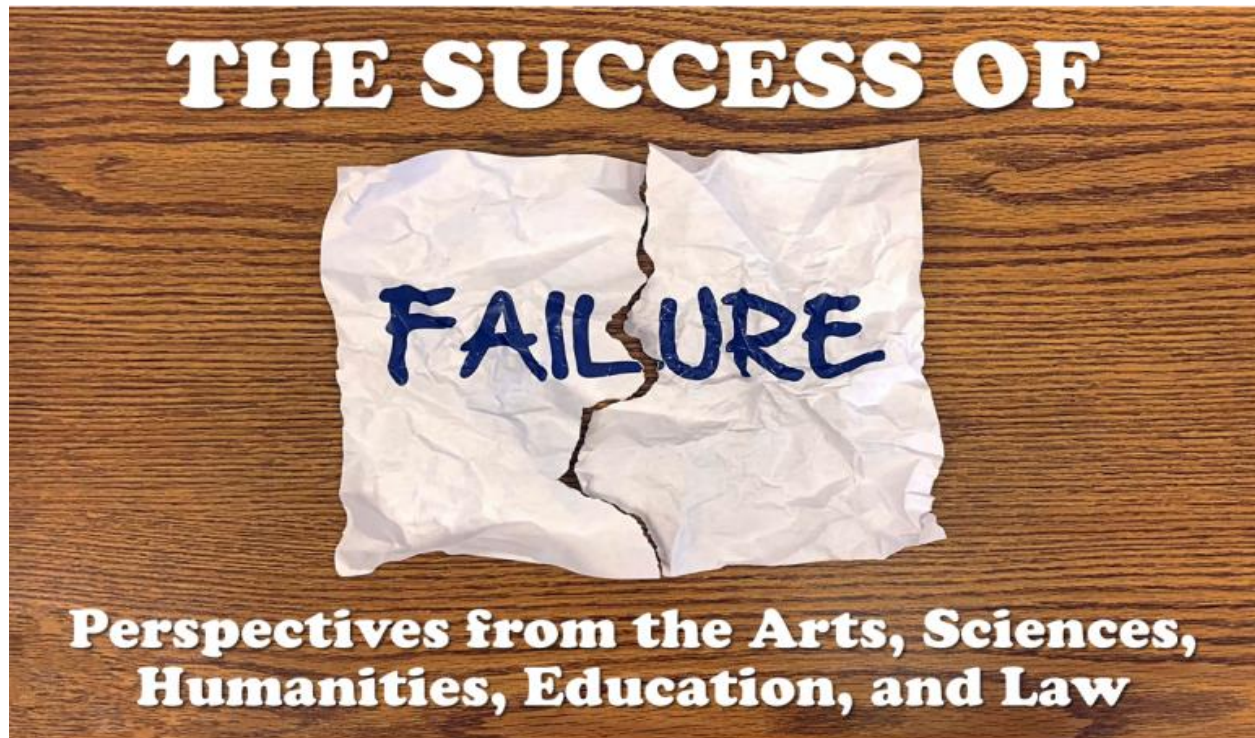


The Success of Failure: Perspectives from the Arts, Sciences, Humanities, Education, and Law

December 7-8, 2017

Cowin Auditorium, 147 Horace Mann Hall, Teachers College



Sponsored by: The Center for Science and Society, Columbia University; The Society of Fellows and Heyman Center for the Humanities, Columbia University; The Institute for Social and Economic Research and Policy, Columbia University; and Teachers College, Columbia University

This conference is supported, in part, by The Institute for Social and Economic Research and Policy (ISERP) at Columbia University and the John Templeton Foundation.

Introduction:

A real failure does not need an excuse. It is an end in itself. – Gertrude Stein

We are all familiar with the many bromides teaching us the value of failure on the path to success. It builds character, shows perseverance and dedication, demonstrates willingness to take a risk, and so forth. All perhaps true, but all constrained by a view of failure as a means to an end, an unfortunately necessary obstacle to be overcome. One may learn from failures, but what is mostly meant is that one learns not to do that particular thing again. Failing is fine, especially on someone else's dime, if you gain some experience to avoid future failures.

We take here an alternative view of failure. What about failure as a good? What about the intrinsic value of failure? How about failure that contains valuable data, not just an error message? Failure that is a critical part of the process, not a means to an end? Failure that stands shoulder to shoulder with success? Can there be such a thing as positive failure? Can failure make progress? Can we use failure to improve creativity, education, or behavior? How do we research failure? How do we discover important failures? How do we recognize important failures? This symposium will investigate these and other perspectives on failure across disciplines, searching for commonalities and differences.

