AMERICAN ACADEMY OF ARTS & SCIENCES

WWW.AMACAD.ORG

Bulletin

SUMMER 2011
VOL. LXIV, NO. 4

Race in the Age of Obama

Gerald Early, Jeffrey B. Ferguson, Korina Jocson, and David A. Hollinger

Making America More Competitive, Innovative, and Healthy

Harvey V. Fineberg, Cherry A. Murray, and Charles M. Vest

ALSO:

Upcoming Events

Induction Weekend – Cambridge

September 30 – *Welcome Reception for New Members*

October 1 – *Induction Ceremony*

October 2 – *Symposium: American Institutions and a Civil Society*

Partial List of Speakers: **David Souter** (Supreme Court of the United States), **Maj. Gen. Gregg Martin** (United States Army War College), and **David M. Kennedy** (Stanford University)

OCTOBER

25th

Stated Meeting – Stanford

Perspectives on the Future of Nuclear Power after Fukushima

Introduction: **Scott D. Sagan** (Stanford University)

Speakers: **Wael Al Assad** (League of Arab States) and **Jayantha Dhanapala** (Pugwash Conferences on Science and World Affairs)

27th

Stated Meeting – Berkeley

Healing the Troubled American Economy

Introduction: **Robert J. Birgeneau** (University of California, Berkeley)

Speakers: **Christina Romer** (University of California, Berkeley) and **David H. Romer** (University of California, Berkeley)

NOVEMBER

9th

Stated Meeting – Cambridge

Talcott Parsons Prize Ceremony and Address by Daniel Kahneman: Two Systems in the Mind

Introduction: **Harriet Zuckerman** (The Andrew W. Mellon Foundation)

Speaker: **Daniel Kahneman** (Princeton University)

NOVEMBER

12th

Stated Meeting – Chicago
in collaboration with the Chicago Humanities Festival

WikiLeaks and the First Amendment

Introduction: **John A. Katzenellenbogen** (University of Illinois at Urbana-Champaign)

Speakers: **Geoffrey R. Stone** (University of Chicago Law School), **Richard A. Posner** (U.S. Court of Appeals for the Seventh Circuit), **Judith Miller** (formerly of *The New York Times*), and **Gabriel Schoenfeld** (Hudson Institute; Witherspoon Institute)

DECEMBER

7th

Stated Meeting – Stanford

On the Modern American Military

Introduction: **John L. Hennessy** (Stanford University)

Speakers: **David M. Kennedy** (Stanford University), **Condoleezza Rice** (Stanford University), and **William J. Perry** (Stanford University)

14th

Stated Meeting – Cambridge

Holiday Concert

Introduction: **Christoph Wolff** (Harvard University)

Performer: **Robert Levin** (Harvard University)

For updates and additions to the calendar, visit http://www.amacad.org/event.aspx.

Contents

Features

Departments

Clockwise from top left: John Williams, cover from *Game Changers for Nuclear Energy*, Margo T. Oge, John W. Rowe, Richard H. Brodhead, John Lithgow, Shafi Goldwasser

Social Science and the Alternative Energy Future

Panel discussion on Incorporating Behavior in Policy Analytic Tools: James Sweeney, Professor of Management Science and Engineering, Stanford University, Holmes Hummel, Senior Policy Advisor for Policy and International Affairs, U.S. Department of Energy, John A. "Skip" Laitner, Director of Economic and Social Analysis, American Council for an Energy-Efficient Economy, and Alan Krupnick, Director, Center for Energy Economics and Policy, and Director of Research and Senior Fellow, Resources for the Future

Global environmental and geopolitical challenges are driving efforts to increase the security and sustainability of America's energy system. As a result, there is renewed interest in accelerating the deployment of new energy technologies.

These efforts depend on the willingness and ability of institutions and individuals to adopt new practices and technologies. While much has been written about the technical benefits and costs of transforming the energy system to reduce carbon emissions, many of the social and regulatory considerations underlying these necessary changes have not been adequately addressed. The Academy's project on the Alternative Energy Future is exploring how these obstacles could be more effectively addressed using tools developed by social scientists.

On May 19–20, 2011, the Academy convened a workshop at George Washington University to discuss how social science research and expertise can speed the adoption of new energy technologies. Project Leader **Robert W. Fri** (Resources for the Future) led the two-day meeting, which included representatives from academia, industry, and government. In his remarks, Fri noted that the goal of the workshop was to "begin the conversation between the energy policy community and the social science research community." He urged both groups to identify steps to help ease the adoption of new energy technologies and to outline a future research agenda.

Steven Knapp, President of George Washington University, and Academy President **Leslie C. Berlowitz** welcomed the workshop participants. Noting that interdisciplinary study is crucial in the areas of energy production and use, Berlowitz said that "this project is trying to apply social science expertise to better understand how public attitudes, economic trends, and government regulations affect the development and adoption of clean energy."

The workshop participants included representatives from the Department of Energy, the National Science Foundation, and the National Renewable Energy Laboratory, as well as senior staff from public utility commissions, universities, industry, and nongovernmental organizations. Several panel discussions and break-out sessions focused on consumer behavior and regulation and addressed a number of key questions:

- How will the transformation of the energy system affect the decisions made by individuals and communities?
- How do state and federal regulations governing energy production and use need to change to support new technologies?
- How can individual attitudes and behaviors as well as institutional needs be integrated more effectively into policy development and economic modeling?

Steven E. Koonin, Under Secretary for Science at the U.S. Department of Energy, and **Myron Gutmann**, Assistant Director for Social, Behavioral, and Economic Sciences at the National Science Foundation, delivered keynote presentations during the workshop.

Koonin focused on the realities and challenges of the energy system, laying out the Obama administration's clean energy goals: reductions in oil imports and greenhouse gas emissions, and increases in energy efficiency and electric vehicles. Pointing out that "the

Margo T. Oge, Director of the Office of Transportation and Air Quality at the U.S. Environmental Protection Agency, spoke about Policy Durability and Adaptability.

Keynote speaker **Steven E. Koonin** (center), Under Secretary for Science at the U.S. Department of Energy, talks with **Robert W. Fri** (left), a Visiting Scholar at Resources for the Future and leader of the Academy's Alternative Energy Future project, and **Steven Knapp**, President of George Washington University.

challenges of policy and human behavior have become even more critical," he urged participants to look at how social science research can further the transition to a clean energy future. He cited specific areas that need more study, including incentives, discount rates, energy awareness, and the acceptance and adoption of new technologies.

Because 95 percent of the energy system is constructed, owned, and operated by the private sector, Koonin added that "nothing is going to happen in energy of any consequence unless the private sector is engaged."

Gutmann acknowledged the need for more research. "We don't want to know just whether people will adopt a new technology; we need to understand fundamental questions, for example, about how markets work. This is what engages the economic community and the decision community, and we are not going to advance the science unless we do that," he said.

Gutmann added: "The critical questions are fundamental questions about behavior: how are people thinking about and reacting to new energy sources? Instead of figuring out where to put the outlets for plug-in hybrid cars, we should be theorizing about where to look for the next innovation behaviorally beyond the plug-in, or how to think about optimizing commuting and residential patterns to enhance conservation. We also need to enhance how the technology community thinks about their innovations."

Members of the study committee for the Alternative Energy Future project include:

Robert W. Fri, Project Leader (Resources for the Future)
Stephen Ansolabehere (Harvard University)
Doug Arent (National Renewable Energy Laboratory)
Jan Beyea (Consulting in the Public Interest)
Stephen Brown (Resources for the Future)
Ann Carlson (University of California, Los Angeles)
Thomas Dietz (Michigan State University)
Kelly Sims Gallagher (Tufts University)
Michael Graetz (Columbia University)
William Hogan (Harvard University)
Robert B. Jackson (Duke University)
Daniel Kammen (The World Bank)
John List (University of Chicago)
Granger Morgan (Carnegie Mellon University)
Daniel Nocera (Massachusetts Institute of Technology)
Richard L. Revesz (New York University School of Law)
Maxine Savitz (retired, Honeywell, Inc.)
William H. Schlesinger (Cary Institute of Ecosystem Studies)
Adele Simmons (Chicago Metropolis 2020)
John Steinbruner (University of Maryland)
Paul Stern (National Research Council)
James Sweeney (Stanford University)
Michael Vandenbergh (Vanderbilt Law School)
David Victor (University of California, San Diego)
Leslie C. Berlowitz (American Academy of Arts and Sciences)

Paul Stern (left), Study Director for the National Research Council, with **Roger Kasperson**, Research Professor and Distinguished Scientist at Clark University. Stern was a member of the panel exploring Behavior and Decision-Making Related to Energy Efficiency.

During a session on policy, **Phil Sharp**, President of Resources for the Future and a former member of the U.S. House of Representatives, outlined three basic factors on energy markets and policy. First, he noted, "our energy markets are huge, complex, dynamic, and, like oil, natural gas, and coal, are global in nature." Second, "we are fundamentally a private capital economy and society. We do not use public investment in huge ways to control and organize our economy." Finally, we have "dispersed governmental authority." Because of these factors, he said, regulatory mandates tend to endure, as opposed to those that have budget implications, such as taxes or financial expenditures. Sharp also emphasized the need for policy evaluation.

Margo T. Oge, Director of the Office of Transportation and Air Quality at the U.S. Environmental Protection Agency, joined the discussion on policy, speaking about the challenge of transitioning to alternative fuels. She said that the United States, historically, has had very inexpensive energy prices and that "freedom of mobility is valued greatly." Petroleum "is firmly entrenched" in our way of life," she said, making the switch to alternative fuels a daunting challenge. Also, when consumers and industries make decisions about vehicle purchases, they must make decisions between higher costs and increased fuel efficiency, with uncertainty about future paybacks.

Nicholas Donofrio, Senior Fellow at the Kauffman Foundation and former Executive Vice President of Innovation and Technology for IBM, spoke at the workshop.

At another session, **Nicholas Donofrio**, Senior Fellow at the Kauffman Foundation and former Executive Vice President of Innovation and Technology at IBM, commented on the role of innovation. He remarked that innovation at IBM "was really all about creating value by understanding the problem." He said that participants should strive to understand the problem and then "apply your technology, your knowledge, your invention, your creation, and your discovery in a unique and facile way to unlock that hidden value." According to Donofrio, innovation cultures are collaborative, open, multidisciplinary, and global.

The Academy will release a report from the workshop in the coming months to provide guidance for shaping public policies to govern the large-scale application of alternative energy technologies. The report will also offer recommendations for a social science research agenda designed to fill major gaps in the understanding of the economic, legal, and social implications of proposed changes to the energy system. A double issue of *Dædalus* on the alternative energy future, edited by Robert Fri and Stephen Ansolabehere, will follow in 2012.

The Academy is grateful to the U.S. Department of Energy and the National Science Foundation for their support of this project. ■

To read more about the Academy's Alternative Energy Future project, visit http://www.amacad.org/projects/alternativeNEW.aspx.

This material is based upon work supported by the Department of Energy under Award Number DE-SC0006134 and by the National Science Foundation under Award Number SMA-1135231. This article was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Philanthropy in Public Education

Private donors contribute more than $6 billion annually to public K-12 education in the United States. But how do philanthropists know if their investments are making a difference in the classroom? And what can their efforts teach us about how to improve education more generally?

As part of its project on Philanthropy in Public Education, the Academy recently brought together foundation leaders, researchers, evaluation specialists, and education officials to explore how better collaboration and communication between the philanthropic sector and educators can improve instruction and student outcomes. Participants at the June meeting discussed model initiatives in the Chicago, Boston, and New York City public school systems, including efforts to collect data and inform practice in the schools.

"There's a huge amount of innovation in the education sector," said **Thomas J. Kane**, Professor of Education and Economics at the Harvard University Graduate School of Education. "The problem is there's no learning from the innovation." He added: "School districts are drowning in data but lack staff to analyze it."

Mary M. Brabeck, Dean of New York University's Steinhardt School of Culture, Education, and Human Development, called for "translating basic research into teachable knowledge." In education, as in medicine, the tendency of researchers to work in silos has created a "theory-practice gap," she said. "But policy-makers, superintendents, principals, teachers, and even deans of schools of education are all searching for ways to join together as public and private parties to improve learning and life chances for kids."

In his keynote address, **Anthony Miller**, U.S. Deputy Secretary of Education, spoke about how the system of K-12 education in the United States desperately needs breakthrough innovations in order to sustain national competitiveness. "How do we continue to have civic engagement, and well-rounded individuals who are informed – key to any thriving democracy – if they're not educated and literate?" he asked. Miller also questioned whether the public understands the seriousness of the challenge. "Just yesterday I attended a meeting about this issue with the new Joint Chiefs of Staff," he said. "It is a national security issue."

Groups represented at the Academy meeting included the Research Alliance for New York City Schools, Boston Plan for Excellence, Consortium on Chicago School Research, New York City Department of Education, Harvard University Graduate School of Education, Technical Education Research Center, The Boston Foundation, JPMorgan Chase, the Pioneer Institute, Lynch School of Education at Boston College, The Wallace Foundation, Nellie Mae Education Foundation, Math for America, and New York University Steinhardt School of Culture, Education, and Human Development, among others. ■

Mary M. Brabeck, Dean of NYU's Steinhardt School, called for an integrated approach between public and private parties.

Anthony Miller, U.S. Deputy Secretary of Education, stressed the need for innovations to sustain American competitiveness.

Thomas J. Kane (left), Professor of Education and Economics at the Harvard University Graduate School of Education, and **Edward Pauly**, Director of Research and Evaluation at The Wallace Foundation, spoke about the challenges and benefits of evaluation.

New Publications

The Future of Nuclear Power in a Changing World

In the aftermath of Japan's Fukushima Daiichi accident, most countries that use nuclear power are undertaking major reviews of reactor safety and emergency preparedness. But are conventional planning strategies sufficient? A new paper published by the Academy, *Game Changers for Nuclear Energy*, examines scenarios for nuclear power that take into account potential game changers such as new technology, new customers and suppliers, accidents, nuclear terrorism, and climate change policy.

Because decisions made now will affect the energy sector for decades, it is critical to assess the role of nuclear power in the overall energy mix. According to the paper's authors, "The public perception of nuclear power has changed and continues to change. Once viewed as a miracle of modern technology, nuclear power came to be perceived by many as a potential catastrophe; now it is viewed as a potential, albeit potentially still dangerous, source of green power." This evolving interaction between public perception and energy policies is just one of the potential game changers discussed in the volume.

The paper, authored by **Kate Marvel** and **Michael May**, is based in part on a workshop organized by the Academy as part of its Global Nuclear Future Initiative. The workshop was held in collaboration with the Center for International Security and Cooperation (CISAC) at Stanford. Marvel is the William J. Perry Fellow in International Security at CISAC. May is Professor Emeritus (Research) in the School of Engineering at Stanford University, where he is also a Senior Fellow with the Freeman Spogli Institute for International Studies.

Members of the Global Nuclear Future Initiative are working with policy-makers in the United States, Middle East, and Asia to advance effective policies and procedures to ensure that the spread of nuclear power does not aggravate, and in fact reduces, concerns over international safety, security, and nonproliferation. Because the Academy is not identified with a particular stance on nuclear questions, yet has a fifty-year-old tradition of work on arms control, it offers a neutral forum for discussing these issues. ■

Dædalus: The Modern American Military

Foreword by **William J. Perry** (Stanford University)

Introduction by **David M. Kennedy** (Stanford University)

"The Counterrevolution in Strategic Affairs" by **Lawrence Freedman** (King's College London)

"The U.S. Armed Forces' View of War" by **Brian McAllister Linn** (Texas A&M University)

"Weapons: The Growth and Spread of the Precision-Strike Regime" by **Thomas G. Mahnken** (U.S. Naval War College; Johns Hopkins University)

"American Military Culture from Colony to Empire" by **Robert L. Goldich** (formerly of the Congressional Research Service)

"Manning and Financing the Twenty-First-Century All-Volunteer Force" by **Lawrence J. Korb** (Center for American Progress) and **David R. Segal** (University of Maryland)

"Military Contractors and the American Way of War" by **Deborah D. Avant** (University of California, Irvine) and **Renée de Nevers** (Syracuse University)

"Filming War" by **Jay M. Winter** (Yale University)

"The Future of Conscription: Some Comparative Reflections" by **James J. Sheehan** (Stanford University)

"Whose Army?" by **Andrew J. Bacevich** (Boston University)

"The Military-Industrial Complex" by **Charles J. Dunlap, Jr.** (Duke University School of Law)

"Defending America in Mixed Company: Gender in the U.S. Armed Forces" by **Martha E. McSally** (George C. Marshall European Center for Security Studies)

"Military Law" by **Eugene R. Fidell** (Yale Law School)

"Casualties" by **Jonathan Shay** (formerly of the Boston Department of Veterans Affairs)

"Today's American military is at once increasingly prominent as an instrument of national policy and increasingly detached from and poorly understood by the civilian society in whose name it is asked to fight."

–David M. Kennedy, Guest Editor of the issue and the Donald J. McLachlan Professor of History, Emeritus, at Stanford University

For more information about Academy publications, visit http://www.amacad.org/publication.aspx.

First Meeting for Commission on the Humanities and Social Sciences

Commission members in attendance included: (seated) **Leslie C. Berlowitz**, **Amy Gutmann**, **Diane P. Wood**, **Drew Gilpin Faust**; (row 1) **Donna E. Shalala**, **Billie Tsien**, **Pauline Yu**, **Annette Gordon-Reed**, **David Brooks**, **Carl H. Pforzheimer III**; (row 2) **George Lucas**, **James Cuno**, **Kathleen Hall Jamieson**, **John W. Rowe**, **Richard H. Brodhead**, **Roger W. Ferguson, Jr.**, **Robert M. Hauser**, **Richard B. Freeman**, **Earl A. Powell III**; (row 3) **Phil Bredesen, Jr.**, **John Lithgow**, **Anthony W. Marx**, **Rev. John I. Jenkins**, **Tom Campbell**.

