

MILLER INSTITUTE ANNUAL INTERDISCIPLINARY SYMPOSIUM HISTORY

The Miller Institute, established in the mid-1950s on the Berkeley campus of the University of California, is “dedicated to the encouragement of creative thought and conduct of research and investigation in the field of pure science.” The Institute supports three primary programs: Miller Research Professorships for UC faculty, Visiting Miller Professorships, and Miller Research Fellowships. Each year approximately 50 scientists are supported in these program activities.

In 1997, the Miller Institute broadened its charge with the addition of an Interdisciplinary Symposium. Our intention was to promote discussion of cutting-edge science among leading researchers through a weekend of scientific interaction and discussion. The Research Fellows were the catalyst behind this program and they helped to design it as a freewheeling discussion across all the sciences, including astronomy, biology, chemistry, geology, mathematics and physics.

2016 SPEAKERS

John Boothroyd, Stanford University

“Strength through diversity: How an intracellular infectious agent like Toxoplasma co-evolved with many hosts to maintain a generalist lifestyle in a very special niche.”

Mark Cane, Columbia University

“Climate and Conflict”

Jordan Ellenberg, University of Wisconsin

“Randomness and Number Theory”

Eddie Farhi, MIT

“What is all the fuss about Quantum Computers?”

Pupa Gilbert, University of Wisconsin

“Biomineralization”

Heather Knutson, Caltech

“Cloudy or Clear? Weather Forecasting for Extrasolar Planets”

Percy Liang, Stanford University

“Machine Learning: Success Stories and Core Challenges”

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2015 Speakers:

Donna Blackmond, Scripps Research Institute
“Chemical and Physical Models for the Origin of Biological Homochirality”

Adam Cohen, Harvard University
“Bringing Bioelectricity to Light”

Maitreya Dunham, University of Washington
“Aneuploidy and Adaptation in Yeast”

Cynthia Kenyon, CALICO
“How Can the Germline Be Immortal?”

Ruth Murray-Clay, UC Santa Barbara
“A Diversity of Worlds: Origin of Structure in Planetary Systems”

Lyman Page, Princeton University
“Observing the Birth of the Universe”

James Sethian, UC Berkeley
“The Mathematics of Moving Interfaces: From Industrial Printers to Semiconductors to Medical Imaging to Soap Bubbles”

2014 Speakers:

Boris Baer, The University of Western Australia
“Sex, Sperm...and Society”

Ray Beausoleil, HP Laboratories
“The “Music” of Light: Optical Resonances for Fun and Profit”

Emily Brodsky, University of California Santa Cruz
“Friction on Faults”

Keith Devlin, Stanford University
“Breaking the Symbol Barrier – Designing a Better Interface to Learn Mathematics”

Sönke Johnsen, Duke University
“Hide and Seek in the Open Sea”

David Liu, Harvard University
“Integrating Chemistry and Evolution to Illuminate and Program Biology”

Alice Shapley, University of California Los Angeles
“Decoding the Contents of Distant Galaxies”

Howard Stone, Princeton University
“Some Surprises in Fluid Dynamics (even after hundreds of years)”

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2013 Speakers:

Ed Burger, Williams College
“Thinking Through the Natural Numbers: A Rational and Irrational Look at 1, 2, 3, 4, ...”

John Dabiri, Caltech
“Do Swimming Animals Mix the Ocean?”

Kevin Laland, St. Andrews College
“Cause and Effect in Biology Revisited”

Seth Putterman, UCLA
“Spontaneous Energy Focusing Phenomena”

Scott Ransom, NRAO and The University of Virginia;
“Millisecond Pulsars: Nature’s Gifts that Keep on Giving”

Pamela Ronald, UC Davis
“Plant Genetics and the Future of Food”

Julie Theriot, Stanford
“New Directions in Cell Motility: Dynamics and Mechanics of Cell Turning and Pathfinding”

George Whitesides, Harvard
“‘Simplicity’ as a Component of Invention”

2012 Speakers

R. Tom Baker, University of Ottawa
“Carry that Weight: Enabling Catalysis Studies of Amine-Borane Dehydrogenation toward Renewable Transportation Fuels”

Carl Bergstrom, University of Washington
“Dealing with Deception in Biology”

Steve Cowley, Culham Centre for Fusion Energy
“Fusion Power – the Scientific and Technological Challenge”

Peter Olson, Johns Hopkins University
“When Earth’s Magnetic Field Reverses Itself: How, Why and So What?”