Format:

This symposium follows on the conference, *Evidence: An Interdisciplinary Conversation about Knowing and Certainty*, held at Columbia University April 21-22, 2017. Similar in format, *The Success of Failure* will bring together scholars and practitioners in the arts, sciences (natural and social), humanities, economics, business, law, and education to examine the value of failure in making progress in each of these areas. Speakers and participants will include academic and industry leaders from around the world and within the Columbia University community. Historical, current, and future perspectives will be discussed through a combination of short presentations, discussions, and panels divided by disciplinary topic. In order to foster cross-disciplinary interactions and generate new ideas, speakers will participate as respondents to the presentations in other sessions.

The Success of Failure: Perspectives from the Arts, Sciences, Humanities, Education, and Law
Cowin Auditorium, 147 Horace Mann Hall, Teachers College, Columbia University
3040 Broadway, New York, NY 10027
December 7-8, 2017

THURSDAY, DEC 7 - DAY 1				
Time	Location	Topic	Speakers	Respondents
8:30AM - 9:00AM				
9:00AM - 9:30AM	Cowin Auditorium	Welcome	Conference Organizers	--
9:30AM - 11:00AM	Cowin Auditorium	Failures in Science from the Perspective of History	Harry Collins (Cardiff University) David Kaiser (Massachusetts Institute of Technology) Jutta Schickore (Indiana University Bloomington)	Catherine Chase (Teachers College, Columbia University) Jonathan Weiner (Columbia University Journalism School)
11:00AM - 11:30AM				
11:30AM - 1:00PM	Cowin Auditorium	Failures of Social Regulation	Carl Hart (Columbia University) Alondra Nelson (Columbia University) Tim Wu (Columbia University Law School)	Harry Collins (Cardiff University) Katharina Pistor (Columbia University Law School) Luz Santana (Right Question Institute)
1:00PM - 2:00PM				
2:00PM - 3:00PM	Cowin Auditorium	Failures in Publishing and Negative Results	John Spiro (Simons Foundation) Jonathan Weiner (Columbia University)	Peter Norvig (Google) Jutta Schickore (Indiana University Bloomington)
3:00PM - 4:00PM	Cowin Auditorium	The Importance of Teaching Failure in Education	Xiaodong Lin (Teachers College, Columbia University) Luz Santana (Right Question Institute)	Sara Jane Bailes (University of Sussex) Alondra Nelson (Columbia University)
4:00PM - 4:15PM				
4:15PM - 5:15PM	Cowin Auditorium	Narratives of Failure	Jennifer Hecht (Historian and Author) Scott Sandage (Carnegie Mellon University)	David Kaiser (Massachusetts Institute of Technology) John Collins (Elevator Repair Service) Robert Siegler (Carnegie Mellon University)
5:15PM - 6:15PM				
Reception in Horace Mann Hall, Room #152				
FRIDAY DEC 8 - DAY 2				
Time	Location	Topic	Speakers	Respondents
8:30AM - 9:00AM				
9:00AM - 10:30AM	Cowin Auditorium	The Psychology of Failure	John Black (Teachers College, Columbia University) Catherine Chase (Teachers College, Columbia University) Robert Siegler (Carnegie Mellon University) Lisa Son (Barnard College, Columbia University)	Carl Hart (Columbia University) Mario Livio (University of Nevada, Las Vegas)
10:30AM - 10:45AM				
10:45AM - 12:00PM	Cowin Auditorium	Failure in the Sciences	Mario Livio (University of Nevada, Las Vegas) Peter Norvig (Google) Michael Shadlen (Columbia University)	Matthew Jones (Columbia University) Xiaodong Lin (Teachers College, Columbia University)
12:00PM - 1:00PM	Cowin Auditorium	Failures in Economics	Katharina Pistor (Columbia University Law School) Josh Wolfe (Lux Capital)	Scott Sandage (Carnegie Mellon University) John Spiro (Simons Foundation)
1:00PM - 2:00PM				
2:00PM - 3:00PM	Cowin Auditorium	Failure in the Arts - Music	Chris Washburne + Musicians (Columbia University)	--
3:00PM - 3:45PM	Cowin Auditorium	Failure in the Arts - A Conversation About Performance	Sara Jane Bailes (University of Sussex) John Collins (Elevator Repair Service)	--
3:45PM - 4:00PM				
4:00PM - 4:30PM	Cowin Auditorium	Discussion Panel	Select Chairs and Speakers	--

Conference Organizers:

Stuart Firestein, Professor of Biological Sciences; Columbia University

Eileen Gillooly, Executive Director of the Heyman Center for the Humanities and Society of Fellows, Adjunct Associate Professor of English and Comparative Literature and the Institute for Research on Women and Gender; Columbia University

Jeremy Kessler, Associate Professor of Law; Columbia University

Xiaodong Lin, Professor of Cognitive Studies; Teachers College, Columbia University

Pamela Smith, Seth Low Professor of History and Director of the Center for Science and Society; Columbia University

Conference Speakers:

