 8-week "Summer Course/Boot Camp on Embryology" at the Marine Biological Laboratory, Woods Hall, MA and the director of the course for 15 years, Professor Eric Davidson of the Division of Biology at California Institute of Technology. The story goes that invited speakers at this course would talk in the laboratory's Warm Room and would be subjected there to tough scientific questions about their scientific findings and their claims. Professor Davidson, professor-in-chief of developmental gene regulatory network biology and a beacon of critical discourse, has mentored about 300 PhDs, postdocs and faculty in his laboratory. Basing his work on causality-focused and genomics-based systems, and with insights from experimental biology, biochemistry, physics and engineering, he has been bringing together all us biologists, physicists, biochemists, engineers, mathematicians, statisticians and computer scientists in a renaissance research quest for the functional meaning of DNA. The resulting symbiosis of insights is von Neumannesque in spirit and fits well with von Neumann's unfinished research towards a new logical and computational model for the biological cell by unifying continuous and discrete mathematics via a concept of thermodynamic error. Our "Sweatbox" is so named to honor Professor Davidson's academic legacy.

For more information, please visit:
https://cs.brown.edu/events/brown250symposium/

All events held in Brown University's Thomas J. Watson Sr. Center for Information Technology, 115 Waterman Street, 3rd floor, Providence, Rhode Island.
Directions available at: www.cs.brown.edu/about/directions/

**Organizing Committee**

Sorin Istrail (Symposium Chair, Sorin_Istrail@brown.edu, 401-863-6196), Suzanne Alden (Symposium Coordinator, Suzanne_Alden@brown.edu, 401-863-6511).

# Twelve John von Neumann Lectures on Economics, Physics, Computer, Science and Brain and Neuroscience unified by von Neumann's vision of "Computation as a Scientific Lens"

## Tuesday, May 12

**Sorin Istrail**
Julie Nguyen Brown Professor of Computational and Mathematical Sciences, Symposium Chair

**Christina Paxson**
President, Brown University

**Ugur Cetintemel**
Professor and Chair, Department of Computer Science

**Marina von Neumann Whitman**
Professor of Business Administration and Public Policy, University of Michigan

**Ruth Simmons**
Former President, Brown University: Official opening of the renovated CIT 368 ("Symposium Place")

Introductory Remarks

**Susanne Schennach**
Professor of Economics, Brown University

Learning from Errors

Susanne Schennach is a world leader in mathematical econometrics, with important work on central econometric problems, including measurement error, factor analysis in nonlinear settings, and empirical likelihood.

**Mark Satterthwaite**
A.C. Buehler Professor in Hospital and Health Services Management, Northwestern University

Designing Economic Institutions: Accomplishments and Constraints

Mark Satterthwaite is a leading economic theorist and game theorist, with fundamental contributions to the theory of mechanism design, the theory of incentives, and decentralized markets.

**Vincent Crawford**
Drummond Professor of Political Economy Oxford University

Efficient Mechanisms for Level-*k* Bilateral Trading

Vincent Crawford is a world leader in game theory and experimental economics whose main contributions are pervasive in areas in matching theory, communication, and bounded rationality.

**Kenneth Arrow**
Joan Kenney Professor of Economics and Professor of Operations Research, Emeritus, Stanford University

How the Future Influences the Present

Kenneth Arrow, winner of the 1972 Nobel Memorial Prize in Economics, works primarily in economic theory and operations, focusing on areas including social choice theory, risk bearing, medical economics, general equilibrium analysis, inventory theory, and the economics of information and innovation.

Lunch, hosted by Provost **Vicki Colvin**, will follow Mark Satterthwaite's lecture.

## Wednesday, May 13

**David A. Savitz**
Vice President for Research, Brown University

Introductory Remarks

**Freeman Dyson**
Professor Emeritus
Institute for Advanced Study

The Blacksmiths

Dr. Dyson is Professor Emeritus of Physics at the Institute for Advanced Study. Among his many accomplishments, he made seminal contributions to quantum electrodynamics; he was awarded the Templeton Prize for progress in religion in 2000, and in 2012 he was awarded the Henri Poincaré Prize by the International Mathematical Physics Congress.

**Nima Arkani-Hamed**
Professor
Institute for Advanced Study

Quantum Mechanics and Space-Time in The 23rd Century

Dr. Arkani-Hamed is Professor in the School of Natural Sciences at the Institute for Advanced Study. He is one of the leading particle physics phenomenologists of his generation, and has been prominent in proposing new physical theories that are being tested at the Large Hadron Collider at CERN in Switzerland.

**Frank Wilczek**
Herman Feshbach Professor of Physics, Nobel Laureate in Physics
Massachusetts Institute of Technology

Physics in ~~250~~ 100 Years

Dr. Wilczek is the Herman Feshbach Professor of Physics at MIT. In 2004 he was awarded the Nobel Prize in Physics (with David J. Gross and H. David Politzer) for the discovery of asymptotic freedom in the theory of strong interactions.