Tom Seeley, Cornell University
“Swarm Intelligence in Honey Bees”

Kristin Scott, University of California Berkeley
“Taste Recognition: Food for Thought”

Jack Szostak, Harvard
“The Origin of Life and the Emergence of Darwinian Evolution”

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2011

Ron Breaker, Yale University
“The Expanding Diversity of Noncoding RNA in Bacteria”

Naomi Halas, Rice University
“Plasmonics: Nanoscale Manipulation of Light”

Greg Laughlin, University of California Santa Cruz
“The Galactic Planetary Census”

Claire Max, University of California Santa Cruz
“Black Holes in Colliding Galaxies seen with Adaptive Optics”

Corrie Moreau, Field Museum of Natural History
“Evolution and Diversification of the Ants”

James Nelson, Stanford University
“Evolution of a Polarized Epithelium: not just for Animals”

Taylor Ricketts, World Wildlife Fund Conservation Science
“Natural Capital: Quantifying the Economic Benefits Provided by Nature”

2010

Michael Brenner, Mathematics, Harvard University
“Linear Algebra and Darwin’s Finches”

Bruce Buffett, Earth & Planetary Science, UC Berkeley
“The Origin of Earth’s Magnetic Field”

Scott Emr, Molecular & Cell Biology, Cornell University
“Using Cell Biology to Understand Diseases like Cancer, AIDS, and Neuro-Degeneration”

Neil Gershenfeld, Center for Bits & Atoms, MIT
“Programming Bits & Atoms”

Debbie Jin, JILA, University of Colorado
“Fun with Ultra cold Atoms”

Lisa Kewley, Institute for Astronomy, University of Hawaii
“The Star Formation and Chemical History of Galaxies”

Gero Miesenboeck, Physiology, University of Oxford
“Lighting Up the Brain: Imagine and Controls of Genetically Targeted Neural Circuits”

David Nelson, Physics, Harvard University
“Gene Surfing and Survival of the Luckiest”

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2009

John Bush, MIT

“Surface Tension in Biology”

Alyssa Goodman, Harvard University

“Astronomy as I “SEE” it”

Hopi Hoekstra, Harvard University

“What Darwin didn’t know: the genetic basis of adaptation?”

Paul McEuen, Cornell University

“Nano carbon: from string theory to atomic drums”

Jerry Mitrovica, University of Toronto

“Solving the Enigma of Global Sea Level Rise”

Paul Sherman, Cornell University

“Darwinian Medicine”

Chris Somerville, University of California Berkeley

“Development of Cellulosic Fuels”

Avi Wigderson, Institute of Advanced Study

“The “P vs NP” Problem: efficient computation, internet security, and the limits to human knowledge”

2008

Nima Arkani-Hamed, Harvard

“Fundamental Physics, Cosmology, and the Large Hadron Collider”

David Chandler, University of California Berkeley

“Dynamics on the way to forming glass, the past, present, and future”

Joshua Jortner, Tel Aviv University

“Dynamics at Extremes”

Susan Lindquist, MIT

“Extraordinary Surprises from Protein Folding in Biology”

Avi Loeb, Harvard

“The Past and Future of our Universe”

Michael Manga, University of California Berkeley

“Why do Volcanoes only sometimes erupt explosively?”

Haynes Miller, MIT

“Knots and Numbers”

Terrie Williams, University of California Santa Cruz

“The Carnivore Conundrum: How environmental perturbation is leading to a small, snarling, smelly world”

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2007

Bruce Ames – University of California Berkeley
“Delaying (or Accelerating) the Degenerative Diseases of Aging”

Joe DeRisi – University of California San Francisco
“Bugs, Drugs, and Microarrays”

Phillip Geissler – University of California Berkeley
“Emergence of glassy disorder in biological systems”

Christian Korner – University of Basel
“Change in cash flow or capital? – Plants in a CO₂ rich world”

Charlie Peskin – New York University
“Muscle and Blood and Valves, and Electricity, too: Fluid-Structure Interaction in the Heart”

Lonnie Thompson – Ohio State University
“Glaciological Evidence of Abrupt Tropical Climate Change: Past and Present”

Harry Swinney – University of Texas Austin
“Emergence of Order in Physical, Chemical and Biological Systems”

2006

Karen De Valois - University of California, Berkeley
"A New Understanding of Color Vision"