Sara Jane Bailes, Associate Professor in Theatre and Performance Studies; University of Sussex

John Black, Cleveland E. Dodge Professor of Telecommunications & Education; Teachers College, Columbia University

Catherine Chase, Assistant Professor of Cognitive Studies; Teachers College, Columbia University

Harry Collins, Distinguished Research Professor of Social Sciences; Cardiff University

John Collins, Artistic Director; Elevator Repair Service

Carl Hart, Dirk Ziff Professor of Psychology in Psychiatry; Columbia University

Jennifer Hecht, Historian and Author

Matthew Jones, James R. Barker Professor of Contemporary Civilization, Columbia University

David Kaiser, Germeshausen Professor of the History of Science and Professor of Physics; Massachusetts Institute of Technology

Mario Livio, Professor of Astrophysics; University of Nevada, Las Vegas

David Madigan, Executive Vice President for Arts and Sciences, Dean of the Faculty of Arts and Sciences, and Professor of Statistics; Columbia University

Alondra Nelson, Professor of Sociology; Columbia University

Peter Norvig, Director of Research; Google

Katharina Pistor, Michael I. Sovern Professor of Law, Columbia University Law School

Scott Sandage, Associate Professor of History; Carnegie Mellon University

Luz Santana, Co-Director; Right Question Institute

Jutta Schickore, Professor of History of Science; Indiana University Bloomington

Michael Shadlen, Professor of Neuroscience; Columbia University Medical Center

Robert Siegler, Teresa Heinz Professor of Cognitive Psychology; Carnegie Mellon University

Lisa Son, Associate Professor of Psychology; Barnard College, Columbia University

John Spiro, Deputy Scientific Director; Simons Foundation Autism Research Initiative

Chris Washburne, Associate Professor of Music; Columbia University

Jonathan Weiner, Maxwell M. Geffen Professor of Medical and Scientific Journalism; Columbia University Journalism School

Josh Wolfe, Co-Founder and Managing Partner; Lux Capital

Tim Wu, Isidor and Seville Sulzbacher Professor of Law; Columbia University Law School

Participant Bios

Sara Jane Bailes

Associate Professor in Theatre and Performance Studies; University of Sussex

Sara Jane Bailes is currently a Macgeorge Fellow at the University of Melbourne and Associate Professor of Theatre and Performance Studies at the University of Sussex (UK), where she was Head of Drama, Theatre and Performance (2009-2016). She is a world-leading scholar in contemporary performance and collaborates professionally as dramaturg and producer with European and US-based artists. She is author of *Performance Theatre and the Poetics of Failure* (Routledge, 2010), a major book on late twentieth century experimental theatre practice, and a co-edited volume on *Beckett and Musicality* (Ashgate, 2014). She is currently co-authoring a book on the history of New York theatre ensemble, Elevator Repair Service, with Artistic Director John Collins, and working on a new book-length project on objects in performance.

John Black

Cleveland E. Dodge Professor of Telecommunications and Education, Director Institute for Learning Technologies; Teachers College, Columbia University

John B. Black is the Cleveland E. Dodge Professor of Telecommunications and Education at Teachers College, Columbia University where he is a member of both the Department of Human Development and the Department of Math, Science, and Technology and serves as Co-Director of the Institute for Learning Technologies. He has a BS degree (1970) in math from MIT and a PhD degree (1979) in Cognitive Psychology from Stanford. He was an Assistant and then Associate Professor of Psychology and Computer Science at Yale before joining the TC faculty. He has served as a consultant to the Xerox Palo Alto Research Center, IBM Research, and Bell Laboratories. He is the author of over 80 refereed publications and 4 books. His work focuses on cognitive research and its application to the design and use of educational technology.

Catherine Chase

Assistant Professor of Cognitive Studies; Teachers College, Columbia University

Catherine Chase is Assistant Professor of Cognitive Studies at Teachers College, Columbia University. She studies how the design of instruction impacts student learning, transfer, and motivation, largely in the context of science education. One branch of her work explores the impact of contrasting examples on student perception and transfer of deep scientific structures. A second line of research investigates psychological resilience in the face of failure and technological tools that can support students in rebounding. Chase has designed and developed a variety of educational games and agent-based environments for K-8 science learning. Chase holds a PhD in Learning Sciences and Technology Design from Stanford University's School of Education, an MS Ed in Teaching from CUNY-Brooklyn College, and a BAS in Biology and Psychology from Stanford University. She recently completed a post-doctoral fellowship in Psychology and Human-Computer Interaction at Carnegie Mellon University. Her interest in

educational research was sparked by five years of teaching K-8 science in public and private schools in Brooklyn, New York.