"The physical and natural sciences are inextricably linked with the humanities and social sciences," said **John W. Rowe**, cochair of the American Academy Commission on the Humanities and Social Sciences, kicking off the Commission's first meeting on June 10 and 11 in Chicago. "Excellence in one cannot be achieved without excellence in – and broad-based support for – the other."

Rowe, the Chairman and Chief Executive Officer of Exelon Corporation, was joined by cochair **Richard H. Brodhead**, President of Duke University, and thirty members of the distinguished, blue-ribbon commission. The Commission was formed at the request of U.S. Senators Lamar Alexander (R-Tennessee) and Mark Warner (D-Virginia) and Congressmen Tom Petri (R-Wisconsin) and David Price (D-North Carolina) to explore ways to bolster teaching, research, and scholarship in all disciplines.

Commission Cochairs **John W. Rowe** (left), Chairman and CEO of Exelon Corporation, and **Richard H. Brodhead**, President of Duke University, opened the two-day meeting.

During a wide-ranging discussion over two days, Commission members identified several themes that are likely to form the basis of their examinations for the next year.

"There is national consensus that for the nation to remain competitive, we need to strengthen our grasp of science, technology, engineering, and math," Brodhead said. "But education isn't an either/or affair. Business leaders all recognize the need for communications skills and cross-cultural understanding. Our everyday life as citizens requires a sense of history, of personal values and the social good. A strong infrastructure for the humanities and social sciences – supported through our schools, libraries, museums, and other cultural institutions – is critical to our nation's health and the quality of our personal and communal life."

Addressing concerns about the apparent decline of the American education system, and the rise of international economic competition, Commission members championed the liberal arts as a crucial element in the education of effective leaders, a flexible workforce, and a thoughtful electorate.

Panel Discussion on The Importance of the Humanities and Social Sciences for American Competitiveness: **Roger W. Ferguson, Jr.**, President and CEO of TIAA-CREF, **Louise H. Bryson**, Chair Emerita of the J. Paul Getty Trust, and **James McNerney**, Chairman, President, and CEO of The Boeing Company

David Brooks, a columnist for *The New York Times*, **Amy Gutmann**, President of the University of Pennsylvania, and Commission Cochair **John W. Rowe** visited during a break.

"Leadership is about the social and interpersonal skills that these disciplines teach," said **James McNerney**, Chairman, President, and Chief Executive Officer of The Boeing Company. "The breadth of the education experience is a primary source of leadership."

Drew Gilpin Faust, President of Harvard University, placed particular emphasis on the importance of historical knowledge in a time of rapid technological change: "We ask students to help create change by becoming innovators. How do you understand how to bring about change and manage change if you have no notion of a world that was different from the one in which you are living?"

Commission members also discussed the role of the humanities and social sciences in the promotion of effective citizenship.

Danielle S. Allen, Professor of Political Science at the Institute for Advanced Study, focused on jury duty as an example of how the humanities and social sciences play a daily role in civic life. "To be a good juror you have to track narratives, you have to track argument, you have to be able to weigh evidence, and you have to be able to judge legal and moral categories," Allen said. "These are the skills of the humanities and social sciences."

"This Commission has an opportunity to engage all sectors of our society in a conversation about the importance of these disciplines, and how to support them in challenging economic times," said Academy President **Leslie C. Berlowitz**. "We cannot compete in a global economy without a strong knowledge of foreign languages and cultures, or the development of basic writing skills in our elementary school students, or a working knowledge of our own history and institutions."

Over the next two years, the Commission will formulate recommendations for how government officials, educators, business leaders, and philanthropists can strengthen the humanities and social sciences. A primary goal of the Commission, Rowe said, will be "to find new ways to state our case and identify new advocates to help us make it."

George Lucas, film producer, screenwriter, director, and member of the Commission, will be one such advocate. "The sciences teach us how. The humanities teach us why," Lucas said. "You can't continue to do the how without the why. If we ignore history, philosophy, and all of the other attempts to deal with the why, the how can become very dangerous." ■

To learn more about the Commission, visit http://www.humanitiescommission.org/.

Members of the American Academy Commission on the Humanities and Social Sciences

Richard H. Brodhead, President, Duke University, *Cochair*

John W. Rowe, Chairman and Chief Executive Officer, Exelon Corporation, *Cochair*

Leslie C. Berlowitz, President, American Academy of Arts and Sciences

Danielle S. Allen, Professor of Political Science, Institute for Advanced Study

Kwame Anthony Appiah, Professor of Philosophy, Princeton University

Norman R. Augustine, Chairman and Chief Executive Officer (Retired), Lockheed Martin Corporation

Robert M. Berdahl, former President, Association of American Universities

Robert J. Birgeneau, Chancellor, University of California, Berkeley

Phil Bredesen, Jr., former Governor of Tennessee

David Brooks, Columnist, *The New York Times*

Louise H. Bryson, Chair Emerita, J. Paul Getty Trust

Ken Burns, Director and Producer, Florentine Films

Tom Campbell, Dean, Chapman University School of Law; former Representative from California

G. Wayne Clough, Secretary, Smithsonian Institution

James Cuno, Director and President, Art Institute of Chicago; President-Designate, J. Paul Getty Trust

Gerald Early, Professor of Modern Letters; Director, Center for the Humanities, Washington University in St. Louis

John Engler, President, Business Roundtable; former Governor of Michigan

Drew Gilpin Faust, President, Harvard University

Roger W. Ferguson, Jr., President and Chief Executive Officer, TIAA-CREF

Richard B. Freeman, Professor of Economics, Harvard University

Dana Gioia, Professor of Poetry and Public Culture, University of Southern California; former Chairman, National Endowment for the Arts

Annette Gordon-Reed, Professor of Law, Professor of History, and Professor at the Radcliffe Institute for Advanced Study, Harvard University

Anthony Grafton, Professor of History, Princeton University

Amy Gutmann, President, University of Pennsylvania

Emmylou Harris, Musician/Songwriter

Robert M. Hauser, Professor of Sociology; Director, Center for Demography of Health and Aging, University of Wisconsin-Madison

F. Warren Hellman, Cofounder, Hellman & Friedman LLC

John L. Hennessy, President, Stanford University

Kathleen Hall Jamieson, Professor of Communications; Director, Annenberg Public Policy Center, University of Pennsylvania

Rev. John I. Jenkins, President, University of Notre Dame

John Lithgow, Actor

George Lucas, Producer, Screenwriter, Director, Founder, and Chairman, Lucasfilm, Ltd.

Yo-Yo Ma, Musician

Carolyn "Biddy" Martin, Chancellor, University of Wisconsin-Madison; President-Designate, Amherst College

Anthony W. Marx, President, Amherst College; President-Designate, New York Public Library

James McNerney, Chairman, President, and Chief Executive Officer, The Boeing Company

Carl H. Pforzheimer III, Managing Partner, Carl H. Pforzheimer and Co.

Earl A. Powell III, Director, National Gallery of Art

Hunter R. Rawlings III, President, Association of American Universities

John Sexton, President, New York University

Donna E. Shalala, President, University of Miami

David J. Skorton, President, Cornell University

David Souter, former Associate Justice, Supreme Court of the United States

Eric Sundquist, Professor of English, Johns Hopkins University

Billie Tsien, Architect, Tod Williams Billie Tsien Architects

Charles M. Vest, President, National Academy of Engineering

John E. Warnock, Chairman of the Board, Adobe Systems, Inc.

Diane P. Wood, Circuit Judge, United States Court of Appeals for the Seventh Circuit

Pauline Yu, President, American Council of Learned Societies

Reflections

by John Lithgow

These remarks are excerpted from the first meeting of the American Academy's Commission on the Humanities and Social Sciences, held in Chicago on June 10–11, 2011. To read more about that meeting, see page 7 in this issue.

Earlier this week I received a briefing book in the mail from the American Academy of Arts and Sciences. You have seen this book. It was the same one that was sent to each of you – hefty, intimidating, and grimly bound in black. If I needed any further evidence of the high seriousness of our charge, this was it. Inserted among its weighty essays and articles was a schedule for our two-day meeting. Halfway through this schedule was tonight's agenda item: "Dinner: Reflections. John Lithgow." I swallowed hard. *Reflections? John Lithgow?!*

Ladies and Gentlemen, you are the most distinguished group of American thinkers, scholars, writers, and leaders I have ever addressed. Among you sit the presidents of great universities, the directors of great museums, wise policy-makers, sage judges, and professors whose heads are so crammed with great thoughts that you can barely stand upright. I am a shambling actor! I parrot other people's words for a living! Mine is the only name on the Commission's roster that dilutes and compromises its lofty mission. In your midst, I tremble like a serf invited into the manor house on Christmas Eve. The Reflections of John Lithgow? My reflections carry about as much weight in your company as a mayfly buzzing at the window of one of your meeting rooms.

But maybe not. Of the forty-five men and women on this Commission, four of us are from the world of the creative arts: a filmmaker, a singer-songwriter, the aforesaid shambling actor, and arguably the greatest cello player in the world. Throw in the poet Dana Gioia and Ken Burns, who has elevated the historical documentary to the level of a fine art, and you have six. There must be a reason for inviting us artists to the party, beyond making droll after-dinner remarks and signing the odd autograph for your grandkids back home. All of us in this renegade "gang of six" deal in the currency of human emotion, of the ineffable, the irrational, the poetic. Perhaps we are here to add a measure of recklessness to the proceedings, to lubricate the machinery of communication, to counterbalance the intellectual and the political with the emotional and the visceral. On reflection, maybe we are here for . . . well, for our reflections.

Permit me then to embrace the role I have been assigned. Let me put one thought into play, which has its roots in the artistic process. Over the course of this weekend's meetings (and indeed over the next several months of our deliberations), I suggest that from time to time you think like an actor. This involves making an imaginative and empathetic leap. It means playing a role. It requires you to put yourself into the character and inside the mind of another human being. This is less difficult than you may think, because the character I am asking each of you to inhabit is actually you yourself, when you were a young boy or a young girl.

Our mission is to make sure that the largest number of young people, today and in the future, have the opportunity and the encouragement to fulfill their most ambitious dreams.

And why do I suggest such a thing? We have been asked to examine the state of the humanities and the social sciences in our country at this historical moment, to evaluate their importance, and to make recommendations for the future. Of primary importance are the American system of education and the educational well-being of our vast student population at every age level – in primary and sec-

ondary schools, as undergraduates, graduate students, and young post-grads hurled into adulthood. All of the members of our Commission are products of American education, although our last formal schooling ended many years ago, in a very different era. American education has served this group extremely well. Let's face it, we're all pretty special. Each of us is a stunning success story. If we weren't, we wouldn't be here. This is not boastfulness. It's a fact. And we're all entitled to a healthy measure of self-congratulation.

Another fact, of course, is a little more sobering: only a tiny percentage of the current student population of America will end up as well educated, as successful, or as lucky as we have been. Although things were not necessarily easy for us when we were growing up, for most students today they are much harder. But this should only strengthen our resolve. Our mission is to make sure that the largest number of young people, today and in the future, have the opportunity and the encouragement to fulfill their most ambitious dreams. As we examine current realities in American education, analyze its problems, and advocate for solutions, our own individual histories are perhaps our most useful points of reference. Ask yourself the question, "What was it in my educational background that set me on the path that, all these years later, has put me in the company of the remarkable people in this room?" And beyond that, "What can be done to provide the same degree of stimulation, excitement, and achievement for young people today?"

And here is where I urge you to think like an actor. Indulge in that hoary old Actors' Studio exercise called "sense memory." Keep asking questions of yourself. What were the eureka moments of discovery, creativity, and joy that created in you the habit of learning? What single event made you choose your life's work? How old were you when that event took place? What teacher first truly inspired you? What sentence did he or she speak that has stayed with you ever since? Don't be shy about sharing these sense memories with each other, even when you are discussing the thorniest, most complex issues before us. And then make one more imaginative leap. Try to see in your young self the state of mind of today's schoolchildren.

I'll start you off with a sense memory of my own. It's a story more about the arts than the humanities, but I consider it apropos. When I was a kid I had no notion of being an actor. I wanted to be an artist.

Art class would launch me into the rest of my day with a heady creative rush. The expressive energy of those art classes served as a kind of booster rocket to my entire educational career.

In a checkered childhood, I happened to spend my ninth and tenth grade years in Akron, Ohio, public schools. Typical of public schools in those days, art classes were a staple of every school curriculum. Their presence in the school day was completely taken for granted. But there was nothing typical about my art classes in Akron. They were fantastic. For two years, I was given the extraordinary luxury of starting every single school day with two elective periods of art. And such wonderful classes! I did drawings in charcoal and ink, paintings with watercolors and acrylics, woodcuts, linoleum prints, silk screens, ceramics and mosaics. Every morning I would eagerly anticipate those early hours of school. Without fail, art class would launch me into the rest of my day with a heady creative rush. As a result, school had an exhilarating magnetic pull for me. Those classes made me into an eager student for the remainder of every school day. An eager student and a happy one. True, I never became an artist. But the expressive energy of those art classes served as a kind of booster rocket to my entire educational career. When I consider my good fortune in those years, my heart goes out to the kids in so many of today's public schools who must soldier on without the benefit of classes in art, music, theater, dance, or even manual arts. To me their young lives sound like academic drudgery, in the joyless iron grip of test prep.

Ah, yes, test prep. It's not hard for you to perceive where my prejudices lie. But they are deeply rooted in my own experience and they will deeply color any opinion I may express in our upcoming conversations. I urge you to bring your experiences to bear, too, during our time together. Share your story. Speak your mind, but speak from your heart as well, and from your gut. Let's make these proceedings into a creative, passionate, fun moment for all of us, in an effort to bring those same passions into the lives of this nation's children. ■

John Lithgow, an actor, author, and recording artist, was elected a Fellow of the American Academy in 2010.

RACE in the Age of Obama

Does race still matter? If so, what is different about race today? These questions animated the discussion at the Academy's 1968th Stated Meeting, held at Washington University in St. Louis on February 25, 2011. **Gary Wihl**, Dean of the Faculty of Arts and Sciences and the Hortense & Tobias Lewin Distinguished Professor in the Humanities in Arts & Sciences at Washington University in St. Louis, joined Academy President **Leslie C. Berlowitz** in welcoming four scholars to consider *Race in the Age of Obama*.

Academy Fellow **Gerald Early** (Washington University in St. Louis) stressed how "understanding race depends on understanding the past." **Jeffrey B. Ferguson** (Amherst College) looked to his own past – an upbringing "bathed in the rhetoric of the civil rights movement" – before cautioning against narratives that cast racial history in simple terms of progress. **Korina Jocson** (Washington University in St. Louis) also focused on youth, exploring how young people are shaping the "new race era," particularly through poetry they write and perform. Academy Fellow **David A. Hollinger** (University of California, Berkeley) emphasized the need to ask new, better questions of race: "the not-so-easily answered questions [that] are often generated by the contingencies of history."

The meeting followed the January publication of "Race in the Age of Obama," the Winter 2011 issue of *Dædalus* guest edited by Gerald Early. That issue was the first of two volumes revisiting the main themes of the Academy's mid-1960s project on "The Negro American." The second volume, "Race, Inequality & Culture," guest edited by **Lawrence D. Bobo** (Harvard University), was published in April 2011.

More than a hundred Fellows and guests gathered to hear the presentations at the February meeting. What follows is an edited transcript.

Image courtesy of Julie Conway, Washington University in St. Louis.

Gerald Early

Gerald Early is Merle Kling Professor of Modern Letters and Director of the Center for the Humanities at Washington University in St. Louis. A Fellow of the American Academy since 1997, he serves as Cochair of the Academy's Council.

Guest editing the issue of *Dædalus* on "Race in the Age of Obama" was something I undertook with considerable seriousness of purpose. I felt the burden of history. This feeling is inevitable with the subject of race, which is not just a political concept but also a complex historical construction. That is, what race is depends a great deal on what it was. This is unavoidable because race is deeply rooted in the idea of progress. No progress can occur without a past against which to measure it. Are things getting better or worse compared to how they were at an earlier time? With race we are constantly swimming against the currents of the past.

I began by familiarizing myself with the two influential volumes of *Dædalus* on "The Negro American" produced in Fall 1965 and Winter 1966. How might these volumes inform an examination of race today? What did the leading social scientists that were assembled to write for those *Dædalus* volumes think we were living through? What did people think Negroes were at that time?

It is not surprising that Lee Rainwater, a sociologist at Washington University, and Erik Erikson, the famed Harvard psychologist, wrote essays on Negro identity in the 1966 *Dædalus* volume. What is surprising is that the volume did not include more such essays. Negro identity was a highly salient topic at the time and was to become only more so. Even more surprising, no black scholar or intellectual was asked to write about identity.

Race as a concept of identity is composed of a series of categories, each deriving its meaning from how it is contingent upon and comparable to the other. For instance, white has meaning only as it relates to black or to anything else that is not white. White has no real meaning in and of itself. As Erik Erikson wrote in his *Dædalus* essay, "[F]or man meets man always in categories, be they adult and child, man and woman, employer and employee, leader and follower, majority and minority." In this one respect little progress has been made in race relations over the last one hundred years. For all the talk of multiculturalism and diversity, they are simply another way of talking about people as categories. If ending prejudice and bigotry means destroying the idea of seeing and understanding human reality as a set of categories, we still have a long way to go. But perhaps categories are a prison from which human beings will never escape, and all we can hope to do is to be more humane in how we create our categories.