Chris Dobson - Cambridge University
"Protein Folding, Molecular Evolution and Human Disease"

L. Mahadevan - Harvard University
"Shape, Flow and Movement: the Science of Everyday Life"

Akkihebbal Ravishankara - University of Colorado / NOAA
"Chemistry and Its Role in Climate"

Paul Steinhardt - Princeton University
"A Tale of Two Universes"

Steven Strogatz - Cornell University
"Sync: The Emerging Science of Spontaneous Order"

Irving Weissman - Stanford University
"Stem Cells"

Xiaowei Zhuang - Harvard University
"Tracking Individual Virus Particles in Live Cells"

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2005

Bonnie Bassler, Princeton University
“Tiny Conspiracies: Cell-to-Cell Communications in Bacteria”

Carolyn Bertozzi, University of California Berkeley
“Chemistry in Living Systems: New Tools for Probing the Glycome”

Arup Chakraborty, University of California Berkeley
“Intercellular Communication in the Adaptive Immune System”

Paul Chaikin, New York University
“Colloids and Candies”

Michael Malin, Malin Space Sciences Systems
“The “New” Mars”

Lord Robert May, University of Oxford
“Hard Choices for Tomorrow’s World”

David McLaughlin, New York University
“Modeling of Spatial Temporal States in Primary Visual Cortex”

Eliot Quataert, University of California Berkeley
“The Big Black Hole in the Center of the Milky Way”

2004

Charles Bennett – IBM Research
“Quantum Information Processing”

Jennifer Chayes – Microsoft Research
“Phase Transitions in Computer Science: How Do You Melt a Resource Allocation System?”

George Lauder – Harvard University, Museum of Comparative Zoology
“Fishes, Submarines, and Robots: Moving About in the Underwater World”

Chung Pei Ma – University of California, Berkeley
“What’s the Matter with Dark Matter?”

Geoff Marcy – University of California, Berkeley, Astronomy
“New Planets, Old Yellowstone, and Life in the Universe”

Sarah Otto – University of British Columbia, Zoology
“Why Have Sex? The Population Genetics of Sex and Recombination”

JoAnne Stubbe – MIT, Chemistry
“Ribonucleotide Reductases: Radical Enzymes with Suicidal Tendencies”

David Weitz – Harvard University, Applied Physics
“What Makes Soft Materials Soft?”

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2003

Sir Michael Berry – University of Bristol, Physics
“Making Light of Mathematics”

Louis Brus – Columbia University, Chemistry
“Chemistry and Physics of Semiconductor Nanocrystals”

David Helfand – Columbia University, Astronomy &
Astrophysics
“Nuclear Physics at a Distance: Seeking Quarks at 10,000
Light Years”

Sidney Nagel – University of Chicago, Physics
“Shadows and Ephemera: A (Post-Modern) Photographic
Exploration of our Singular World”

Dianne Newman – California Institute of Technology,
Geobiology & Environmental Science
“Microbe-Mineral Interactions”

Fred Nijhout – Duke University, Biology
“The Control and Evolution of Polyphenic Development of
Insects”

George Oster – University of California, Berkeley, ESPM &
MCB
“The Mysterious Meanderings of Myxobacteria”

Steve Wofsy – Harvard University, Chemistry
“Forests, the Global Carbon Cycle, and Climate Change”

2002

Philip Anfinrud – National Institutes of Health, Chemical
Physics
“Watching a protein as it functions: real time observations
using time resolved spectroscopy and x-ray crystallography”

Persi Diaconis – Stanford University, Statistics
“The Problem of Thinking Too Much”

Michael Dickinson – University of California Berkeley,
Integrative Biology
“The Eponymous Fly”

Ursula Goodenough – Washington University, Cell Biology &
Biochemistry
“Sex and Speciation at a Molecular Level”

Harry Gray – California Institute of Technology, Chemistry
“The Currents of Life: Electron Flow through Biological
Molecules”

David Jewitt – University of Hawaii, Institute for Astronomy
“The Solar System: Bigger & Better”

Lawrence Krauss – Case Western Reserve University, Physics
“Life, The Universe, and Nothing: Life and Death in an Ever-
expanding Universe”

Christopher McKay – NASA Ames Research Center
“Life on Mars”

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2001

Steven Chu – Stanford University, Physics
“Biological Processes, One Molecule at a Time”