Harry Collins

Distinguished Research Professor, School of Social Sciences; Cardiff University

Harry Collins is a British sociologist of science at the School of Social Sciences, Cardiff University, Wales. In 2012 he was elected a Fellow of the British Academy. His best known book is *The Golem: What Everyone Should Know About Science* (1993). While at the University of Bath, Professor Collins developed the Bath School approach to the sociology of scientific knowledge.

John Collins

Artistic Director and Founder of Elevator Repair Service Theater

John Collins is the Artistic Director and Founder of Elevator Repair Service (ERS) Theater. Since 1991, he has directed or co-directed all of the company's productions. John is the recipient of a 2014 Doris Duke Performing Artist Award, a 2010 Guggenheim Fellowship, and a 2011 United States Artists Donnelley Fellowship. He received an Elliot Norton Award and a Lucille Lortel Award for outstanding directing for ERS's production of *Gatz*. Recent productions include ERS's *Measure for Measure* at The Public Theater and *The Select (The Sun Also Rises)* at The Shakespeare Theater Company in Washington, DC. John will direct ERS's production of *Everyone's Fine with Virginia Woolf* written by Kate Scelsa at Abrons Arts Center in 2018.

Stuart Firestein

Professor of Biological Sciences; Columbia University

Dr. Stuart Firestein is Professor in Columbia University's Department of Biological Sciences where his colleagues and he study the vertebrate olfactory system, possibly the best chemical detector on the face of the planet. His laboratory seeks to answer that fundamental human question: How do I smell? Dedicated to promoting the accessibility of science to a public audience, Firestein serves as an advisor for the Alfred P. Sloan Foundation's program for the Public Understanding of Science. Recently he was awarded the 2011 Lenfest Distinguished Columbia Faculty Award for excellence in scholarship and teaching. He is the author of *Ignorance, How It drives Science* (2012), and *Failure: Why Science Is So Successful* (2015), both published by Oxford University Press.

Eileen Gillooly

Executive Director of the Heyman Center for the Humanities and Society of Fellows, Adjunct Associate Professor of English and Comparative Literature and the Institute for Research on Women and Gender; Columbia University

Professor Gillooly's interests include nineteenth-century literature and culture in Britain and its colonies, gender studies, public humanities, justice studies, medical and health humanities, the

history of the English novel, and literary and social theory. She is the author of *Smile of Discontent: Humor, Gender, and Nineteenth-Century British Fiction* (University of Chicago Press, 1999), which was awarded the Perkins Prize by the International Society for the Study of Narrative (2001); and of essays, articles, and reviews in such publications as *Victorian Studies*, *ELH*, *Feminist Studies*, *The New York Times Book Review*, *Victorian Literary Cultures: A Critical Companion to the Nineteenth-Century Novel*, *Feminist Literary Theory: A Dictionary*, *The Victorian Comic Spirit*, *The Politics of Humour*, *Victorian Prism: Refractions of the Crystal Palace*, *Feminist Nightmares/Women at Odds*, *Contemporary Dickens*, and *A Companion to British Literature* (Wiley/Blackwell).

Carl Hart

Dirk Ziff Professor of Psychology in Psychiatry; Columbia University

Carl L. Hart is the Chairperson in the Department of Psychology and Dirk Ziff Professor of Psychology in the Departments of Psychology and Psychiatry at Columbia University. He has published dozens of scientific articles in the area of neuropsychopharmacology and is co-author of the textbook *Drugs, Society and Human Behavior* (with Charles Ksir). His book, *High Price: A Neuroscientist's Journey of Self-Discovery that Challenges Everything You Know about Drugs and Society*, was the 2014 winner of the PEN/E. O. Wilson Literary Science Writing Award. Fast Company magazine named Hart one of Most Creative People for 2014.

Jennifer Michael Hecht

Historian and Author

Jennifer Michael Hecht is a poet, historian, and commentator. She is the author of the bestseller *Doubt: A History*, a history of religious and philosophical doubt all over the world, throughout history. Her newest book is *Stay: A History of Suicide and the Arguments Against It* (Yale University Press, 2013). Her book *The Happiness Myth* (HarperOne, 2007), brings a historical eye to modern wisdom about how to lead a good life. Hecht's *The End of the Soul: Scientific Modernity, Atheism, and Anthropology* won Phi Beta Kappa's 2004 Ralph Waldo Emerson Award, "For scholarly studies that contribute significantly to interpretations of the intellectual and cultural condition of humanity." She holds a PhD in the history of science/European cultural history from Columbia University (1995). She has taught in the MFA program at Columbia University and the New School in New York City. Hecht has also published in peer-reviewed journals, including *The Journal of the History of Ideas*, *Isis: Journal of the History of Science Society*, *French Historical Studies*, and *The Journal of the History of the Behavioral Sciences*. She has delivered lectures at Harvard, Yale, MIT, Cal Tech, Columbia University as well as The Zen Mountain Monastery, Temple Israel, Saint Bart's Episcopal Church, and other institutions of learning and introspection.