In any case, one thing I knew clearly when asking my contributors to write for *Dædalus* was that the United States had elected a black man as president and that his first term would coincide with the sesquicentennial of the American Civil War. The juxtaposition is striking.

The *Dædalus* volumes of the 1960s appeared at an equally incredible moment in the history of American race relations, a time just as remarkable as the election of Barack Obama as president of the United States in 2008. The actual planning and writing of those volumes took place during the centennial of the American Civil War. On July 2, 1964, President Lyndon Johnson signed the Civil Rights Act of 1964 into law. Despite compromises, this was the most serious and far-reaching piece of civil rights legislation since the days immediately following the Civil War.

The civil rights movement seemed to have gotten what it had wanted, what it had fought for over the last decade or more: a bill that completely shattered legalized racism and segregation in the United States. Two weeks later, on July 16, an off-duty white police officer shot and killed a fifteen-year-old unarmed black boy in New York City. For the next several days in New York the story about three missing civil rights workers in Mississippi was completely forgotten as several boroughs erupted in racial violence against the police. From August 28 to August 30, 1964, a similar race riot took place in Philadelphia. Things in northern ghettoes would get a lot worse before they got any better – if indeed one can say that fifty years later anything in ghettoes has gotten better.

What race is depends a great deal on what it was. Are things getting better or worse compared to how they were at an earlier time?

On August 6, 1965, President Johnson signed the Voting Rights Act into law. Martin Luther King, Jr., and Rosa Parks were among those who witnessed the event in the Oval Office. This was the final jewel in the crown of the civil rights movement. If the dramatic 1963 campaign in Birmingham and the subsequent March on Washington played a role in the passage of the 1964 Civil Rights Act, then the agony of the Selma cam-

paign played a role in the passage of the Voting Rights Act.

These two pieces of legislation were coupled with President Johnson's speech at Howard University on June 4, 1965, in which he spoke of "the next and more profound stage of the battle for civil rights. We seek not just freedom but opportunity. We seek not just legal equity but human ability, not just equality as a right and a theory but equality as a fact and as a result."

Nothing seemed clearer in President Johnson's speech than that this was the moment when affirmative action began. On August 11, 1965, just five days after the signing of the Voting Rights Act, racial tensions erupted into violence in Watts. This was not a race riot; it was a small race war. Over six days, thirty-four people were killed, and more than one thousand were injured. The Watts riot was among the worst race riots in American history.

When Johnson heard about the riot, he said despairingly about blacks, "I am giving them boom times and more good legislation than anyone else did and what do they do? Attack and sneer. Could FDR do better? Could anybody do better? What do they want?" What was clear in the mid-1960s was that race relations in the United States, the struggle between blacks and whites, was not just over immediate and concrete issues such as jobs, housing, health care, and schools but over the meaning of more abstract ideas like justice, freedom, equality, fairness, and reparations, and this struggle pitted decidedly different views of reality against each other, views that have become both central to our nation's self-understanding and utterly intractable. This moment was both the best of times for whites and blacks and the worst of times, and it was at this moment that the American Academy of Arts and Sciences held conferences that resulted in the seminal issues of *Dædalus* in 1965 and 1966 on "The Negro American."

The American Academy had long had an interest in participating in public policy debates. In the 1960s, as a result of the civil rights movement, the status of the Negro American was one of the hottest public policy debates in the nation. With support from the Carnegie Foundation, the Academy, having determined that the public policy debate about race and black Americans was worth engaging, held a planning meeting in April 1964, just a few months before the passage of the Civil Rights Act.

Among those present at that meeting and also at the conference held in May 1965 just before the passage of the Voting Rights Act was Daniel Patrick Moynihan, then the Assistant Secretary of Labor. Moynihan, who had come on board in the Labor Department under President Kennedy, had already made a name for himself in policy circles by writing about automobile safety (Moynihan also hired Ralph Nader to work for the government) and by modifying qualifications for the armed forces so that more men from the lower socioeconomic strata of society, who previously could not pass the entrance exam to get into the military, could now enlist. By 1964 he had become interested in the civil rights movement, which impressed him greatly.

From December 1964 to March 1965 Moynihan and his staff drafted a report entitled "The Negro Family, a Case for National Action," which became one of the most famous – or infamous, depending on your point of view – sociological treatises on race in the twentieth century. Moynihan relied greatly on the work of black sociologists like W.E.B. Du Bois, E. Franklin Frazier, and Kenneth Clark because at the time the Negro family was understudied by whites. He also relied on a flotilla of government statistics.

Influenced by his Irish Catholic background and by the fact that his own father had deserted his mother when Moynihan was ten years old, Moynihan wrote a ringing endorsement of traditional family life and an almost panic-stricken document of the disintegration of the black family and its "tangle of pathologies." These "pathologies" included out-of-wedlock children, low marriage rates, low regard for education, and a high number of unemployed, emasculated men who mostly made babies and mischief.

For all the talk of multiculturalism and diversity, they are simply another way of talking about people as categories. If ending prejudice and bigotry means destroying the idea of seeing and understanding human reality as a set of categories, we still have a long way to go.

All these observations about the negative impact of urbanization on blacks had been made before by black sociologists as far back as W.E.B. Du Bois in *The Philadelphia Negro*, which was published in 1899. The essay Moynihan wrote for *Dædalus* was far more muted than his report. However, at the *Dædalus* conference on the Negro American in May 1965, he was the lightning rod. Few people outside the government had read his report at that time. Moynihan presented a bleak description of the problems of the black family, but he offered no solutions. He felt that government policy-makers were too fixated on so-called solutions or poorly-thought-out government programs, so he purposely did not offer any.

Moynihan had once said, "[T]he role of social science lies not in the formation of social

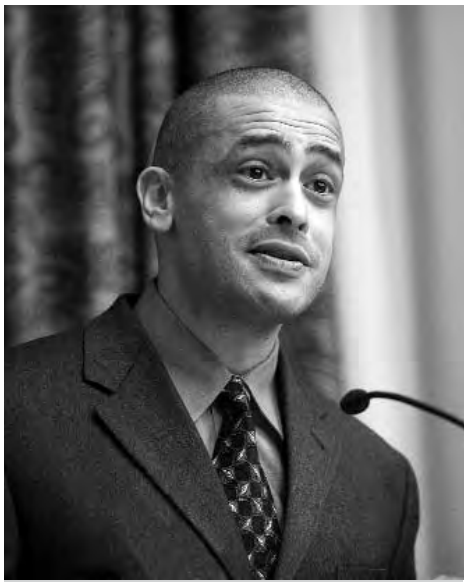
policy but in the measurement of its results." But Moynihan itched to create public policy for the Negro family. He contributed to President Johnson's Howard University speech. He endorsed something much like affirmative action. After the report was leaked publicly, however, and blacks in the civil rights movement reacted so negatively to it, saying Moynihan was blaming the victim, his voice was essentially thwarted. He left the Labor Department before the end of 1965.

In addition to the Moynihan thread, one other interesting aspect of the *Dædalus* race volumes of the 1960s is how few blacks wrote for them. No blacks attended the planning meeting in April 1964, and black authors contributed only five essays to the two volumes, their voices joined by Ralph Ellison and J. Saunders Redding, who were among the attendees at the May 1965 conference and whose words are recorded in the conference transcript published in the second *Dædalus* volume.

In the 1960s race was still seen as a social science issue by the consent of both blacks and whites who studied race academically. Oddly, the two most prominent black voices about race at that time were not social scientists at all but creative writers, James Baldwin and Ralph Ellison, both of whom were at best skeptical and at worst hostile to social science and its view of blacks as a maladjustment to be corrected rather than a way of life to be understood. Ellison wrote sharply about Gunnar Myrdal's classic study of race, *An American Dilemma*: "But can a people (its faith in an idealized American creed notwithstanding) . . . live and develop over three hundred years simply by *reacting*? Are American Negroes simply the creation of white men, or have they at least helped to create themselves out of what they found around them?" Baldwin wrote, "In overlooking, denying, evading [the Negro's] complexity – which is nothing more than the disquieting complexity of ourselves – we are diminished and we perish."

But with the election of Obama we face a fundamentally different question than Americans did in 1965. For many the question now is, does race still matter? If it does, it cannot matter in the same way it did in 1965 when the thought of a black president would have seemed a fantasy. So what is different about race now?

I had several objectives with my volume of *Dædalus*: One, to offer a broad and diverse set of humanist responses, from both creative writers and historians, to the question of race today in order to present the humanistic and cultural thinking about race that has become central to any discussion of the subject and to show that the questions of identity and the political meaning of identity are, for better or worse, more salient now than ever. Two, to provide in my own essay an objective account of Obama's historical moment to define clearly the occasion for the volume and to historicize it so that readers might open the pages fifty years from now and find a time capsule in which they can see how we understood our own time. Third, to revisit historian John Hope Franklin's essay in the original *Dædalus* race volume of 1965 to underscore the importance of how understanding race depends on understanding the past. Finally, to refocus in my essay the discussion of Moynihan away from his sociological arguments to where I think the focus should rightly be: on his own struggle with the challenges to liberalism and the welfare state posed by the race problem, which made blacks different from other American ethnic groups.



Jeffrey B. Ferguson

Jeffrey B. Ferguson is Andrew W. Mellon Professor of Black Studies and American Studies at Amherst College.

I generally dislike the easy dishonesty of autobiographical presentations, especially by scholars, so it is with apologies that I offer one in this case. Academic life rarely affords me the opportunity to reflect out loud on why I wrote something or what it might mean.

Although reincarnated as a black American and later as an African American, I was born a Negro American one year before the publication of the landmark 1965 *Dædalus* volume on "The Negro American," and every year of my conscious life I have been endeavoring, both intellectually and emotionally, to disentangle the puzzle of our peculiar American tendency to return continually and despite our best wishes to what we most disavow: privilege based on heredity and human possibility circumscribed by descent.

Thus, the subject of the new *Dædalus* volume on "Race in the Age of Obama" – a volume that seeks to take stock of what has occurred in the nearly half-century between the end of legal segregation and our more subtly segregated though notably more integrated present – is in some ways about my life. Admittedly, one might not reach this conclusion upon reading my essay. There I

take on our racial moment at a distance, more as a matter of intellectual definition than as a conundrum at once lived and thought. Yet now, with the context of my essay as my focus, I will take up the same questions in a more personal fashion by returning to W.E.B. Du Bois's reverberative question in *The Souls of Black Folk*, "What does it feel like to be a problem?" – only inflected along the lines of a similar question asked by Harlem hustlers of a young James Baldwin, "Whose little boy are you?"

I was born in the midst of a tumultuous period of racial change, but being young in this era meant not even half understanding it. Nevertheless, I felt even as a black child living in the projects in Chattanooga, Tennessee, that the events going on around me conferred an enchanted, if somewhat embattled, sense of membership in a privileged group at the forefront of change in a great, if not the greatest, nation. I was born bathed in the rhetoric of the civil rights movement.

With so many heroes, so many mythical events of recent vintage, who needed fairy tales? From my limited but privileged angle, my people were cool and smart and strong and stylish and somehow transcendently right in a wonderful way. As they used to say when all of this mattered, right on! I would always smile when my aunt called me her little black boy. Deeply rooted in Southern black traditions, Aunt Kat figured that my survival depended on thinking of myself this way. She didn't want her little light-skinned boy to get any bright ideas about being anything else. But with apologies to Richard Wright, who wrote *Black Boy*, to me the term meant that I somehow fit in with all the rightness and coolness around me, and that made Aunt Kat's nurturing love seem even more delicious.

In an effort to develop my mind, my father liked to play memory games with me. He would state a term, and I would have to name an appropriate match. The pairs were almost always intended to confer pride and to teach a bit of history. If he said Joe Louis, I would have to name a great boxer, preferably Ali, whom my dad liked for being both oppositional and pretty. If he said King, I always said Malcolm (and vice versa), though at my young age I registered only the sense of triumph, not the profound sense of loss invoked by this pairing.

When the wave of riots that marked the late 1960s and early 1970s came to Chattanooga and the National Guard with them, I had no idea that everyone was still reeling from the loss of King – though I had osmotically imbibed many of the black power slogans that marked the moment. My first real memory comes from this riot. As a police helicopter made slow progress overhead, I ran down a hill with my fist in the air, screaming, "Power to the people! Power to the people!"

My subsequent education has bled this demand with a thousand pinpricks disguised as questions and qualifications; it has transformed my childish ultimatum into a series of questions and at times even reduced it to an embarrassment or a joke. Whose power? What people? Still I return to it because, as with most American dreams, something vital remains in the sheer impossibility of a childish wish made in the first conscious encounter with something large and real and virtually impossible to solve.

I see in my helicopter image both a metaphor for personal advancement and a figure for the pursuit of an ever-more-distant yet palpable source of oppression. That, in a nutshell, is how it has felt to live as a maturing and now mature black person in the post–civil rights era. Even as I developed into an affirmative action baby headed for the Ivy League and benefited from a certain mainstreaming of the views of the civil rights movement, I witnessed the crumbling of its late phases from both internal dissension and external attack. As my own fortunes improved, the ghetto deepened its grip on those who remained, including many of my own relatives.

Yet by the time I entered college much had already changed in the country. Diversity and multiculturalism had become catchwords, and concentrations of black students at Harvard had grown large enough for the administration to worry about such relatively new phenomena as voluntary segregation at dinner tables and an almost constant morality play of injured racial feelings in need of repair.

Even as I benefited from a mainstreaming of the views of the civil rights movement, I witnessed the crumbling of its late phases from both internal dissension and external attack.

Imagine that, I thought. Even in the midst of the most integrated scene imaginable and in the most comfortable place that I had ever experienced in my life, racial feelings ran high on every side of the color line; it appeared that nothing could suppress them. People even seemed attracted to them at some level as if they stood at the center of some grand antagonistic ritual of incorporation and justification through the constant redrawing of boundaries. What seemed true of race on campus also seemed to hold for the broader racial controversies. I wouldn't have put it this way at the time though. I wasn't a professor then.

I hope my brief autobiographical sketch serves somewhat to indicate the kind of post–civil rights life that might lead to viewing race, and by extension America, in somewhat unprogressive terms, as I do in my

essay, which argues that the principal pillars of the American progressive viewpoint, the belief in universal freedom and equality, are logically and historically linked to our history of racial exclusion and violence. Despite the varied railings of academics against ideas of American exceptionalism and, more broadly, against ideologies of modernism, most Americans continue to believe that this nation is categorically good in a special sense, that it progresses in a self-perfecting way toward ever-greater days to come, that those who work hard and maintain solid values of moral self-examination and delayed gratification have every opportunity to prosper, and that prosperity itself may be taken as a sign both of individual merit and of the larger positive direction of the nation. I could go on, explaining the features of this viewpoint, which has become more powerfully held during the post-1970s era of conservative ascendancy – notwithstanding our multicultural, regional, and ideological factioning – but I think that we all know its main features. We are steeped in it.

I take the story of black and white in this nation as the best evidence against this progressive viewpoint despite the fact that our racial history is most often told as a progressive from-to story (as John Hope Franklin put it in his justly famous text, *From Slavery to Freedom*). As one of my teachers, Sacvan Bercovitch, has trenchantly pointed out across several books (most recently in *The Rites of Assent*), the most amazing aspect of our national ideology may be its absorptive capability, which occurs through the encouragement of vigorous but somewhat narrow rituals of dissent. This absorptive capability, which covers up thousands of sins and often defers the will to reform, circumscribes dissent in part by making America the only real topic of conversation. Those who object to the state of the nation, whether they be multiculturalists, Marxists, or what have you, tend to express their disagreement in terms of the nation's transcendent mission – even when they think they are going against that mission.

Most dissenters align themselves with the myth of America even as they hurl their jeremiads against their opponents. The black American political tradition has a long history of standing on American ideals while denouncing America for not standing up to its promise. For example, Martin Luther King managed through this kind of rhetoric finally to close the deal on making racism un-American. Yet he did not succeed in his late-career attempt to have imperialism or poverty recognized in the same terms. In a sense, this represents "the chickens coming home to roost" for him because his rhetoric of dissent and universal brotherhood unwittingly empowered the other side by reinforcing the sense of American exceptionalism that engenders our tolerance for poverty at home and fuels our sometimes callous disregard for rights and interests of less powerful nations abroad.

For many people Obama plays a symbolic role similar to that of King. Obama succeeds as a figure in part by representing the absorption of racial dissent by the American myth. Suspected by many as a Manchurian candidate or as "not one of us," he nonetheless projects the deepest faith in national unity and the continuing power of our mission as a nation. For all that is good, indeed wonderful, about Obama as a figure in our national life, his faith works in many ways against the achievement of racial justice. Such are the ironies of our most peculiar racial moment, which returns to the past all the more powerfully for the sometimes remarkable effort that it has put into overturning it.

Korina Jocson

Korina Jocson is Assistant Professor of Education at Washington University in St. Louis.

Two questions guided my thinking as I wrote "Poetry in a New Race Era," my contribution to the *Dædalus* volume on "Race in the Age of Obama": What is shaping youth culture? How are youth shaping culture in this new race era? The *new* in my title suggests a continuum, a blending, the forging of the old and the new; it does not supersede or replace the old. Instead it marks a shift, something emerging in this era of hope and possibility.

Although I consider intersections of race, ethnicity, class, gender, language, and other markers of difference in my work, I am far from a race theorist, and I do not consider myself a race scholar. My work is set primarily in literacy studies and education, and so for at least the past decade I have been most interested in how young people use and often leverage different types of literacies to navigate their social worlds and make sense of their lives, both in school and out of school.