**Leon Cooper**
T.J. Watson Sr. Professor of Science (Research), Brown University

Can Free Will And Locality Exist Together In The Quantum Theory?

Dr. Cooper is the T.J. Watson St. Professor of Science (Research) and Director of the Institute for Brain and Neural Systems at Brown University. He was awarded the Nobel Prize in Physics in 1972 (with John Bardeen and J.R. Schrieffer) for their theory of superconductivity (BCS); he is also known for his contributions to the BCM theory of synaptic modification.

**Michael Jordan**
Pehong Chen Distinguished Professor in the Department of Electrical Engineering and Computer Science and the Department of Statistics
University of California at Berkeley

Computational Thinking, Inferential Thinking and "Big Data"

Dr. Jordan is the Pehong Chen Distinguished Professor of Computer Science and Statistics at UC Berkeley. As one of the world's most influential researchers in machine learning and artificial intelligence, his work was recognized by the ACM/AAAI Allen Newell Award and the IEEE Neural Networks Pioneer Award. He is a member of the National Academy of Engineering and of the National Academy of Sciences.

Lunch, hosted by Vice President for Research **David A. Savitz,** will follow Nima Arkani-Hamed's lecture.

## Thursday, May 14

**Kevin McLaughlin**
Dean of the Faculty

Introductory Remarks

**Tom Leighton**
Professor of Applied Mathematics, Massachusetts Institute of Technology
Chief Executive Officer, Akamai Technologies

Grand Challenges Facing the Internet

Tom Leighton is Professor of Applied Mathematics at MIT. He co-founded Akamai Technologies in 1998, and served as Akamai's Chief Scientist for 14 years before becoming the CEO. He is one of the world's preeminent authorities on parallel and distributed algorithms for network applications; his technology achievements at Akamai earned him recognition as one of the Top 10 Technology Innovators in *U.S. News & World Report*. He is a member of the National Academy of Engineering and the National Academy of Sciences.

**Christos Papadimitriou**
C. Lester Hogan Professor of EECS
University of California at Berkeley

Games Johnny Would Play: Computation as a Lens

Christos Papadimitriou is the C. Lester Hogan Professor of Computer Science at UC Berkeley. He is a member of the National Academy of Engineering and the National Academy of Sciences. His seminal work on algorithms and computational complexity was recognized through the Knuth Prize for his overall impact of his research on the field of computer science, and the Godel Prize for his work on the foundations of algorithmic game theory.

**Leslie Valiant**
T. Jefferson Coolidge Professor of Computer Science and Applied Mathematics
Harvard University

How Nature Exploits Big Data: Learning and Evolution

Dr. Valiant is the T. Jefferson Coolidge Professor of Computer Science and Applied Mathematics at Harvard. He was awarded the Turing Award ("Nobel for Computing") for his seminal contributions to the foundations of parallel and distributed computing, algebraic computation and machine learning.

Following Leslie Valiant's lecture:
A dinner reception hosted by **Peter Webber**, Dean of the Graduate School

A conversation with **Freeman Dyson**, Professor Emeritus, Institute for Advanced Study

Memories of Johnny at the Institute for Advanced Study
Movie: *John von Neumann Mathematician and More*

## Friday, May 15

**Edward Hawrot**
Alva O. Way University Professor of Medical Science, Professor of Medical Science, Associate Dean of Medicine and Biological Sciences, Brown University

Introductory Remarks

**David Berson**
Sidney A. Fox and Dorothea Doctors Fox Professor of Ophthalmology and Visual Sciences, Professor of Neuroscience
Brown University

The Brain in Your Eye

Dr. Berson is the Sidney A. Fox and Dorothea Doctors Fox Professor of Ophthalmology and Visual Sciences and Professor of Neuroscience at Brown University. His highly regarded research into the structure and function of the visual system has led to his appointment as a Fellow of the American Association for the Advancement of Science.

**Patricia S. Churchland**
UC President's Professor of Philosophy
University of California, San Diego

Nerve Agents: You and Your Amazing Old-Fangled Reward System

Dr. Churchland is the UC President's Professor of Philosophy at the University of California, San Diego. She is a pioneer in the field of neurophilosophy, the interface between neuroscience and philosophy. Her work has been recognized with a MacArthur Fellowship, and she was named a Humanist Laureate by the International Academy of Humanism.

## About Brown's 250th

The semiquincentenary celebration gives us the opportunity to celebrate Brown's many triumphs in education, research, and service; reflect on the issues that Brown has confronted over time; consider Brown of today; and imagine Brown's future in the 21st century and beyond.

IMAGINE BROWN 250+