Matthew Jones

James R. Barker Professor of Contemporary Civilization; Columbia University

Matthew L. Jones studies the history of science and technology, focused on early modern Europe and on recent information technologies. As a Guggenheim Fellow for 2012-13, and a Mellon New Directions fellow for 2012-15, he is writing on a book called *Data Mining: The Critique of Artificial Reason, 1963-2005*. This is a historical and ethnographic account of “big data,” its relation to statistics and machine learning, and its growth as a fundamental new form of technical expertise in business and scientific research. His publications include, “Querying the Archive: Data Mining from Apriori to Page Rank,” in L. Daston, ed. *Archives of the Sciences* (Chicago, 2016); *Reckoning with Matter: Calculating Machines, Improvement, and Thinking about Thinking from Pascal to Babbage* (Chicago, 2016); “Improvement for Profit: Calculating Machines and the Prehistory of Intellectual Property,” in Mario Biagioli and Jessica Riskin, eds., *Nature Engaged: Science in Practice from the Renaissance to the Present* (Palgrave-MacMillan, 2014); and *The Good Life in the Scientific Revolution* (University of Chicago Press, 2006).

David Kaiser

Germeshausen Professor of the History of Science and Professor of Physics; Massachusetts Institute of Technology

David Kaiser completed an AB in physics at Dartmouth College and PhDs in physics and the history of science at Harvard University. Kaiser's historical research focuses on the development of physics in the United States during the Cold War, looking at how the discipline has evolved at the intersection of politics, culture, and the changing shape of higher education. His physics research focuses on early-universe cosmology, working at the interface of particle physics and gravitation. He has also helped to design novel experiments to test the foundations of quantum theory. Kaiser is author of the award-winning book, *Drawing Theories Apart: The Dispersion of Feynman Diagrams in Postwar Physics* (University of Chicago Press, 2005), which traces how Richard Feynman's idiosyncratic approach to quantum physics entered the mainstream. His latest book, *How the Hippies Saved Physics: Science, Counterculture, and the Quantum Revival* (W. W. Norton, 2011), charts the early history of Bell's theorem and quantum entanglement and was named “Book of the Year” by *Physics World* magazine.

Jeremy Kessler

Associate Professor of Law; Columbia Law School

Jeremy K. Kessler, Associate Professor of Law, is a legal historian whose scholarship focuses on First Amendment law, administrative law, and constitutional law generally. He joined the Columbia Law School faculty in 2015 and is co-director of Columbia University's 20th Century Politics and Society Workshop and Columbia Law School's Legal History Workshop. He also serves on the ABA's Committee on the History of Administrative Law. Kessler's forthcoming

book, *Fortress of Liberty: The Rise and Fall of the Draft and the Remaking of American Law* (Harvard University Press), explores how the contested development of the military draft transformed the relationship between civil liberties law and the American administrative state. His articles have appeared in the *Harvard Law Review*, the *Columbia Law Review*, the *University of Chicago Law Review*, and the *Texas Law Review*, among other publications. Kessler received his JD from Yale Law School, where he was a Legal History Fellow and the executive editor of the *Yale Journal of Law and the Humanities*. He earned a MPhil in the history and philosophy of science from the University of Cambridge and a BA from Yale College, summa cum laude.

Xiaodong Lin

Professor of Cognitive Studies; Teachers College, Columbia University

Dr. Lin studies metacognition and problem solving, and the ways that cultural interactions with the help of technology can facilitate domain subject learning and personal reflection. She develops technology-rich learning environments and explores how such environments influence cross-cultural collaboration and reflection. She finds that technologies make it possible for teachers and students from different cultures to collaborate in fundamentally new ways. This offers exciting opportunities for metacognitive awareness. Her most recent research explores the creation of 3D Virtual Learning Environments that permit teachers from different cultures to collaborate. She hopes that these studies will lead to design principles that can transform the obstacles of geographical and cultural distance into new opportunities for learning. Professor Lin received her PhD from Purdue University in Instructional Psychology and Educational Technology, her MA from Louisiana State University in Elementary Science Education and Information Technology, and a BA from Teachers College, HeNan University in Foreign Language Education (English) and Linguistics.

Mario Livio

Professor of Astrophysics; University of Nevada, Las Vegas

Dr. Mario Livio is an internationally known astrophysicist, a best-selling author, and a popular speaker. He is a Fellow of the American Association for the Advancement of Science. He has published more than 400 scientific papers on topics ranging from Dark Energy and cosmology to black holes and extrasolar planets. Dr. Livio is also the author of six popular science books, including *The Golden Ratio* (an International Bestseller for which he received the "Peano Prize" and the "International Pythagoras Prize") and *Is God A Mathematician?* (which was the basis for the 2016 Emmy-nominated TV NOVA program "The Great Math Mystery"). Dr. Livio's book, *Brilliant Blunders*, was a national bestseller in the U.S. and was selected by the Washington Post as one of the "Best Books of the Year." His new book, *Why? What Makes Us Curious*, appeared in the U.S. in July 2017.