Christopher Garrett – Univ of Victoria, Dept of Physics & Astronomy
“From Millimetres to Megametres: the Interacting Scales of Ocean Physics”

David Haig – Harvard University, Botanical Museum
“The Divided Self”

Susan Kieffer - S. W. Kieffer Science Consulting
“Geological Nozzles: The Rapids of the Colorado River, Old Faithful Geysers, Mount St. Helens, and Planetary Volcanoes”

Dan Kleppner – MIT, Physics
“Future Knowledge”

Peter Sarnak, Princeton University, Mathematics & Institute for Advanced Studies
“The Riemann Hypothesis”

George Whitesides – Harvard University, Chemistry
“Self-Assembly”

Gregory Wray – Duke University, Biology
“Ants, Urchins, and the Hox Paradox: The Evolution of Gene Networks”

2000

Fred Adams – University of Michigan, Physics
“Into the Dark: The long term fate and evolution of astrophysics objects in a dying universe”

Jackie Barton – California Institute of Technology, Chemistry
“A Different View of the DNA Double Helix: A Conduit for Charge Transport”

Ann Burke – Wesleyan University, Biology
“Evolution and Development: Exploring intrinsic mechanisms in the evolution of morphology”

Ingrid Daubechies – Princeton University, Mathematics
“Surfing with Wavelets”

Jack Horner – Univ. of Montana, Museum of the Rockies
“Dinosaur debates; sorting out science from opinion”

Leo Kadanoff – University of Chicago, Physics & Mathematics
“Making a Splash; Breaking a Neck: Physics and Complexity”

Tom Koob – University of South Florida, Skeletal Biology
“Biomimetic Fibers: Bridging the Gap”

Walter Pitman – Columbia University, Lamont-Doherty Earth Observatory
“Noah’s Flood”

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1999

Eric Cornell – University of Colorado JILA, Physics
“The Day the Gas Stopped: Physics within a Millionth of a Degree of Absolute Zero”

Alex Filippenko – University of California Berkeley
Astronomy
“Einstein’s Biggest Blunder? Evidence for Cosmic Antigravity”

Hiroo Kanamori – California Institute of Technology
Geophysics
“Chaos and Order in Earthquakes”

Mary Claire King – University of Washington
Molecular biology
“The Limits of Genetic Omnipotence”

Mimi Koehl – University of California Berkeley
Integrative Biology
“Feeding, Smelling and Swimming with Hairy Little Legs”

Daniel Nocera – MIT
Physical Inorganic Chemistry
“After the Oil Runs Out, then What? Harnessing the two-electron bond as the fuel source of the future”

Baldomero Olivera – University of Utah, Biology
“Learning Drug Design from Venomous Cone Snails”

Steven Smale – City University of Hong Kong, Mathematics
“On the Limits of Intelligence”

1998

Steven Block – Princeton University, Biological Sciences
“Biophysics of Single Molecules”

Nature Walk with Bill Dietrich & Mary Power - UC Berkeley
Earth & Planetary Science & Integrative Biology

Vaughan Jones - UC Berkeley, Mathematics
“Noncommutative Geometry”

William Kahan - UC Berkeley, Mathematics & Computer Science
“How Java’s Floating-Point Hurts Everyone Everywhere”

Dan Rokhsar - UC Berkeley, Physics
“Modeling Protein Folding”

Sherwood Rowland - UC Irvine, Chemistry
“Atmospheric Chemistry”

Dan Simberloff - University of Tennessee, Ecology & Evolutionary Biology
“Nonindigenous species, biological control and biodiversity”

Mike Turner - University of Chicago, Astronomy & Astrophysics
“Cosmology and Background Anisotropies”

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1997 – 1st Annual Miller Institute Symposium

Charles Alcock – Lawrence Livermore National Laboratory
Astronomy - Dark Matter

Walter Alvarez - UC Berkeley, Earth & Planetary Science
Cretaceous-Tertiary Extinction

Joe Felsenstein – University of Washington
Population Genetics

Robert Kirshner – Harvard University
Astronomy - Supernovae

James Randi - James Randi Educational Foundation
Science and Pseudoscience

Carla Shatz – UC Berkeley
Neurobiology - Brain Wiring

Chuck Stevens - Salk Institute for Biological Studies
Neurobiology - Coding in the Brain

Richard Zare – Stanford University
Chemistry – “Is There Life on Mars?”