I had the good fortune of working closely with June Jordan's Poetry for the People program during my graduate studies at Berkeley. Even before that time, in my experience as a high school teacher in Los Angeles, I had

noticed a resurgence or reemergence of poetry and the spoken word – in particular, youth's affinity for writing, performing, and sharing poetry in various spaces. These experiences helped formalize my thinking and propelled me to examine them further in the field of education.

In late 2008, on the eve of President Obama taking office, the subject of my essay came to me. I was in Washington, D.C., for a meeting and was talking with social and educational theorist Zeus Leonardo, who was writing about the idea of post-race thought. He asked, "How do we think more deeply about race or the future of race?" In this context I couldn't help but think about youth culture, poetry, and a new race era.

In my essay I begin with Brave New Voices, an amazing weeklong festival held every summer and culminating in the International Youth Poetry Slam. Brave New Voices (BNV) is spearheaded by leading literary arts organizations Youth Speaks and Urban Word NYC to create opportunities for youth ages thirteen to nineteen to write about matters of importance in their lives and, equally important, to voice them in ways that reach large audiences in both physical and online environments.

Youth in various parts of the United States and abroad are telling us something through their words and through their actions. Today this is done not only on paper and on the stage but also online and through audio and video offerings of their work. What do their words and actions suggest to us as we try to find ways to support young people in this age of Obama and beyond?

First, though, what are young people writing about today? Their themes include love, discovery, experimentation. They also write about invisibility, surveillance, harassment, pain, and loss shaped by racialized and gendered experiences in school and in society.

Second, how and why does poetry matter? Poets and writers long ago established the power of poetry as a medium of expression. There is nothing revolutionary per se about the cultural phenomenon I am describing. Obama did not change this potential power or the approach to poetry or even the writing process, but with his iconic campaign and historic electoral win he brought about a shift that has influenced the way young people take up issues in their writing. This shift brings to the fore the need to confront what still lies beneath the skin, the need to face race and other markers of difference head on, the need to elevate ourselves and to turn discourse into action. In this new race era the challenge is just that, how do we confront race without turning to color blindness?

My *Dædalus* essay features several student poems. In one, Carolyn writes, "I'm not the black you know, I'm the black you will know so I ask once more can you see me?" How do we charge ahead with newer tools for mediating and sharing experiences in a way similar to that of BNV poet B. Yung, who wrote, "Every time I write a slave poem my paper bleeds . . . society never wanted me to make it so I guess the gravity ain't the only thing that's been holding me down lately." These days poets not only write on the page; some also perform on stage, and others use new media tools. Many video poems, including ones by BNV poets, are on YouTube.

Young people are finding more and more ways to create and distribute works capturing their varied experiences, and this has implications for practice and for policy. It is essential to take into account such literacies in order to support youth's literacy development both in and out of school. As youth continue to demonstrate in their work, some more explicitly than others, the danger in this era is a system that rewards a few and punishes many. Thus, we need to create learning opportunities to help young people make sense of their lives, and we need to create conditions in schools and in communities to shape the academic and life trajectories of students, particularly those from nondominant, historically marginalized populations.

With his iconic campaign and historic electoral win Obama brought about a shift that has influenced the way young people take up issues in their writing.

David A. Hollinger

David A. Hollinger is Preston Hotchkis Professor of American History at the University of California, Berkeley. He has been a Fellow of the American Academy since 1997.

Jeffrey's contribution to this issue of *Dædalus* observes that many of the voices in today's conversation about the place of descent communities in the United States divide into the party of memory and the party of hope. I understand what he means, and I think that most of us in this ongoing conversation, whatever emphasis we take, like to believe that we appreciate the virtues of memory and of hope, that we try even if we often fail to remember the past without being blinded by it to possibilities that present and future circumstances might enable.

Yet I want to suggest a third party, again one to which most of us here would like to count ourselves as members. This is the party of analysis. The ideal of analysis inspires us to mobilize and employ our skills as scientists and scholars and to use those skills to evaluate critically and in some cases even to neutralize the claims of memory and the claims of hope. This is the spirit in which I wrote my own *Dædalus* essay, which rejects as all-too-easily answered a question popular today in the media, a question that sometimes divides the party of memory from the party of hope, a question that misses a great deal of the action: Has the United States achieved a society in which the physical marks of descent and the legacies of racism no longer operate to disadvantage historically racialized communities of descent?

This is an easy question because it requires little science and scholarship to answer in the negative. To be sure, some Americans are tempted to answer this question incorrectly. That so many journalists and politicians are functioning as a kind of truth squad correcting this mistake is thus fortunate. This is an important task. But an organization of scientists and scholars such as the American Academy of Arts and Sciences has a much more demanding calling. We should be identifying questions not so easily answered and should be offering the best commentary we can on those questions, especially those that are not constantly discussed in the mainstream press.

The not-so-easily answered questions are often generated by the contingencies of history, by developments that the party of memory is sometimes too slow to engage and the party of hope sometimes too eager to interpret as signs of victory. Two such historic developments are the focal points of my essay.

Both developments are major preoccupations of a splendid book I read on the plane from San Francisco yesterday, Eugene Robinson's *Disintegration: The Splintering of Black America*. Robinson is one of my favorite cable TV talking heads, so I was pleased to find his book so sensible and sound and such a bracing mixture of memory, hope, and analysis. We scholars sometimes patronize journalists, as I probably did a moment ago, but Robinson is refreshingly up to date on the latest social science, and he advances a perspective that I find totally congruent with my own essay in the *Dædalus* issue we are discussing today.

One of the two developments that Robinson and I both think demand sustained attention is the blurring of the lines between the classic color-coded communities of descent, often still called races. Although rates of out-marriage in the Hispanic and Asian American populations were already beyond 30 percent as early as the 1990 census (and for Korean Americans and Japanese Americans have reached more than 50 percent in Los Angeles), what is more remarkable in recent years is the increase in marriage, cohabitation, and reproduction across the black-white color line. Citing some of the same sociological studies I mention in my essay, Robinson observes that of the census-identified black males who got married in the year 2008, 22 percent married women who were not census-identified black females and 9 percent of the census-identified black females who got married that year married outside their so-called race. Because the mixed offspring of these socially recognized unions often ask their mixture to be acknowledged, at least in some settings, the power of the "one drop" rule to classify Americans is diminishing.

What does the blurring of these lines, especially between blackness and nonblackness, mean? I am not certain, but the question strikes me as one worth pursuing because it is not so easily answered.

A second development to which my essay calls attention is massive immigration since the late 1960s and the increasing percentage of immigrants who have dark skins and would be classified as African American by our inherited set of categories. The diversity of the populations arriving from East Asia, South Asia, and the Middle East make a mockery of the category "Asian American," and the destiny of many specific immigrant groups from Asia reminds us of the role of class position in enabling people to overcome the power of white racism. That poorly educated immigrants from Mexico have a different destiny in the United States than Koreans, who often come here as college graduates and with English fluency, is not surprising.

Americans of Japanese ancestry were taken from their homes and thrown into internment camps within my lifetime and within a few miles of where I now live in Cal-

ifornia. The depth and intensity of anti-Asian racism in this society is often underestimated, with the result that people do not focus enough on the process by which so many Asian Americans have managed to overcome the barriers created by white supremacy. What can we learn about white supremacy from the fact that it has had less and less effect on Americans of East Asian ancestry?

But what most invites our attention is the increase in black immigration. Robinson, too, is much engaged by this demographic transformation, and again to my delight, he cites some of the data that I cite in *Dædalus*. Immigration from Africa consisted of only about 1 percent of arriving peoples as late as the 1980s but now constitutes 7 percent. More immigrants are coming into the United States today from sub-Saharan Africa than from India, China, or Russia – sources of immigrants that the press constantly discusses.

Astonishingly, the anti-immigration forces in American politics have yet to say much about how the color of immigration is blackening, and the class differentials introduced into the black population of the United States are stunning. Immigrants from Nigeria, Kenya, and Ghana, Robinson notes with fascination, have stronger financial and educational standing than do immigrants from most of Asia. One social scientific study after another reveals that the immigration-based black population, like the immigration-based populations from Korea, Taiwan, and India, does very well in this country by standard indicators. What does this say about the significance of the black-white color line? The children of immigrants from Nigeria, Ghana, Jamaica, Trinidad, and Barbados are, after all, just as black as and often blacker than the children of African Americans whose families experienced Jim Crow and before that centuries of slavery. Might history, as opposed to race, have some significance here?

One social scientific study after another reveals that the immigration-based black population, like the immigration-based populations from Korea, Taiwan, and India, does very well in this country by standard indicators. What does this say about the significance of the black-white color line?

At issue is not the power of white racism but rather the ways in which that power works differently in relation to different population groups with different histories. Do well-educated black immigrants from Africa and the Caribbean experience discrimination? Of course they do. But white racism hurts them much less than it hurts other black people. We cannot remind ourselves often enough that the African American descendants of American slavery and Jim Crow are the only demographic group in the United States to inherit a multicentury legacy of chattel slavery and systematic, violently enforced discrimination, cataclysmically inadequate educational opportunities, and extreme racialization under the ordinance of the one drop rule – all sanctioned by constitutional authority in the United States.

President Obama is not a member of this unique population group, whose history is markedly different from that inherited by Obama and generally by the new immigrants from Africa and the Caribbean. I can't pretend to have all this figured out, but, as with the phenomenon of ethnoracial mixture, figuring out what all this means is well worth the attention of our best minds. Hence, I am frustrated by the countless writers who keep telling us how bad racism is – a claim they are right about – but who so rarely discuss these developments.

The reason to study these developments is not just to decide on how much or how little progress we have made in diminishing racism. Rather the point is to understand the specific dynamics of the process by which racism is diminished. What are the forces that diminish it? How does racism interact with class position? What historical circumstances make a difference? In what particular locations does white supremacy do the most and the least damage and why? These questions get short shrift when we focus instead on the matter of the hourglass being half empty or half full or just how far in some general sense we have gotten beyond racism, on whether we are optimistic or pessimistic. Only when we energetically engage difficult questions are we likely to enable the party of memory and the party of hope to work together with greater confidence and maximum effect. ■

To view or listen to the presentation, visit http://www.amacad.org/events/obamaStLouis/obamaStLouis.aspx.

British Turing Bombe machine at Bletchley Park Museum, Bletchley, United Kingdom

Breaking the Code

The Academy's 1969th Stated Meeting featured members of the Catalyst Collaborative@MIT performing a staged reading of Hugh Whitemore's play *Breaking the Code*, about the life of Alan Turing. (See opposite page for an extract from the play.) The reading was followed by a panel discussion of Turing's professional and personal life from the perspective of science, engineering, drama, and social history. Academy President **Leslie C. Berlowitz**, who welcomed Fellows and guests to the program, remarked that Turing "was instrumental in breaking the Nazis' Enigma code during World War II. Yet his own life was a cipher. He could not resolve the tension between his sexual orientation and prevailing government policies and public mores. The play portrays these conflicts and how they tormented his life."

Academy Fellow **Alan Lightman** (MIT), a cofounder of the Catalyst Collaborative@MIT, described the group's mission "to use theater to convey the culture of science to the public, with an emphasis on subjects of social and cultural interest." He also stressed that "the hallmark of their productions is the post-performance discussion during which the audience can ask questions of Boston-area scientists whom we have invited to the performance."

Following the staged reading, Academy Fellows **Laurence Senelick** (Tufts University), **Ronald L. Rivest**, **Shafi Goldwasser**, and **Silvio Micali** (all from MIT) described the impact of Turing's work and life on cryptology and computer and network security, as well as how it is portrayed in *Breaking the Code*.

An edited transcript of the panel discussion follows on pages 24 to 30.

From the play *Breaking the Code*, by Hugh Whitemore

Act II, Scene 7

TURING. Thank you, Nikos, dear. Thank you. It's a good feeling, isn't it? Solving a problem, finding the answer. Making it work. A good feeling. It's all like that wireless, really, it's all a question of making the right connections. Shall I tell you a secret? Top secret. I couldn't even tell my analyst about this. But since you won't understand a single word, it doesn't really matter. It all took place at the beginning of the war in a country house called Bletchley Park. The Germans had built a machine called the Enigma. It was very cunning. It made codes – and nobody knew how to break the codes it made. That was the problem we had to solve. If we didn't, if we couldn't we'd lose the war – it was as simple as that. But where to begin? Well, first there was guess-work. The codebreaking process always began with a guess. You had to guess what the first few letters of the message might mean. This wasn't as difficult as it sounds because military messages invariably start with a stereotyped phrase: The date, the time, the name and rank of the sender, that sort of thing. Then we discovered that it was possible to use the phrase we guessed to form a chain of implications, of logical deductions, for each of the rotor positions. If this chain of implications led you to a contradiction – which was usually the case – that meant you were wrong, and you'd have to move onto the next position. And so on and so on. An impossibly lengthy and laborious process; time was against us. We didn't know what to do. And then, one afternoon, I remembered a conversation I'd had with Wittgenstein; we were arguing about the fact that a contradiction implied any proposition. And I saw – immediately – how I could use this elementary theorem in mathematical logic to build a machine that would have the necessary speed: a machine with electrical relays and logical circuits which would sense contradictions and recognize consistencies; a machine of cribs, closed loops, and perfect synchrony; a machine for discerning a pattern in the patternless. If your guess was wrong, then the electricity would flow through all the related hypotheses and knock them out in a flash – like the chain reaction in an atomic bomb. If your guess was correct, everything would be consistent – and the electrical current would stop at the correct combination. Our machine could examine thousands of millions of permutations at amazing speed – and, with any luck, would give us the "way in." More than that: all the connections had been made. There was the pure beauty of the logical pattern. The human element. The deeply satisfying relationship between the theoretical and the practical. What a moment that was. Quite, quite extraordinary. Oh, Christopher . . . If only you could've been there. Never again. Never again a moment like that. In the long run, it's not breaking the code that matters – it's where you go from there. That's the real problem.

Breaking the Code by Hugh Whitemore, based on the book *Alan Turing: The Enigma* by Andrew Hodges. *Breaking the Code* will be produced again on Broadway in 2012. Look to the theater announcements!

Alan Lightman

Alan Lightman is Adjunct Professor of Humanities at the Massachusetts Institute of Technology. He was elected a Fellow of the American Academy in 1996.

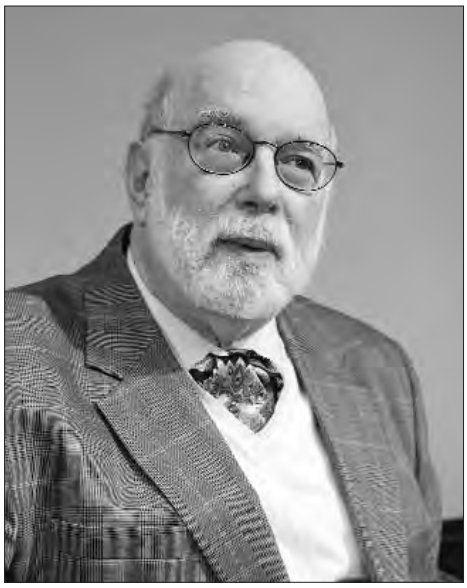
The Catalyst Collaborative – formed five years ago by Debra Wise, artistic director of the Underground Railway Theater, a Boston theater company; Alan Brody, a playwright and professor of theater at MIT; John Lipsky, a playwright and director at Boston University; and myself – is an imaginative collaboration between MIT and the Underground Railway Theater. The Collaborative's mission is to use theater to convey the culture of science to the public, with an emphasis on subjects of social and cultural interest.

Over the last quarter of a century, we have seen a surge of theater involving science, including such outstanding examples as Tom Stoppard's *Arcadia* (1993), Michael Frayn's *Copenhagen* (1998), and David Auburn's *Proof* (2000). Artists have long been interested in science as a source of subject matter – not just for plays but for novels, paintings, and other art forms. Artists have also found that the general public has a real hunger for science and that many in the public don't want to encounter science through the traditional channels.

The Catalyst Collaborative does several things. Our mission is to create new plays about science. We bring scientists and playwrights together at an early stage to create the play. We also produce plays, including, recently, *An Evening with Richard Feynman*, *The Life of Galileo*, *Einstein's Dreams*, *The Water Engine* by David Mamet, and a play we commissioned, *From Orchids to Octopi* by Melinda Lopez. We usually perform in the Central Square Theater but have performed all over the Boston/Cambridge area. We like to bring in a large range of the community. One of the hallmarks of our productions is the post-performance discussion during which the audience can ask questions of Boston-area scientists whom we have invited to the performance.

[At this point, there is a staged reading of *Breaking the Code*.]

The general public has a real hunger for science and many in the public don't want to encounter science through the traditional channels.



Laurence Senelick

Laurence Senelick is Fletcher Professor of Drama and Oratory and Director of Graduate Studies at Tufts University. He was elected a Fellow of the American Academy in 2010.

As Alan Lightman pointed out, one of the most interesting phenomena in drama in the last twenty years or so has been the number of plays that have been organized around scientific ideas or around the lives of scientists. *Arcadia,* for instance, treats the origins of chaos theory and iteration. The human relationships in *Proof* pivot on a paradigm-shifting proof about prime numbers. In *Copenhagen*, Werner Heisenberg and Niels Bohr argue over the ethics and control of nuclear power. Audiences leave these performances feeling that they have been edified as well as entertained.