David Madigan

Executive Vice President for Arts and Sciences, Dean of the Faculty of Arts and Sciences, and Professor of Statistics; Columbia University

David Madigan received a bachelor's degree in Mathematical Sciences and a PhD in Statistics, both from Trinity College Dublin. He has previously worked for AT&T Inc., Soliloquy Inc., the University of Washington, Rutgers University, and SkillSoft, Inc. He has over 100 publications in such areas as Bayesian statistics, text mining, Monte Carlo methods, pharmacovigilance and probabilistic graphical models. He is an elected Fellow of the American Statistical Association and of the Institute of Mathematical Statistics. He recently completed a term as Editor-in-Chief of Statistical Science.

Alondra Nelson

Professor of Sociology; Columbia University

Alondra Nelson is President of the Social Science Research Council and Professor of Sociology at Columbia University. A scholar of science, technology, and social inequality, she is the author most recently of *The Social Life of DNA: Race, Reparations, and Reconciliation after the Genome*. Her publications also include *Body and Soul: The Black Panther Party and the Fight against Medical Discrimination*; *Genetics and the Unsettled Past: The Collision of DNA, Race, and History*; and *Technicolor: Race, Technology, and Everyday Life*.

Peter Norvig

Director of Research; Google

Peter Norvig is a Director of Research at Google Inc. Previously, he was head of Google's core search algorithms group and of NASA Ames's Computational Sciences Division, making him NASA's senior computer scientist. He received the NASA Exceptional Achievement Award in 2001. He has taught at the University of Southern California and the University of California at Berkeley, from which he received a PhD in 1986 and the distinguished alumni award in 2006. He was co-teacher of an Artificial Intelligence class that signed up 160,000 students, helping to kick off the current round of massive open online classes. His publications include the books *Artificial Intelligence: A Modern Approach* (the leading textbook in the field); *Paradigms of AI Programming: Case Studies in Common Lisp*; *Verbmobil: A Translation System for Face-to-Face Dialog*; and *Intelligent Help Systems for UNIX*. He is also the author of the Gettysburg Powerpoint Presentation and the world's longest palindromic sentence. He is a fellow of the AAAI, ACM, California Academy of Science and American Academy of Arts & Sciences.

Katharina Pistor

Michael I. Sovern Professor of Law; Columbia Law School

Katharina Pistor is the Michael I. Sovern Professor of Law at Columbia Law School and Director of the Law School's Center on Global Legal Transformation. She obtained her law degree from

Freiburg University in 1988 and qualified for legal practice in 1992 after clerking for the Hamburg Court of Appeals. She obtained a Masters in Law from the University of London in 1989; a Masters in Public Administration from the Kennedy School of Government in 1994; and a Doctorate in Law from the University of Munich in 1998. Her research and teaching spans corporate law, corporate governance, money and finance, property rights, and comparative law and legal institutions. She has published widely including in the *Journal of Comparative Economics* and the *American Law and Economics Review*, and with Chicago and Columbia University Presses. In 2012 she was co-recipient (with Martin Hellwig) of the Max Planck Research Award on International Financial Regulation; in 2014 she received the Allen & Overy Prize for the best working paper on law of the European Corporation Governance Institute; and in 2015 she was elected member of the Berlin-Brandenburg Academy of Sciences.

Scott Sandage

Associate Professor of History; Carnegie Mellon University

Scott A. Sandage is a cultural historian who specializes in the nineteenth-century United States and in the changing aspects of American identity. He is the author of *Born Losers: A History of Failure in America* (Harvard University Press, 2005), which was awarded the 34th Annual Thomas J. Wilson Prize, for the best "first book" accepted by the press. In 2007, translations were published in Japan, Taiwan, and China. His abridgement of Alexis de Tocqueville's *Democracy in America* was published in 2006 by Harper Perennial Modern Classics. Sandage's next book, *Laughing Buffalo: A Tall Tale from the Half-Breed Rez*, focuses on mixed-blood families to show how federal Indian policy, court decisions, early anthropologists, folklore, and family traditions have shaped racial identity in the United States. Sandage earned his PhD from Rutgers University in 1995. His article, "A Marble House Divided: The Lincoln Memorial, the Civil Rights Movement, and the Politics of Memory, 1939-1963" (*Journal of American History*, June 1993), won prizes from the Organization of American Historians and from the Eugene V. Debs Foundation.

Luz Santana

Co-Director; Right Question Institute

Luz Santana is the Co-Director of the Right Question Institute (RQI) and co-author of *Partnering with Parents to Ask the Right Questions* (ASCD: 2016) and *Make Just One Change: Teach Students to Ask Their Own Questions* (Harvard Education Press: 2011). In the late 1980s, as a parent of children in the Lawrence, MA public school system, Santana began to work with other parents as part of a drop-out prevention program. At the time, she was also traveling a path that led from her own personal experiences coming from Puerto Rico and navigating the welfare and other public systems to earning an associate's degree, a bachelor's, and a master's degree from Springfield College School of Human Services. One of the founders of RQI, she is now a nationally recognized educational innovator, facilitator, and keynote speaker in English and Spanish who has designed a wide range of participatory learning curricula in many fields,

including parent involvement, adult education, social services, health care, immigrant advocacy, neighborhood organizing, and voter engagement.

Jutta Schickore

Professor of History of Science; Indiana University Bloomington

Jutta Schickore received her PhD from the University of Hamburg, Germany, in 1996. Before coming to IU, she held a Wellcome Research Fellowship at the Department of History and Philosophy of Science in Cambridge, UK as well as postdoctoral fellowships at the Dibner Institute for the History of Science and Technology at M.I.T. and the Max Planck Institute for the History of Science. She has been a member of the Institute for Advanced Study (2007-2008 and 2017-2018) and of the National Humanities Center (2011). Her research interests include philosophical and scientific debates about scientific methods in past and present, particularly debates about (non)replicability, error, and negative results; science and public engagement; historical and philosophical aspects of microscopy; and the relation between history and philosophy of science. She has been an active member of the Committee for Integrated History and Philosophy of Science ("HPS"), which seeks to promote HPS as a field of study and to strengthen the community of scholars working in HPS. Schickore has published widely on the above topics.

Michael Shadlen

Professor of Neuroscience; Investigator of the Howard Hughes Medical Research Institute and Professor of Neuroscience; Columbia University

Michael N Shadlen an Investigator of the Howard Hughes Medical Research Institute and Professor of Neuroscience at Columbia University. He is a member of the Mortimer B. Zuckerman Mind Brain Behavior Institute and the Kavli Institute of Brain Science. Dr. Shadlen obtained his undergraduate and medical degrees at Brown University, his PhD at UC Berkeley with Ralph Freeman. He trained in clinical neurology at Stanford University and in the lab as a postdoctoral fellow with William T. Newsome. He then joined the Department of Physiology & Biophysics at the University of Washington, where he remained until 2012. His research focuses primarily on the neural mechanisms that underlie decision making. He is also a neurologist and a jazz guitarist. Honors include the Alden Spencer Prize, the Golden Brain, the Lashley Award and elections to the AAAS and National Academy of Medicine.

Robert Siegler

Teresa Heinz Professor of Cognitive Psychology; Carnegie Mellon University

Robert Siegler is Teresa Heinz Professor of Cognitive Psychology. His research focuses on the development of mathematical thinking. Dr. Siegler has published more than 250 articles and chapters, written 10 books, and edited 4 others. His books have been translated into numerous languages, including Japanese, Chinese, Korean, German, Spanish, French, Greek, and Portuguese. Much of Dr. Siegler's research focuses on how theoretical understanding of

mathematical development can be applied to improving children's math learning. His studies examine how children's representations of numbers influence their ability to learn whole number arithmetic, fractions, and other topics in mathematics. Among the issues examined in this work are how representations of numbers change with age and experience, types of mathematical experiences that are especially helpful in producing improvements, the strategies that children use to solve mathematical problems, why some children are more mathematically proficient than others, and how children discover new strategies for solving math problems.

Lisa Son

Associate Professor of Psychology; Barnard College

Dr. Son, Associate Professor and Chair of the Psychology Department at Barnard College, specializes in human learning and memory, and in metacognition. Receiving a BA from the University of Pennsylvania and a PhD from Columbia University, she has received funding from the U.S. Department of Education for her work with children, and was a Visiting Member at the Institute for Advanced Study (Princeton). Recently, Dr. Son was named a Fulbright Scholar, which has allowed her to examine educational differences more broadly across cultures. Dr. Son continues to examine the complexities of learning, and devotes her time to understanding where and why people often fail to learn successfully. In her free time, she loves being a parent to Seryn and Guy.

Pamela Smith

Seth Low Professor of History and Director of the Center for Science and Society; Columbia University

Pamela H. Smith, specializes in early modern European history and the history of science. Her current research focuses on attitudes to nature in early modern Europe and the Scientific Revolution, with particular attention to craft knowledge and historical techniques. She is the author of several books, including *Making Knowledge in Early Modern Europe: Practices, Objects, and Texts, 1400-1800*; *The Body of the Artisan: Art and Experience in the Scientific Revolution*; *Merchants and Marvels: Commerce, Science and Art in Early Modern Europe*; and *The Business of Alchemy: Science and Culture in the Holy Roman Empire*.