Breaking the Code, because of its biographical thrust, more closely resembles the granddaddy of these plays: Bertolt Brecht's *Das Leben des Galilei*, *The Life of Galileo*. For Brecht, Galileo was the perfect example of the intellectual in conflict with the powers that be.

In the first version of Brecht's play in 1937, Galileo is a sort of wily antifascist who manages to get his ideas across despite a repressive power structure. When Brecht rewrote the play in 1945, after the A-bomb had been dropped, Galileo became quite a different figure. In this version, Galileo is complicit with power in some rather tricky moral issues. He no longer sees the establishment as simply an antagonist but goes along with it for his own reasons. This is obviously a more interesting and complex treatment of the situation.

Breaking the Code presents a man, Alan Turing, who believes in the power of the machine to solve problems. And yet what keeps tripping him up is his humanity, particularly what would have been regarded as a great rift running through that humanity: his sexuality.

Turing picked a particularly unfortunate time to be a homosexual. During World War II, both in England and America, in civilian life and in the military, rules on sexual activity were relaxed. With the threat of death hanging over everybody's head, sex was something to be reveled in, to be welcomed and entertained whenever it showed up, because who knew the next time one might have the opportunity. And so a good deal of activity that would ordinarily have been policed was winked at.

Breaking the Code presents a man who believes in the power of the machine to solve problems. And yet what keeps tripping him up is his humanity, particularly his sexuality.

Things changed radically after the war. England became particularly censorious because of the Cambridge Five, a group of men allegedly recruited at Cambridge University to spy for the Soviet secret service. Two of them, Guy Burgess and Donald Maclean, left England for the Soviet Union in 1951 after being tipped off about a British intelligence service investigation into their activities. Only the authorities knew of their defection until the two men appeared at a press conference in Moscow in 1956.

The open secret that Burgess was homosexual spurred a witch hunt of what we now call gay men (the term was used only by coteries at the time). Clubs and public toilets were raided on a regular basis. Individuals who would normally have been above suspicion suddenly were being investigated and made the centers of high-profile prosecutions. In the United States, Senator McCarthy equated Reds and fags. The State Department and the Pentagon purged many inoffensive people simply on the basis of suspicion.

Turing, who was by no means a flamboyant individual, thus had to live what we might call a coded life. *Breaking the Code* deals not only with his experiments at Bletchley Park, where the Enigma code was broken, but also with the fact that to be a homosexual in that society meant learning a cipher that you would then use and interpret at your own risk.

For instance, Polari, based on the Romany language and current in show business, was also exploited by the homosexual subculture. By dropping certain Polari words and phrases – as well as other hints, including sartorial signals – you could both communicate your trustworthiness and establish whether you were dealing with somebody you could trust, somebody who was a sexual fellow traveler.

Throughout the play, Turing is looking for that trust. He is not looking so much for the moment of passion, although the moment of passion, the one-night stand, is clearly a way of gauging the relationship. Instead, he is looking for a situation where he can be as comfortable with a human being as he is with a machine. Often he is looking for predictability, for something that will be consistent, that will always provide the right

answer in a given case. That is all very well and good when you are dealing with mathematical formulas; it is much more difficult when you are dealing with human behavior.

Turing's fate was ridiculous by any law of equity or logic. He took home a man whose friend then broke into Turing's apartment and stole a few things. Turing foolishly informed the police, who put more than two and two together. Turing was arrested and prosecuted under the same law that had condemned Oscar Wilde a half-century earlier: the 1885 Labouchere Amendment, which proscribed all sexual activity between two males, whether private or public.

Upon his conviction, Turing was given the choice of a prison sentence or chemical castration by hormone injection. He chose the latter. His security clearance was revoked, and he was not allowed into the United States. All the things on which he had predicated his life, all the things that had enabled him to function as a human being, were suddenly pulled out from under him. He died of cyanide poisoning, ruled a suicide, two years later.

Turing structured the professional achievements of his life on consistency, on mechanical rectitude, but he was continually being tripped up by the fallacies of human behavior and human sexuality. His story is both farcical and tragical. It is that ambiguity that makes the play's portrayal of Turing so engrossing.

Ronald L. Rivest

Ronald L. Rivest is Andrew and Erna Viterbi Professor of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology. He was elected a Fellow of the American Academy in 1993.

Arguably, the breaking of the German Enigma code was the most significant event in the history of cryptography; it marked a dramatic, qualitative change. Before World War II, cryptography felt like a field for amateurs, dabblers. After World War II, it became serious business because of the impact of Turing's work and the work of his colleagues at Bletchley Park. Breaking the Enigma code was to mathematicians what the atomic bomb was to physicists; it legitimized the deep study of mathematics and computation for warfare.

The use of cryptanalysis in World War II may not have changed the outcome of the war. But certainly it shortened the war considerably by allowing the Allies to break codes describing where German U-boats were going to attack.

Cryptology is all about the study of secrets – about generating secrets and uncovering secrets – which is why this play about Turing is so marvelous; it deals with secrets on a number of different fronts. If you find out someone's secret, you have an advantage. If they find out your secret, they have an advantage. If you can guard your secrets, you can protect yourself. Cryptography is all about the mathematical generation and use of secrets. You identify yourself because of the secrets you own. If you have a digital certificate in your browser, that's a secret you use to identify yourself.

Once you know someone's secret, a second layer of secrecy emerges as you try to keep hidden the fact that you have found out somebody else's secret. During World War II, Winston Churchill faced the issue of what to do with secretly obtained information. Because the British had broken the Enigma code, they were able to learn of the German plans to bomb Coventry. But if Churchill warned of the impending bombing, he might also reveal the secret that the Brits knew how to break the German code.

The brilliant work done at Bletchley was founded on the ability to build machines that used not only the cutting-edge technology of the day to run through the code's possibilities but also used clever algorithms and clever mathematics to reduce the number of possibilities to a manageable level.

What was the impact of Turing's cryptanalysis work at Bletchley? (Cryptanalysis is the breaking of codes. Cryptography is the making of codes, although the word *cryptography* has come to refer to both practices.) Turing was a cryptanalyst focused on breaking the German Enigma code.

Turing had an impact on the field, but not in the usual academic sense. He didn't write papers in this area (at least I don't know of any cryptography papers he wrote that are unclassified). He was not trying to build a science or create a field of academic inquiry. He was trying to solve the problem at hand, to do whatever it took to break that code.

His impact on academic cryptography was indirect and primarily through Claude Shannon, whom Turing met several times in 1943 at Bell Labs in New Jersey to discuss the breaking of Enigma. After the war Shannon wrote a seminal academic paper about cryptography.

Turing's work thus became influential through the publications of others but not because these publications revealed the technical details of breaking Enigma, some parts of which are still hidden. Instead, the powerful idea of *building machines to solve problems* pervades his work, both theoretical and practical. The brilliant work done at Bletchley was founded on the ability to build machines that used not only the cutting-edge technology of the day to run through the code's possibilities but also used clever algorithms and clever mathematics to reduce the number of possibilities to a manageable level.

Turing also designed machines for theoretical purposes. The eponymous machine he designed in the 1930s still plays a role today in the foundations of theoretical computer science.

The work done at Bletchley Park further laid the foundation for computer science in practice. Many of the earliest computers were spin-offs of work done at Bletchley. People who learned how to build interesting electronic devices that could do computation of various sorts at Bletchley Park later went off to build the first generation of digital computers. Turing is thus the father of both the practice and theory of computer science.

The work done at Bletchley also became a model for intelligence agencies everywhere. The U.S. National Security Agency, founded in the 1950s, can be viewed as a scaled-up version of Bletchley Park: many smart mathematicians in one place with many high-powered computers, doing their best to break the codes of the day.

The field of cryptography has grown substantially since the end of World War II; it has become an academic discipline and has expanded to include nonmilitary applications. Cryptography is the glue that holds together our electronic commerce, the glue that makes the Web work effectively so you know to whom you are talking. My colleagues Shafi Goldwasser and Silvio Micali are pioneers in the field, having helped lay the foundations of public key cryptography and many of the other wonderful cryptographic advances since the war.

But the idea of building machines to solve our problems, an idea that characterizes our information age society, owes much to Turing's pioneering efforts, both theoretical and practical.

Shafi Goldwasser

Shafi Goldwasser is RSA Professor of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology and Professor of Computer Science and Applied Mathematics at Weizmann Institute of Science in Israel. She was elected a Fellow of the American Academy in 2001.

The play *Breaking the Code* describes Alan Turing as a mathematician, albeit one who is doing a very unusual kind of mathematics. Were he alive today, he probably would not be called a mathematician. He would be called a theoretical computer scientist, which is appropriate because he was the first computer scientist – even though he never built or programmed a real computer.

What is the difference between mathematics and computer science? Mathematics is the study of what is true; it provides a framework of rules and qualifying mathematical facts. For example, what is the function that defines the circumference of a circle, or what is the product of number x and number y. Computer science is the study of how to compute the circumference of a circle, how to multiply two numbers. Computer science does not ask what is the product of x and y but how do we actually find it?

The central notion in computer science, then, is the notion of computing, of a com-

putational process or an algorithm that describes a computational process. Wikipedia defines computational process, or algorithm, as an effective method by which to express a finite list of well-defined instructions for calculating a function.

An algorithm or a computational process is a sequence of well-defined steps. But what does that mean? What is an effective method? What are these well-defined steps? Turing, motivated by what is called a *decision problem* and by his work with machines during the war, set out to answer this question. That is, he tried to capture an effective method of computation in a precise and accurate mathematical way.

What he came up with is a definition of a machine that today is called a Turing machine. The machine is simple, comprising three parts. First, the machine has an infinite tape (imagine an infinite roll of paper) divided into squares. Second, the machine has a head, a pointer into the tape. The head can either read symbols from the tape or write symbols on the tape. Third, the machine has an automaton, a gearbox. After a symbol on the tape has been read, the gearbox looks at the content of what was read and decides whether to shift gears and whether to write something else on the tape.

Computing the circumference of a circle or multiplying two numbers will require a relatively small number of instructions. They would be carried out in record speed on any of today's computers or calculators. But on the machine Turing defined, the computation might require thousands of transitions involving moving the gears and reading and writing symbols on the infinite tape.

Compared with modern computers, the Turing machine is a turtle. But surprisingly, whatever the hare can do (that is, whatever a fast computer can do), the turtle can do as well. Even the most advanced supercomputer programmed with the most sophisticated programming language can be programmed on Turing's simple machine with its roll, its head, and its simple gearbox.

The wonderful thing about the Turing machine is that its operating manual is simple. I can describe it in half a page in a textbook, which makes it appealing to anyone who wants to prove anything theoretical about the limits or the power of computation. Thus, rather than having to understand how a complicated computer works or how a complicated programming language works, they just have to think about this simple machine, because what this machine can do and what this machine cannot do match what can and cannot be done by the most powerful machine you might have.

What I have described is a mathematical construct. The Turing machine doesn't have any diodes or transistors or physical parts; it has a gear, but only on paper. In the play Turing is asked, "Are you going to build this machine?" "No," he replies, "I'm not going to build it." It is destined to live on paper, never to be built. But it is very much alive in the sense that it gives life to the computational process. That is, as the Turing machine reads a symbol from the tape and decides whether to shift gears and write something, as it moves step by step in this way it gives life to the computational process. If you observed the sequence of transitions, the shifting of gears and writing of symbols, you would see a frame-by-frame recording of the life of a particular computational process.

After defining the machine and the computational process, Turing asked what could be computed using this computational process. He defined computable tasks to be those problems for which one can make up a machine of this sort (that is, a machine designed to solve a computational task). The machine would go through a group of transitions and then output the solution; it would say, "Here. I've solved the task. It's done."

His thesis was that anything that is computable can be computed by this kind of a process. (Sometimes it is called the Church-Turing thesis because Alonzo Church's lambda calculus, which was invented independently, was shown to be equivalent to Turing machines.)

Turing, motivated by what is called a decision problem, tried to capture an effective method of computation in a precise and accurate mathematical way.

The Turing thesis is just that – a thesis. There is no proof that it is true or not true, because Turing took something informal – anything that is effectively computable, which is just an informal intuition – and said it was equal to something formal that he defined. His claim is that anything that can be computed (that is, this informal stated thing) is equivalent to what his machine can compute.

However, as powerful as this machine seems to be – it is equivalent to any other computer that we have – it cannot do everything. This is one of the most fascinating aspects of Turing's work. A fundamental theorem of computer science is that certain well-defined tasks are not computable on a Turing machine and therefore not computable at all. Specifically, Turing showed that the task of computing whether a Turing machine will not be able to compute something is not computable.

What is unique and amazing about Turing's formulation of the Turing machine is not just that it captured computation or the process of computation. Church did so, too, with his lambda calculus, but he was build-

ing on the work of David Hilbert, Kurt Gödel, and other giants of mathematics. Church thus defined computation as a mathematician would. Turing, on the other hand, defined computability in terms of a machine, an engine that has tape and state transitions (that is, shifting "gears"). What he came up with was very different from what mathematicians had been doing and what Church did.

Turing's solution is also simple, natural, intuitive. In fact, that is why today we refer to Turing computability rather than Turing-Church computability and why most undergraduate texts in computer science explain computability in terms of a Turing machine and what it can compute.

Turing's 1937 definition of computation in terms of a machine is not just another mathematical formulation; it is the birthplace not only of the abstract notion of a computer but of the scientific discipline we call computer science.

Silvio Micali

Silvio Micali is Ford Professor of Engineering at the Massachusetts Institute of Technology. He was elected a Fellow of the American Academy in 2003.

Turing was a great man because he gave us something new and then gave us the means to go beyond what he had done. He allowed those of us who came later to have further growth. And that is the best thing we can aspire to as humanists, scientists, and, simply, human beings.

What was the point of rephrasing computation? Church and others had already defined it in terms of lambda calculus, recursive functions, and other things. Why define it in terms of machines? Because doing so ultimately allows us to speak about complexity. Some computations are easy. Some are harder, more complex. Some are harder still. And when some computations are too complex they are de facto impossible. Differentiating what can be computed efficiently from what cannot has allowed us to transform computer science and mathematics. Once you slap the lens of complexity on top of things, they look very different. Had computability been defined without machines, it would not have given birth to complexity.

At the beginning of *Breaking the Code*, Turing asks, "What is mathematics? It's about right and wrong." Well, it used to be. Things have changed a little because the line between right and wrong has been eroded – ironically, thanks to Turing.

Why do we prove theorems? Because we want somebody to read our proofs in order to verify our work. Why do we read proofs? Because reading proofs, verifying the work of others, is simpler than discovering the proof in the first place. The gap between the harder task of discovering the proof and the easier task of reading and verifying the proof is implicit, and is necessary formally in order to prove that it is a separately meaningful concept, and not just another term for discovering truth. Verifying a proof ought to be simpler than finding it, else we can just publish theorem statements. Want to verify that they are correct? Prove them yourself!

Turing's wonderful notion of a machine allows us to define what can be called a proof. At the beginning of the play, Turing explains what a proof is. He describes it in classical terms. But he gave us the means to go beyond the classical. The classical term is still intact: a proof is a string of symbols; you inspect each one in order to figure out whether a certain statement is true or false. But is this the best way to explain, to develop understanding? Consider what happens in school classrooms. Students ask questions and the teacher answers. The teacher doesn't simply say, "Read this book," and then the next year, "Read this other book," and so on. If children could learn simply by reading books, our need for so many teachers would plummet. We would save enormous amounts on the cost of education. But education requires interaction, and interaction, the process of education, is intensive.

The simple way of educating students – handing them one book after another – is not nearly as efficient as the interactive method, which requires dialogue. This tells us that if indeed complexity is important then we should investigate other ways of proving things than just writing down their classical proofs. Proofs need no longer be confined to be syntactic objects; they can be

interactive processes. In this way we might efficiently grab more truth than before.

What about this business of right and wrong? At what point should we be satisfied with a proof? Assume somebody gives you a proof but he may be lying about whether it works. If you can catch him only about half the time, that's not so good, because half the time you will be fooled. But what if the chance he is lying is only one in four? That is slightly better. What if the chance he is lying is one in two to a thousand (1 in 2^{1000})? The chance he is lying is still real, but for all practical purposes it is essentially zero. The probability that he is not lying is overwhelming. Perhaps we should be happy with that. If we now agree to accept as true things that might be false only with an overwhelmingly small probability, the range of problems that are efficiently provable becomes gigantic.

And why stop at that? We can now also have a theory of mathematics that is deliberately inconsistent. *Breaking the Code* starts with Turing saying, "I want consistency. And I want completeness. I want every theorem to be provable, but I never want to prove A and the opposite of A. Otherwise, what's a proof good for?"

Complexity gives us a strange way out. Imagine a system of proof in which we can prove A and we can also prove not-A. But there is a caveat: if A is true, in the classical sense, then a "good-looking" proof of not-A either does not exist, which is the best of all possible worlds, or it exists but takes billions and billions and billions and billions of years to discover. Which one would you accept? You would accept the first option. The consistency Turing so desperately wanted turns out not to be so crucial.

Another offshoot of Turing's work, one that has well served computer scientists and, especially, cryptographers, is the notion of computational indistinguishability. One of the things Turing is famous for is the so-called Turing test in which one person engages in a conversation with a machine and a second person and tries to determine which is which. The test represents a great insight because it suggests that rather than an ontological description of something we can use a procedural description.

Imagine you go to a jewelry store and find a sizable diamond for sale. You say, "This is a beautiful diamond. How much is it?" The jeweler answers, "$100,000." But then you see another diamond that seems to be the equal of the first; it looks just like the $100,000 diamond. The jeweler says, "Ah, but the two are not equal."

"Oh, how much is the second diamond?" you ask.