John Spiro

Deputy Scientific Director; Simons Foundation Autism Research Initiative

John Spiro joined the Simons Foundation in 2007 and is involved in all aspects of the foundation's research initiatives in the field of autism. He earned his undergraduate degree in biology from Haverford College and his doctorate from the University of California, San Diego. His thesis was based on work in the laboratory of the late Walter Heiligenberg, and his postdoctoral work was with Richard Mooney at Duke University. His research interests were in cellular and systems neuroscience, and he focused on preparations where it was possible to forge links between cellular neurobiology and behavior.

In 2000, Spiro joined the Nature Publishing Group as an editor at *Nature Neuroscience*, a leading neuroscience journal, where he was involved in evaluating research findings across the field of neuroscience, including autism and related neurodevelopmental disorders. In 2004, he joined the prestigious general-science journal *Nature* as a senior editor on the biology team, overseeing a group of editors responsible for editorial decisions and peer review of manuscripts across all areas of neuroscience, ranging from molecular development to functional imaging and behavior.

Chris Washburne

Associate Professor of Music; Columbia University

Chris Washburne is Associate Professor of Music at Columbia University and the Founder and Director of Columbia's Louis Armstrong Jazz Performance Program. Since 2006, he has worked as an innovation and leadership consultant, tailoring jazz and improvisational programs, for the World Economic Forum, Columbia's Business School, and a number of private and public companies. Chris Washburne has published numerous articles on jazz, Latin jazz, and salsa. His newest book, *Sounding Salsa: Performing Latin Music in New York* was published in 2008 by Temple University Press. He is currently working on a book on Latin jazz which will be published by Oxford University Press 2018. As a trombonist he has performed on over 150 recordings, two Grammy winners and seven Grammy nominated. He has been hailed as "One of the best trombonists in New York..." by Peter Watrous of the *New York Times* and "one of the most important trombonists performing today" by Brad Walseth of www.jazzchicago.net. He was voted as "Rising Star of the Trombone" numerous times in the annual Downbeat Critics Poll.

Johnathan Weiner

Maxwell M. Geffen Professor of Medical and Scientific Journalism; Columbia Journalism School

Jonathan Weiner has written six books about science. *The Beak of the Finch* won the Pulitzer Prize for General Nonfiction and the Los Angeles Times Book Prize for Science. *Time, Love, Memory* won the National Book Critics Circle Award for General Nonfiction. *His Brother's Keeper* was a finalist for the Los Angeles Times Book Prize. His latest book, *Long for This World*, was a *New York Times* Notable Book of the Year.

Josh Wolfe

Co-founder of Lux Capital

Josh co-founded Lux Capital to support scientists and entrepreneurs who pursue counter-conventional solutions to the most vexing puzzles of our time in order to lead us into a brighter future. The more ambitious the project, the better—like, say, creating matter from light. Josh is a Director at Shapeways, 3Scan, Lux Research, and Kallyope and helped lead the firm's investments in Planet, Echodyne, Clarifai, and Authorea. He is a founding investor and board member with Bill Gates in Kymeta, making cutting-edge antennas for high-speed global satellite and space communications. Josh is a Westinghouse semi-finalist and published scientist. He

previously worked in investment banking at Salomon Smith Barney and in capital markets at Merrill Lynch. In 2008, Josh co-founded and funded Kurion, a contrarian bet in the unlikely business of using advanced robotics and state-of-the-art engineering and chemistry to clean up nuclear waste. It was an unmet, inevitable need with no solution in sight. The company was among the first responders to the Fukushima Daiichi disaster. In February 2016, Veolia acquired Kurion for nearly \$400 million—more than 40 times Lux’s total investment. Josh is a columnist with *Forbes* and Editor for the *Forbes/Wolfe Emerging Tech Report*.

Tim Wu

Isidor and Seville Sulzbacher Professor of Law; Columbia Law School.

Tim Wu joined the Law School in 2006 and teaches antitrust, copyright, the media industries, and communications law. He is the author of, among other works, "Network Neutrality Broadband Discrimination" (2003), *Who Controls the Internet* (2006), *The Master Switch* (2010), and *The Attention Merchants* (2016). Wu was a law clerk for Justice Stephen Breyer and Judge Richard Posner, and has also worked at the White House National Economic Council, at the Federal Trade Commission, for the New York Attorney General, and in the Silicon Valley telecommunications industry. He has written widely for the popular press and is currently a contributing opinion writer for the *New York Times*. Wu has testified before Congress on multiple occasions, has been named twice to the “Politico 50” list of those transforming American politics, and was also named one of America’s 100 most influential lawyers by the *National Law Journal*. He has twice won the Lowell Thomas Award for travel writing, and in 2017 he was named to the American Academy of Arts and Sciences.