"$10."

"But it looks the same."

"Yes, of course it looks the same."

"But it weighs the same."

"Of course it weighs the same."

"What if I put it under a microscope?"

"It still looks the same."

"What if I put it in the microwave for ten hours?"

"Still the same."

"What if I examine it with an MRI?"

"Still the same."

"What if – "

"Sir, no matter what you do in your lifetime, or the lifetimes of your descendants until the sun runs cold – no matter what experiments you do – the two diamonds will look the same."

"But they are not the same?"

"That's right."

"Okay. I don't care. Give me two of the $10 diamonds."

That's the Turing test. What advantage do you have in equating things that are not really the same? Well, you can then do things like equate encryption of zero and encryption of one, giving you an essentially unbreakable code, because they look the same no matter what you do in efficient time. You can have a notion of pseudo-randomness, computers that can expand, say, a thousand random bits to one trillion bits that aren't truly random, but nobody can tell them apart. No statistical test whose results you can see in your lifetime or in the lifetime of the universe will give you different results. If that is the case, do you care that the bits are not truly random?

The Turing test represents a great insight because it suggests that rather than an ontological description of something we can use a procedural description.

What Turing did is to achieve great clarity. Then he gave us complexity. Once you start applying the notion of complexity in machines to everything else that you know, the world begins to look simultaneously the same and different. Much of the mathematics and computer science we are working on today and will be working on in the future is going to pass through the lens this extraordinary man has given us. This notion of extreme simplicity has opened a world in which different things look equal and the world is actually better because of it. ■

To view or listen to the presentation, visit http://www.amacad.org/events/breakingCode/code.aspx.

Making America More

Competitive, Innovative & Healthy

On April 14, 2011, at the House of the Academy in Cambridge, three Academy Fellows, leaders from the nation's engineering and medical sectors, offered their views on the interconnections between American competitiveness, innovation, and health.

Charles M. Vest, President of the National Academy of Engineering, opened the discussion by focusing on U.S. research universities, which "produce much of the most important basic knowledge and technologies," and U.S. companies, which "convert new ideas into real products and services that drive our economy forward." Vest warned that political, social, and fiscal challenges are undermining this special relationship, including deficiencies in K-12 education that affect the university's role in developing an educated workforce.

Drawing on her experience at Bell Labs in the late 1970s through mid-2000s, **Cherry A. Murray**, Dean of the School of Engineering and Applied Sciences at Harvard University, described institutional characteristics that create and sustain innovation. She pointed out that "more than money is required"; physical proximity to universities, for example, and support for interdisciplinary collaboration also play a part in fostering "local innovation ecosystems."

Harvey V. Fineberg, President of the Institute of Medicine, highlighted the positive interaction between an individual's health behaviors and "innovation in health technology and processes." He cited Johnson & Johnson's Live for Life, a health promotion program for its employees, as one successful new approach, and he advocated further innovation: for example, a national competition among U.S. mayors to support local health initiatives.

The panel discussion served as the Academy's 1970th Stated Meeting; it was held in collaboration with the National Academy of Engineering, the Institute of Medicine, and the Harvard School of Engineering and Applied Sciences. The following is an edited transcript of the discussion.

"The United States must try to compete in this world *and* maintain the quality of life we have enjoyed thus far. This challenge is far more daunting for us than for any other country."

– Charles M. Vest, President, National Academy of Engineering

Charles M. Vest

Charles M. Vest is President of the National Academy of Engineering and President Emeritus of the Massachusetts Institute of Technology. He was elected a Fellow of the American Academy in 1991.

Tonight's discussion centers on how to maintain a competitive, innovative, and healthy nation, goals that are interrelated in many ways. Not surprisingly, I will anchor my comments on U.S. competitiveness in the work of the National Academies' report *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* and the recent update of that report.[1]

Because we have been so blessed in this country, we tend to assume that we are the best in the world. Yet we should take note of the areas in which we are not, by most metrics, ranked number one. For example, we are sixth in global innovation-based competitiveness and fortieth in the rate of change in that measure over the last decade. We are eleventh among OECD (Organisation for Economic Co-operation and Development) countries in the fraction of our young adults who have graduated from high school (a number that is truly appalling) and sixteenth in college completion rate. We are twenty-second in our provision of broadband Internet access to our citizens; twenty-fourth in life expectancy at birth; and twenty-seventh among developed nations in the fraction of our college students receiving degrees in science or engineering. Finally, according to the World Economic Forum (and I admit that this measure is somewhat subjective), we are forty-eighth in the quality of our K-12 math and science education. These figures put American exceptionalism in context: we are number one, except when we are not.

When this knowledge began to emerge six or seven years ago, a bipartisan group of members of the House of Representatives and the Senate requested that the National Academies undertake a study to answer the following questions: "What are the top ten actions, in priority order, that federal policymakers could take to enhance the science and technology enterprise so that the United States can successfully compete, prosper, and be secure in the twenty-first century? What strategy, with several concrete steps, could be used to implement each of these actions?" Our committee of twenty individuals, led by Norm Augustine, concluded that if we as a nation want to be competitive, we first have to pay attention to the fundamentals: to education and access to it; to investment in research in order to develop new ideas, understandings, and technologies; and to the policy infrastructure and, in some cases, physical infrastructure that bolster our national competitiveness.

The *Gathering Storm* report outlined four general recommendations. First, and most important, we must increase America's talent pool by vastly improving K-12 science and mathematics education. Second, we need to sustain and strengthen the nation's traditional commitment to long-term basic research. Third, we should strive to make the nation the most attractive place to study and perform research so that we can develop, recruit, and retain the best and brightest students, scientists, and engineers from the United States and around the world. Finally, we must ensure that the United States is the premier nation for innovation, investment in downstream activities such as manufacturing and marketing, and creation of high-paying jobs based on innovation. Largely on the basis of this report, but also on work by other groups, especially the Council on Competitiveness, the America COMPETES Act of 2007 established a pathway for the United States to reinvigorate its basis for being competitive in the twenty-first century. It passed unanimously in the Senate and by a huge bipartisan margin in the House, and was signed into law by President Bush.

Ralph Cicerone, President of the National Academy of Sciences, Harvey Fineberg, and I, recognizing that the bill would be up for reauthorization in 2010, called the committee members back together. We asked them to take a look at what had happened in the intervening five years and decide whether the country was on a good path and where the weaknesses and strengths were in implementing the original recommendations. The second report, subtitled "Rapidly Approaching Category 5," has a dark blue cover, as opposed to the bright red of the original report; a message lies therein. There is also a message in the opening epigraph, a quote from Ernest Rutherford that says, "Gentlemen, we are out of money. It's time to start thinking." In Washington today, we often find that we are out of money.

The group found that the report's original recommendations remain the right ones to implement, but that we have fallen far short of realizing our goals. The federal government has not advanced K-12 education according to our advice. Support for basic research, however, was strengthened throughout the last years of the Bush administration and in the first year of the Obama adminis-

[1] Committee on Prospering in the Global Economy of the 21st Century and Committee on Science, Engineering, and Public Policy, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (Washington, D.C.: National Academies Press, 2007); Members of the 2005 "Rising Above the Gathering Storm" Committee, *Rising Above the Gathering Storm, Revisited: Rapidly Approaching Category 5* (Washington, D.C.: National Academies Press, 2010).

tration. The federal budgets for physical science and engineering research tracked closely with what we had recommended, but they are under precarious circumstances nonetheless. The funding was largely added on in a supplemental appropriation in one of the last two Bush budgets and was mostly funded by the stimulus package in the first Obama budget. While substantial, this funding appears tenuous going forward. On related recommendations, such as increasing the number of H1B visas awarded; making the R&D tax cut permanent; implementing changes in intellectual property law; and, especially, reforming export control, no substantial progress has been made.

Meanwhile, many other countries have heeded the call to invest in science education and scientific research. A science-and-technology-based university with a $10 billion endowment recently opened. There will be 200,000 students studying abroad at the cutting edge of science and technology. An innovation city of 40,000 residents is under construction. A new global nanotechnology hub has emerged, and may at some point have fourteen advanced universities in its vicinity. A high-level government commission patterned on the *Gathering Storm* story has been established. Unfortunately, these developments occurred in Saudi Arabia, China, Russia, India, and the United Kingdom, respectively – not in the United States.

Every nation is facing difficult challenges, particularly following the economic and financial declines of the past few years. But the United States must try to compete in this world *and* maintain the quality of life we have enjoyed thus far. I believe this challenge is far more daunting for us than for any other country. Our fundamental finding in revisiting the *Gathering Storm* report can be summed up thus: "On balance, the United States' long-term competitiveness outlook (that is, jobs) has further deteriorated since the report was published five years ago." Commentators across the political spectrum have backed similar views. *New York Times* columnist Tom Friedman has endorsed the report's agenda and its urgency. So has *Washington Post* columnist George F. Will. Two weeks ago, when *Times* columnist David Brooks weighed in on the budget, he based his thinking on the perspective of declining U.S. competitiveness.

If we as a nation want to be competitive, we have to pay attention to the fundamentals: to education and access to it; to investment in research in order to develop new ideas, understandings, and technologies; and to policy infrastructure and, in some cases, physical infrastructure.

In the United States, we have what is loosely called the "innovation system." This system consists of three elements: our research universities, our policy and funding network, and ultimately, the companies that convert new ideas into real products and services that drive our economy forward. Our research universities, particularly our public universities, are at substantial risk today, yet they are the element without which none of this innovation can happen in the long run. Our universities produce opportunity for our graduates by preparing them to be good citizens, to have good jobs, to contribute to our economy and well-being. But universities also provide opportunity to companies, through the ideas they spawn and the graduates they send to employers. Universities create opportunities for states, regions, and nations by strengthening society and economies. They produce much of the most important basic knowledge and technologies. A federal dollar spent on our institutions, public or private, does double duty: it provides an education for the next generation and produces research results. Sponsoring research based on competition among ideas is a better system than any other society has managed to put forward.

These days, however, public discourse has become vitriolic. Many of those in positions of political power fundamentally believe that university research produces nothing of value, that universities should get back to the business of teaching and leave the research to industry. In response to such thinking, I would point to a few of the significant university-based innovations from the last half of the twentieth century: the computer; the basic framework for the global positioning satellite, or GPS, system (which began at Harvard University with fundamental atomic physics and development of the atomic clock); the genomic revolution; the laser; the deployment of the World Wide Web; the Internet; numerically controlled machines that manufacture virtually everything today; and most of modern medicine. Given that we are all concerned about jobs, I challenge those who would take away funding for university R&D to name one job in the United States that does not depend on one or more of these contributions. We must address the precarious state of our entire education system. While the United States is properly, largely focused on how to restart and reinvigorate our primary and secondary education, what we do in universities is also extraordinarily important; in particular, we must keep them open to people of all socioeconomic strata who have talent.

I think we do have a serious strategic crisis. While the situation in the United States is one of political and social gridlock, other countries such as China are forming innovation systems of their own, and with a long-term strategic vision in the areas of energy, environment, and economic development. On the upside, this is the most exciting era in human history for science and technology. What our young people are doing today is stunning; we just have to be sure that we support them, and give them the opportunity to create as great a society as we had as young people. The United States has a democracy, a free enterprise system, a diverse population, and a stunning history. But to capitalize on our potential, we must produce two things: well-educated women and men, and new ideas that come from basic science and engineering research. And there is hope. As Winston Churchill famously remarked, "You can always count on the Americans to do the right thing, after they've exhausted all the other possibilities."

Cherry A. Murray

Cherry A. Murray is Dean of the School of Engineering and Applied Sciences at Harvard University, where she is also the John A. and Elizabeth S. Armstrong Professor of Engineering and Applied Sciences and a Professor of Physics. She was elected a Fellow of the American Academy in 2001.

In my discussion of American innovation in the twenty-first century, I will begin by describing two twentieth-century innovative environments that I have experienced firsthand. I will explain how to create or replicate a "localized" innovative ecosystem within a company or institution; within a community or city; and on a national scale similar to the one that formed in the United States following World War II. Then I will address how technology and globalization are changing these conditions in the twenty-first century. Finally, I will share my views on how we can sustain American ingenuity and entrepreneurship by focusing on education, and thus, how we can maintain a strong economy and standard of living.

Since the end of World War II, the United States has been the global leader in technology innovation. Here, *innovation* means bringing new products and services to the market, in addition to the process of invention. As noted economist Joseph Schumpeter explained, technological innovation often includes creating new technology and market paradigms or developing new technologies and industries that displace older ones to generate both wealth and social well-being.

What is an innovative environment? What is required to create and sustain such an environment? As an example, I offer my observations of a great twentieth-century supplier of technological innovation: Bell Labs research in the 1970s to 1990s. I began working at the company in 1978, as a member of the technical staff in the physical research laboratory, and was Senior Vice President of Physical Sciences and Wireless Research by the time I left in 2004.

AT&T, which owned Bell Labs, was one of several large U.S. companies with industrial R&D labs, including Xerox Palo Alto Research Center and IBM Research. These companies emerged as powerhouses of invention and innovation in the post–World War II American economy. All held a monopoly or near monopoly position in their market; all were focused on a variant of information technology; all were vertically integrated; and all had resources to support relatively basic research as well as pure product development.

The research staff in these labs published much of their work in the open literature (in addition to and after patenting their ideas) and thus served as a research supplier for the entire information technology industry. For example, Bell Labs and IBM published semiconductor electronics research on first demonstrations of new technologies that both Intel and Taiwan Semiconductor Manufacturing Corporation relied on to determine the semiconductor electronics technologies that were feasible and worth developing further.

Alas, these powerhouses no longer exist. Due to inevitable market forces, maturation of the technologies, growth of supply chains that supported de-layering, and government deregulation of these industries, very few technology companies can now support a large central research lab with relative intellectual freedom. There are, however, some

key insights to be gleaned from how these companies operated.

From the 1970s to 1990s, the Bell Labs research area had roughly twelve hundred scientists and engineers, predominantly PhDs. The development area more closely associated with AT&T (and, after trivestiture, Alcatel-Lucent) business units had roughly thirty thousand employees, with a smaller percentage of PhDs (10 to 20 percent) supervising bachelor's-level personnel and technicians. Flow of ideas, people, and communications between R&D was encouraged by executive management, especially around conceptualization of new products and solving problems in the development of the next generation of products. In this "problem-rich atmosphere," a ventures business unit spun out small businesses around inventions that were not taken up by the various internal business units. Relevant parts of R&D were sometimes collocated, and the two sectors met regularly. Roughly 25 percent of postdoctoral scholars hired into research later found jobs in development, thereby forming a strong link between their former research supervisor and their new development team. Top researchers (usually first- or second-line managers) recruited outstanding PhD graduates from their alma maters and placed them in technical positions in science and engineering teams throughout the company.

In this vast pool of talented, highly trained technical staff, it was up to the entrepreneurial researcher to find scientists and engineers with the relevant expertise and then to interest them in his or her problem. Researchers inevitably ran into one another in the hallway as they moved from office to laboratory. Nearly everyone engaged in spirited technical arguments over lunch in the cafeteria and in the many seminars given by internal employees and a large number of distinguished visitors. Researchers learned what their colleagues were doing in hallway conversations; more often, they bumped into other Bell Labs researchers while attending major scientific conferences.

A number of creative tensions helped the company thrive:

- Lofty long-term goals (do the best science; create the future of telecommunications) were coupled with incentives to patent and push inventions into the market quickly. Some research organizations within Bell Labs focused more on one or the other goal; most were balanced and supported both.
- Researchers were considered career employees but were not guaranteed employment. A meritocratic management and performance review system led a small percentage at the bottom to leave the company each year.
- The management structure was strictly hierarchical at the same time that no professional or management titles were used and all staff were on a first-name basis, from technicians up to the president of Bell Labs.
- With research largely funded internally, managers allocated the finances they procured based on two competing priorities: generating the world's best scientific and engineering research, and generating the most business impact for the company. Managers were judged on their success recruiting talent into the organization and on how well they accomplished both conflicting goals. This task involved considerable risk: betting on creative people and their novel ideas rather than on projects that would succeed but would be more of the same.
- The company maintained a highly competitive yet collaborative environment. Bell Labs had an explicit policy whereby "empires" were not permitted to grow; therefore, employees had to team up to do something big or collaborate to acquire others' expertise or equipment.
- Teams were allowed to "self-assemble," or were occasionally brought together by management, depending on the project.
- Choosing problems to pursue was largely a bottom-up process (that is, managers would let a thousand flowers bloom, but quickly devote resources to the most promising few and cull the rest), but sometimes the route was top-down (that is, a manager would set a challenging goal and let the staff invent how to accomplish it). Perhaps the most well-known top-down project at Bell Labs was the solid-state amplifier that led to the transistor.
- Research was at an intellectual "critical mass," with sufficient expertise in many disciplines, yet most projects were starved for resources, which forced prioritization.

Bell Labs had an explicit policy whereby "empires" were not permitted to grow; therefore, employees had to team up to do something big or collaborate to acquire others' expertise or equipment.

What is required to create such an environment? This question is important precisely because the type of environment that allowed these major corporate labs to flourish no longer exists.

More than money is required: the risks funders are willing to take on ideas and people are even more important than sheer volume of funds. Bringing together, or allowing to self-assemble, a critical mass of interacting scientists and engineers over a considerable length of time – sometimes up to ten

years – is necessary to provide an innovative solution to a particular problem. The practice of not allowing empires to form is probably also important.

I believe that at least some of the creative tensions that existed at Bell Labs must be present in an innovative environment. The best technical innovations come from interdisciplinary teams, not from individuals working alone. A culture of scientific meritocracy is essential. The managers directly supervising or funding research scientists and engineers must themselves be world-class scientists or engineers with a broad view of where a new invention might be best used to create value.

Making highly trained, inventive people available and willing to join an organization's research team requires a strong relationship with the top research universities in the relevant fields, or for the research to come directly from a leading research university. Major U.S. universities have had a better record of educating creative and inventive people than institutions in any other country, and teams of experts working on interesting and challenging projects tend to attract other first-rate scientists and engineers.

When a research team is exposed to challenging real-world problems that require multidisciplinary and diverse expertise, the resulting problem-rich atmosphere generates inventive ideas. Understanding market needs as well as customer reactions to an invention is important. Note also that a challenging problem might require a portfolio of subprojects that exist in three Stokes' quadrants at any one time: Pasteur's problem-driven science, Bohr's curiosity-driven science, and Edison's "do what works" approach. This implies a relatively large team of scientists and engineers working together on a specific technology, yet that team must be small enough to communicate and cooperate effectively. A critical mass could vary from fifteen to one hundred researchers, depending on the range of expertise needed.

At the same time the great industrial R&D labs were forming, another type of complex innovation ecosystem began to emerge, one that integrated public funding with the work of research universities. During and immediately following World War II, the United States established national labs to take over the functions of the Manhattan Project. The federal government also funded a cadre of university scientists, initially recruited to work in the wartime effort, to provide research in the service of national security. After the war, Vannevar Bush, the president's science advisor, provided the imperative for what eventually became a multiagency federal funding source for university research in science and engineering fields related to U.S. economic and national security. This infusion of federal research funding into universities, coupled with the 1980 Bayh-Dole Act, which permitted universities to own the intellectual property generated as a result of federally financed projects, greatly enhanced a scientific revolution in the last two decades of the twentieth century and had a profound effect on industry and innovation. In 1970, two thirds of R&D funding in the United States was from the federal government, a lion's share of the more fundamental scientific research at universities. University research led to the publication of scientific ideas, served as a source of PhD recruits for large, research-intensive companies such as AT&T, and produced a number of entrepreneurial spin-off companies, the disruptive technologies of which, in a number of years, successfully competed with established technologies.

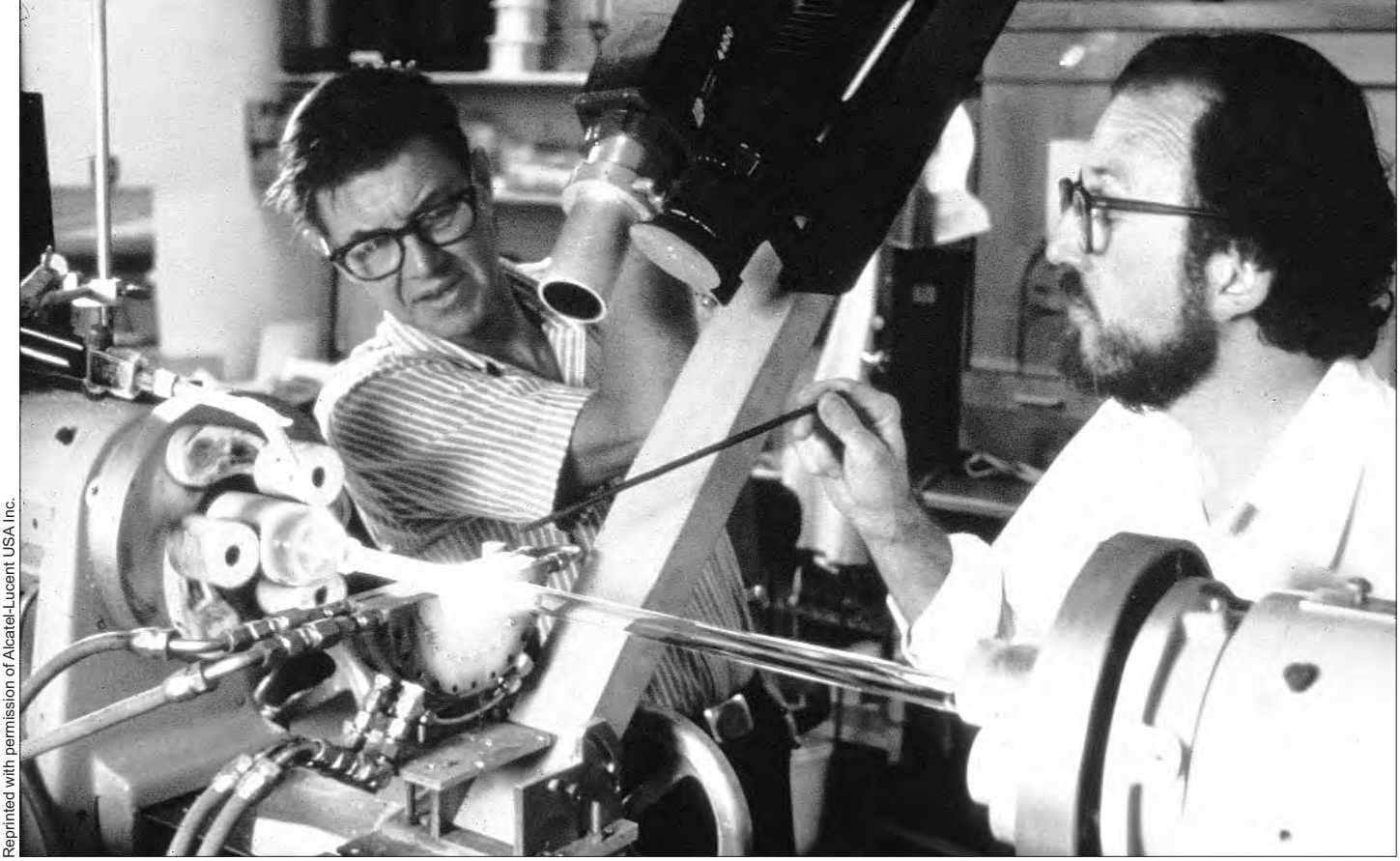
Several complex innovation ecosystems evolved in regions around major universities: notably, Silicon Valley developed around Stanford University, the University of California, Berkeley, and the University of California, San Francisco; and Route 128 grew up around MIT and Harvard University. These entities, in contrast to the large industrial labs, integrated various institutions, sources of venture capital, and the federal and local governments, rather than relying on a single monopolistic employer with mostly internal funding streams. Outcomes for communities and regions were often profound: the North Carolina Research Triangle,[1] for example, was the result of a state investment in innovation services around three major universities. After more than fifty years, it is still a boon for North Carolina's economy.

When a research team is exposed to challenging real-world problems that require multidisciplinary and diverse expertise, the resulting problem-rich atmosphere generates inventive ideas.

What made these local innovation ecosystems successful? Certainly, they shared many of the qualities I observed at Bell Labs. Much research has been done on this subject, including several books by Roger Geiger, an education scholar at Pennsylvania State University.[2] Geiger's findings suggest a few lessons.

[1] Rick L. Weddle, Elizabeth Rooks, and Tina Valdecanas, "Research Triangle Park: Evolution and Renaissance," paper presented at the 2006 International Association of Science Parks World Conference, Helsinki, Finland, June 2006.

[2] Roger L. Geiger and Creso M. Sa, *Tapping the Riches of Science: Universities and the Promise of Economic Growth* (Cambridge, Mass.: Harvard University Press, 2008).



Bell Labs researchers John B. MacChesney (left) and Paul B. O'Connor heat a silica tube on a glass lathe. In 1980, the pair received a patent for a fiber-making process in which highly purified glass layers are formed from chemical vapors that react inside a silica tube when it is heated. Called modified chemical vapor deposition, the process has been widely used by telecommunications firms in the United States and internationally to produce hair-thin glass fibers for transmitting telephone conversations.

First, the ecosystems' physical proximity to several major universities provides a source of people, ideas, and intellectual property. In the late twentieth century, American universities were the predominant source of published scientific research, a notable fact given that the most effective patents on which new revolutions in technology and industries are based have inevitably been those that cite scientific literature. The back-and-forth movement of people from institutions to industry is the best source of knowledge transfer, and it is highly localized around universities.[3] Both Stanford and MIT have undertaken studies showing that a large part of the U.S. and world economy stems from the institutions' respective local environments.

Second, entrepreneurial service providers such as patent lawyers, venture capitalists, human resource specialists, loan providers, laboratory services or machine shops available for fees, mentoring, and relatively inexpensive space to start ventures tend to thrive in close proximity to a cluster of major universities, which are their source of talent and ideas. Encouragement and incentives by local government often help maintain these entrepreneurial services.

Third, intense technical exchange is more likely to occur between university professors and students, venture capitalists, and employees of startups if they regularly run into each other informally at coffee shops or lunch spots.

Fourth, a critical mass of highly motivated and diverse scientists and engineers is a requirement for any innovation ecosystem. (There are debates about what constitutes critical mass in this type of regional ecosystem, but it is greatly enabled by proximity to a cluster of universities, and it surely consists of a complex size distribution for all these elements.)

Fifth, in an environment where venture capital and angel funders bet on people and ideas, a perverse meritocracy persists: that is, entrepreneurs are used to and learn from failure – more so than in large corporations such as Bell Labs.

In the twentieth century, the broad U.S. innovation ecosystem was characterized by a partnership of four key entities: K-12 education, which provided an educated pipeline for universities; research universities, producers of both educated people and knowledge; industry; and government, a source of funding, governance, and regulations. The national system comprised a complex array of many local ecosystems that have generated the vast majority of technological and economic breakthroughs. The 2005 National Academies report *Rising Above the Gathering Storm*, as Chuck Vest discussed, recommended steps the United States could take to maintain all four essential parts of this engine.

In the twenty-first century, how will the impact of technology, market forces, demographics, and – especially – globalization affect this picture of a working, if not ideal, national innovation ecosystem? Will it continue to include local and regional ecosystems? Is it still important to maintain close physical proximity and an easy exchange of

[3] Adam B. Jaffe and Manuel Trajtenberg, "Flows of Knowledge from Universities and Federal Laboratories; Modeling the Flow of Patent Citations over Time and across Institutional and Geographic Boundaries," *Proceedings of the National Academy of Sciences* 93 (1996): 12671 – 12677.

people between the parts? In the Internet and social media age, what kind of connections between people will suffice to create innovation? Are we educating our workforce to compete in a global ecosystem?

As we have observed over the last decade, major corporations are global companies driven by market forces to put their R&D close to their biggest markets – and put their manufacturing in the least expensive and most favorable labor markets. Corporate research labs are moving to large offshore markets such as China and India, countries with educated workforces and research universities that are growing in scientific and technical eminence. Meanwhile, U.S. demographics and entitlements are putting pressure on both federal research budgets and state support of public research universities, and the endowments of private universities were weakened by the 2008 stock market plunge.

The back-and-forth movement of people from institutions to industry is the best source of knowledge transfer, and it is highly localized around universities.

For the United States to flourish in the twenty-first century, we will need a source of entrepreneurial scientists and engineers. I want to focus on how we can change our engineering education, in particular, to foster innovative thinking. As Scott Page, a social scientist at the University of Michigan, has pointed out, a diversity of ideas optimizes problem-solving.[4] Diverse teams may take longer to solve a problem, but they produce a better and more profound solution. Teaching in-depth thinking about problem-solving in a number of different ways is important. I like to think of creating "T-shaped" individuals who are deeply immersed in one discipline but able to communicate across and work with other disciplines.

We also need engineering leaders who will take the long view and be able to hold the creative tensions in an organization in balance. To speak to this need, I will conclude by reading from an editorial that venture capitalist Andy Garman and I wrote on the subject, published today in *The Harvard Crimson*[5]:

> [B]ehind every technological advance inevitably lies an engineer.
>
> China, Korea, and India understand this well, graduating enormous numbers of new engineers. The debate about the need to train and produce more engineers to maintain U.S. competitiveness, however, has obscured an important issue. We don't just need more engineers; we need a different kind of engineer. What we need are engineers who lead, driving not just inventions, but institutions.
>
> The greatest challenges our country and the world face – energy, information access, climate change, sustainability, healthcare, economic development and growth, even financial reform – require the technical knowledge and analytical skills of people trained in the engineering sciences.
>
> [...]
>
> Those who rise to the top of organizations do so in large part because of interpersonal and communication skills, tolerance for real-world ambiguity, and a holistic understanding of organizational needs. Business and law schools tend to attract people with these characteristics and then reinforce them by the nature of their programs and culture.

To provide a foundation for engineering leadership, engineering schools should take a lesson from law and business schools. We aspire to create a new generation of engineers who have deep technical training in a domain, and the breadth of knowledge and character to effectively collaborate with and lead others.

Of course, it takes a great deal of classroom and lab time to be prepared to solve complex technical challenges. The tolerance for technical error is low: airplanes must fly, bridges must stand, and power plants must run.

Without aiming for breadth of knowledge beyond just the technical though, universities risk educating engineers lacking the qualities required for corporate and government leadership. Thankfully, the philosophy of "engineering as a liberal art" – in which engineering discipline is part of a liberal arts curriculum, and students learn by working in multidisciplinary teams to solve real-world problems – is catching on.

We need to foster this holistic way of thinking about the world.

[4] Scott Page, *The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies* (Princeton, N.J.: Princeton University Press, 2007).

[5] Cherry A. Murray and Andrew Garman, "Engineers Who Can Lead," *The Harvard Crimson*, April 14, 2011.

Harvey V. Fineberg

Harvey V. Fineberg is President of the Institute of Medicine. He was elected a Fellow of the American Academy in 1994.

Competitiveness, innovation, and health are all interconnected. We are never going to have a competitive society without a healthy workforce and a healthy population, and we cannot become healthy without innovation in health technology and processes. As has been stated, America currently ranks very poorly on life expectancy – twenty-fourth in the world. For infant mortality, another common, international measure, we are again far behind the frontrunners at thirty-first in the world. There is, however, one health measure in which the United States outdistances all its competitors: how much we spend on health. We spend double the OECD average per capita on health. That's an additional $4,326 per person and with worse results.[1] This grim picture, however, also teaches a very important lesson: we cannot spend our way to better health. Simply spending more money is not going to solve our health challenge; we have run that experiment for fifty years, and it does not work.

To be fair, we are mainly falling behind in a relative sense. Viewed historically, America's track record for population health has been a remarkable success. At the beginning of the twentieth century, the infant mortality rate in the United States exceeded one hundred per one thousand live births.[2] In the early 1900s, the most dreaded disease was tuberculosis[3]; TB was to the beginning of the twentieth century what cancer is to the beginning of the twenty-first century. In 1900, life expectancy at birth was less than fifty years of age[4]; in the space of just one century, life expectancy at birth increased by more than twenty-five years. This last achievement is perhaps the best argument for birth control: wait another year, and your child will have an additional three months of life expectancy! Truly, this past century was an incredible period of progress in health unparalleled in history.

The success of the United States is impressive when measured against its own history, but less so when measured against the staggering pace of improvement in other countries. In the United States, heart disease became the leading killer by the 1920s when it overtook the great infections, going on to peak in the mid-1960s[5] – at about the same time as the first Surgeon General's report on tobacco.

The country with the highest rate of cardiovascular mortality in the 1960s was Finland. Diets there were rich in butter and salt, and Finns were heavy smokers. In 1971, the North Karelia Project (named for the province in Finland it targeted) took up the challenge of trying to rein in this epidemic.[6] The Finns adopted a preventative approach based on the understanding that just as we cannot spend our way to better health, we cannot cure our way to better health: we have to stop the problems before they begin. Armed with this understanding in North Karelia, program officials introduced an array of interventions involving physicians, community organizers, nongovernmental organizations, and government, while launching massive education programs. They intervened at every possible level. The results, after twenty-five years, are quite striking: mortality from heart disease in North Karelia is down by 85 percent; mortality from lung cancer is down by 80 percent; all cause mortality is down by 62 percent. The program was expanded across Finland, and Finland's average life expectancy has now surpassed that of the United States.[7]

Other countries, such as Singapore, have performed similarly – once lagging behind the United States, they are now ahead of us.[8] All of these countries have nearly universal health insurance coverage and have stressed prevention of disease.

We don't have to look abroad for models of exemplary public health policy and practice. There have been major localized successes within the United States. The percentage of U.S. adults smoking tobacco was 42.4 percent in 1965 when the first National Health Interview Survey took place.[9] It has

[1] OECD, *Health at a Glance 2009: OECD Indicators* (Paris: OECD Publishing, 2009); http://www.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance_19991312 (accessed January 17, 2011).

[2] National Center for Health Statistics, *Vital Statistics of the United States, 1982* (Washington, D.C.: Public Health Service, 1985).

[3] National Center for Health Statistics, *Leading Causes of Death, 1900 – 1998,* ed. Public Health Service (Washington, D.C.: Public Health Service, 1998).

[4] National Center for Health Statistics, *Vital Statistics of the United States, 1982.*

[5] National Center for Health Statistics, *Leading Causes of Death, 1900 – 1998.*

[6] Pekka Puska, "The North Karelia Project: 30 Years Successfully Preventing Chronic Diseases," special issue, *Diabetes Voice* 53 (2008): 26 – 29.

[7] OECD, *Health at a Glance* 2009.

[8] The World Bank, World Development Indicators, 2011; http://data.worldbank.org/data-catalog/world-development-indicators?cid=GPD_WDI (accessed May 24, 2011).

[9] Centers for Disease Control and Prevention, *CDC – Trends in Current Cigarette Smoking – Smoking & Tobacco Use,* 2010; http://www.cdc.gov/tobacco/data_statistics/tables/trends/cig_smoking/index.htm (accessed May 24, 2011).

since declined by more than half and is currently around 20 percent. However, success has been uneven across the United States, and some communities have done more to solve the problem and have seen better results. In New York City, there are now three hundred fifty thousand fewer smokers than there were in 2002.[10] Smoking has been banned from public buildings, restaurants, and even parks and beaches.[11] Whereas before, discouragement only came from social norms, it is now being reinforced by public law. Although tobacco played an important part in U.S. history, it is a role best relegated to history. In another hundred years, people are going to look back at this century's attachment to tobacco with utter bafflement.

We can do more. After tobacco, the next critical opportunity is in improving diet and physical activity. Both of these are crucial to solving the obesity epidemic, a growing problem and threat to the future well-being of America. In fact, some estimates are now projecting that obesity has the potential, for the first time, to reverse the continuing curve of advancement in life expectancy.[12] The mayor of Boston recently announced that he was expanding his ban on sugar-sweetened drinks, taking them out of all public buildings in the City of Boston,[13] a strong step in the right direction. That is one area where Boston has now jumped ahead of New York City, and I suspect Mayor Bloomberg is paying attention to Mayor Menino's policy.

We can also learn from the examples set by companies like Johnson & Johnson, which started Live for Life, a health promotion program for employees, more than twenty-five years ago. A recent study compared health and health care costs among Johnson & Johnson and other similarly sized companies from 2002 to 2008.[14] According to this study, the program has yielded healthier employees and an average annual savings of $535 per employee per year in 2007 dollars. Johnson & Johnson was able to build a "culture of health" at the workplace, where American adults spend a large proportion of their time.

There is one health measure in which the United States outdistances all its competitors: how much we spend on health.

There is much to be learned from these individual initiatives. I would love to see a national competition among the mayors of the United States to see who can do more locally to encourage healthier lifestyles. I would love to see governors competing to see which can be the first state to diminish the proportion of overweight and obese. I would love to have a national debate on health that focused not only on the health care system, but also on prevention. Prevention of disease and promotion of health are both connected to health care and to many aspects of policy and daily life, and prevention is the surest path to a healthy nation.

We can do more at every level – personal, family, community, state, and nation-wide. We can learn from our history of what worked, and we can appreciate the power of prevention. We can learn from models of excellence that have been successful at reducing key causes of disease – tobacco, lifestyle, and diet – and we can become a healthier nation, more competitive in the world, and more successful at home. ■

[10] New York City Department of Health and Mental Hygiene, *New York City Smoking Rates Fall to Lowest Rate on Record*, 2009; http://www.nyc.gov/html/doh/html/pr2009/pr023-09.shtml (accessed February 21, 2011).

[11] Javier C. Hernandez, "Council Passes Smoking Ban for City Parks and Beaches," *The New York Times*, February 3, 2011.

[12] Susan T. Stewart, David M. Cutler, and Allison B. Rosen, "Forecasting the Effects of Obesity and Smoking on U.S. Life Expectancy," *New England Journal of Medicine* 361 (23) (2009): 2252 – 2260.

[13] Meghan E. Irons, "Menino Expands Sugary Drink Ban: Some Beverages Won't be Allowed on City Properties," *The Boston Globe*, April 8, 2011.

[14] Rachel M. Henke, Ron Z. Goetzel, Janice McHugh, and Fik Isaac, "Recent Experience in Health Promotion at Johnson & Johnson: Lower Health Spending, Strong Return on Investment," *Health Aff (Millwood)* 30 (3) (2011): 490 – 499.

St. Louis

February 24, 2011

Gerald Early, Cochair of the Academy's Council and Merle Kling Professor of Modern Letters and Director of the Center for the Humanities at Washington University in St. Louis, with **John Dubinsky**, President and CEO of Westmoreland Associates, LLC, and a member of the Board of Trustees of Washington University in St. Louis, at a reception and dinner hosted by Chancellor Mark Wrighton and Mrs. Risa Zwerling Wrighton at their home. The following afternoon, Early moderated the panel discussion "Race in the Age of Obama," the topic of the Winter 2011 issue of *Dædalus*, which he guest edited. To read the panel presentations, see page 12 in this issue.

Korina Jocson, Assistant Professor of Education at Washington University in St. Louis and a contributor to the *Dædalus* volume, with **James Wertsch**, Marshall S. Snow Professor in Arts & Sciences at Washington University in St. Louis

Kenneth Ludmerer, Professor of Medicine at Washington University School of Medicine, and **John McDonnell**, Chairman of the Board (retired) of McDonnell Douglas Corporation, talked with **Mark Wrighton**, Chancellor of Washington University in St. Louis.

New York City

May 4, 2011

Academy Trust member **Kenneth Wallach** (Central National-Gottesman Inc.) and his wife, **Susan Wallach**, welcomed a group of New York-area Fellows to their home for a small reception.

Oscar Tang (New York City), **Susan Wallach**, and **Sara Lee Schupf** (New York City)

Theodore Rogers (American Industrial Partners), **Elizabeth Barlow Rogers** (Foundation for Landscape Studies), and **Kenneth Wallach**

Sarah Leibowitz (Rockefeller University), **Martin Leibowitz** (Morgan Stanley), **David Sabatini** (New York University School of Medicine), and **David McLaughlin** (New York University)

John Whitehead (New York City) and **Helene Kaplan** (Skadden, Arps, Slate, Meagher & Flom LLP)

Washington, D.C.

May 18, 2011

Martha Finnemore, a Professor of Political Science and International Affairs at George Washington University, and **Melvin Kohn**, the William D. and Robin Mayer Distinguished Professor and Professor of Sociology at Johns Hopkins University, attended a small reception for D.C.-area Fellows at the Cosmos Club in Washington, D.C.

Academy President **Leslie C. Berlowitz** welcomed **James A. Leach** (left), Chairman of the National Endowment for the Humanities, and **Earl A. "Rusty" Powell III**, Director of the National Gallery of Art, to the reception.

From left: **Ralph Cicerone**, President of the National Academy of Sciences, talked with **Thomas Lovejoy**, Biodiversity Chair at the Heinz Center for Science, Economics, and the Environment and University Professor at George Mason University, and **Robert W. Fri**, Visiting Scholar and Senior Fellow Emeritus at Resources for the Future.

Boston

May 23, 2011

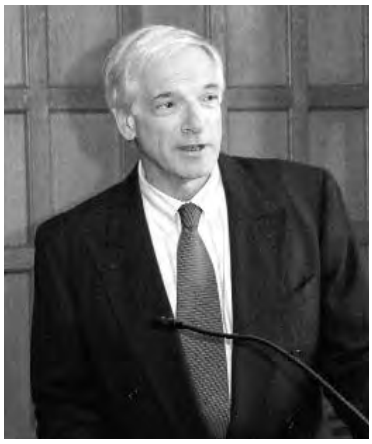
The Academy, together with the Boston Symphony Orchestra, honored music director, conductor, and composer **John Williams** (second from left) at a program held at Boston's Symphony Hall. **Mark Volpe**, the Eunice and Julian Cohen Managing Director of the Boston Symphony Orchestra, joined Academy President **Leslie C. Berlowitz** and **Louis W. Cabot**, Chair of the Academy's Board and Trust, in organizing the event.

Williams paused for a photograph with **Nicholas Zervas**, a Life Trustee of the Boston Symphony Orchestra and a member of the Academy's Development Committee. During the evening's program, Williams signed the Academy's Book of Members. He was elected a Fellow of the American Academy in 2009.

To celebrate Williams's artistry, violinist **Victor Romanul** (left), the Besse Pappas Chair at the Boston Symphony Orchestra, and violist **Michael Zaretsky** performed *Duo concertante*, a work that Williams composed for them. The pair premiered the work at Tanglewood in 2007 and released a recording of it and other duos for violin and viola in 2008.

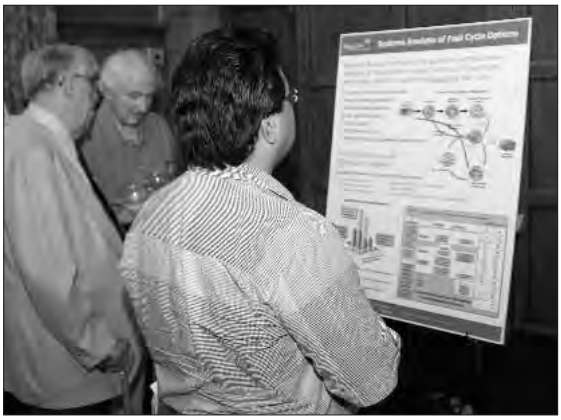
Chicago

June 8, 2011



Robert L. Gallucci, President of the John D. and Catherine T. MacArthur Foundation, participated in the panel discussion "Prospects and Challenges for the Global Nuclear Future: After Fukushima" at an Academy Stated Meeting held at the University of Chicago.

Other panelists included **Steven E. Miller**, Director of the International Security Program at the Belfer Center for Science and International Affairs at Harvard University and Coleader of the Academy's Global Nuclear Future Initiative, **Mark Peters**, Deputy Director for Programs at Argonne National Laboratory, and **Amir Shahkarami**, CEO of Exelon Nuclear Partners and Nuclear Development and Senior Vice President of Exelon Generation, LLC. **Robert Rosner** (not pictured), William E. Wrather Distinguished Service Professor in the Departments of Astronomy and Astrophysics and Physics at the University of Chicago and Senior Advisor to the Academy's Global Nuclear Future Initiative, moderated the discussion.



A poster session with nuclear experts from Argonne National Laboratory

As of press time, several Fellows of the Academy, listed below, had been nominated or appointed to key posts in the Obama administration:

Hyman Bass (University of Michigan): Member, President's Committee on the National Medal of Science

Catherine Bertini (Syracuse University): Member, Board for International Food and Agricultural Development

John Bryson (Edison International): Secretary of Commerce, U.S. Department of Commerce

Francisco G. Cigarroa (University of Texas System): Member, President's Advisory Commission on Educational Excellence for Hispanics

Cora Marrett (National Science Foundation): Deputy Director, National Science Foundation

Claude Steele (Columbia University): Member, National Science Board, National Science Foundation

Select Prizes and Awards

James Roger Prior Angel (University of Arizona) was awarded the 2010 Kavli Prize in Astrophysics. He shares the prize with Jerry E. Nelson (University of California, Santa Cruz) and Raymond N. Wilson (European Southern Observatory).

Timothy Berners-Lee (Massachusetts Institute of Technology) was awarded an honorary doctorate of science from Harvard University.

Caroline W. Bynum (Institute for Advanced Study) was awarded the 2011 Haskins Medal of the Medieval Academy of America.

Albert Carnesale (University of California, Los Angeles) is among the recipients of the 2011 Harvard Medal.

Joanne Chory (Salk Institute for Biological Studies) was named a foreign member of the Royal Society.

Uma Chowdhry (DuPont Engineering) was awarded the Industrial Research Institute's 2011 Medal.

Demetrios Christodoulou (Eidgenössische Technische Hochschule, Zurich) was awarded the 2011 Shaw Prize in Mathematical Sciences. He shares the prize with **Richard Hamilton** (Columbia University).

Donald D. Clayton (Clemson University) was invited by the *Victorian Endowment for Science, Knowledge and Innovation* to present a public lecture entitled "Astronomy with Radioactivity – what is that!" at the Victoria Museum in Melbourne.

Placido Domingo (New York, NY) was awarded an honorary doctorate of music from Harvard University.

Esther Duflo (Massachusetts Institute of Technology) received a Medal of Innovation from the Centre Nationale de la Recherche Scientifique.

Frances Fergusson (Vassar College) is among the recipients of the 2011 Harvard Medal.

Howard Gardner (Harvard University) is the recipient of the 2011 Prince of Asturias Award for Social Sciences.

Ruth Bader Ginsburg (Supreme Court of the United States) was awarded an honorary doctorate of law from Harvard University.

Herbert Gleiter (Institute of Nanotechnology, Germany) was elected a Fellow of the Materials Research Society and was awarded the 2009 Blaise Pascal Medal of the European Academy of Sciences.

Antonio M. Gotto, Jr. (Weill Medical College at Cornell University) is the recipient of the Distinguished Achievement Award of the National Lipid Association.

Richard Hamilton (Columbia University) was awarded the 2011 Shaw Prize in Mathematical Sciences. He shares the prize with **Demetrios Christodoulou** (Eidgenössische Technische Hochschule, Zurich).

Heisuke Hironaka (Tokyo, Japan) is among the recipients of the 2011 Centennial Medal, given by the Graduate School of Arts and Sciences at Harvard University.

Fotis C. Kafatos (Imperial College London) was awarded the 2010 Robert Koch Gold Medal by the Robert Koch Foundation and the 2011 Leibniz Medal by the Berlin-Brandenburg Academy of Sciences and Humanities. He shares the Leibniz Medal with Ernst-Ludwig Winnacker (Human Frontier Science Program).

Richard Lyman (Stanford University) is among the recipients of the 2011 Centennial Medal, given by the Graduate School of Arts and Sciences at Harvard University.

Brenda Milner (McGill University) was awarded the 2011 Pearl Meister Greengard Prize from The Rockefeller University.

Nell Irvin Painter (Princeton University) is among the recipients of the 2011 Centennial Medal, given by the Graduate School of Arts and Sciences at Harvard University.

Henry Petroski (Duke University) was awarded an honorary doctorate of engineering from Missouri University of Science and Technology and delivered the commencement address.

John Greville Agard Pocock (Johns Hopkins University) was awarded an honorary doctorate of law from Harvard University.

James Stewart Polshek (Ennead Architects LLP) is the recipient of the 2011 Summit Award for the Arts.

H. Vincent Poor (Princeton University) is the recipient of the 2011 IEEE Eric E. Sumner Award.

James E. Rothman (Yale University) was awarded the 2010 Kavli Prize in Neuroscience. He shares the prize with **Thomas Südhof** (Stanford University School of Medicine) and **Richard H. Scheller** (Genentech).

David Satcher (Morehouse School of Medicine) was awarded an honorary doctorate of science from Harvard University.

Richard H. Scheller (Genentech) was awarded the 2010 Kavli Prize in Neuroscience. He shares the prize with **James E. Rothman** (Yale University) and **Thomas Südhof** (Stanford University School of Medicine).

Marlan O. Scully (Texas A&M University) is the recipient of the 2011 Herbert Walther Award, given by the Deutsche Physikalische Gesellschaft and the Optical Society of America.

Donna E. Shalala (University of Miami) was awarded an honorary doctoral degree by Ben-Gurion University of the Negev.

Thomas Südhof (Stanford University School of Medicine) was awarded the 2010 Kavli Prize in Neuroscience. He shares the prize with **James E. Rothman** (Yale University) and **Richard H. Scheller** (Genentech).

Susan Treggiari (Oxford, United Kingdom) was named an Honorary Fellow of Lady Margaret Hall, Oxford.

Elizabeth Warren (Harvard Law School; U.S. Department of the Treasury) was inducted into the Oklahoma Hall of Fame.

Susan R. Wessler (University of California, Riverside) is the recipient of the FASEB 2012 Excellence in Science Award.

New Appointments

Jill Abramson (*The New York Times*) was named Executive Editor of *The New York Times*.

Lawrence S. Bacow (Tufts University) was appointed to the Harvard Corporation.

Dean Baquet (*The New York Times*) was named Managing Editor for News of *The New York Times*.

Catherine Bréchignac (Centre National de la Recherche Scientifique) was elected to the Board of Directors of Flamel Technologies.

James Cuno (Art Institute of Chicago) has been appointed President and Chief Executive of the J. Paul Getty Trust.

Ronald A. DePinho (Harvard Medical School/Dana-Farber Cancer Institute) has been appointed President of the MD Anderson Cancer Center at the University of Texas in Houston.

Roger W. Ferguson, Jr. (TIAA-CREF) was named Cochair of the Committee for Economic Development.

Herbert Gleiter (Institute of Nanotechnology, Germany) was appointed to the Presidium of the German National Academy of Sciences Leopoldina.

Susan L. Graham (University of California, Berkeley) was appointed to the Harvard Corporation.

Andrew Hamilton (University of Oxford) was appointed to the Engineering and Physical Sciences Research Council.

Robert E. Page, Jr. (Arizona State University) has been appointed Vice Provost and Dean of the College of Liberal Arts and Sciences of Arizona State University.

Debora Spar (Barnard College) was elected as an independent director of The Goldman Sachs Group, Inc.

Claude Steele (Columbia University) was named Dean of Stanford University's School of Education.

Robert Waterston (University of Washington) was appointed Head of Faculty for Genomics & Genetics at Faculty of 1000 (F1000).

Bruce Western (Harvard University) was named faculty director at Harvard Kennedy School's Malcolm Wiener Center for Social Policy.

Select Publications

Poetry

Yves Bonnefoy (Paris, France). *Second Simplicity,* trans. Hoyt Rogers. Yale University Press, January 2012

Donald Hall (Wilmot, New Hampshire). *The Back Chamber*. Houghton Mifflin Harcourt, September 2011

Adam Zagajewski (University of Houston). *Unseen Hand,* trans. Clare Cavanagh. Farrar, Straus and Giroux, June 2011

Fiction

Xuefei Jin (Ha Jin) (Boston University). *Nanjing Requiem*. Pantheon, October 2011

Amos Oz (Ben-Gurion University of the Negev, Israel). *Scenes from Village Life,* trans. Nicholas de Lange. Houghton Mifflin Harcourt, October 2011

Nonfiction

Alain Berthoz (Collège de France). *Simplexity : Simplifying Principles for a Complex World,* trans. Giselle Weiss. Yale University Press, January 2012

Caroline W. Bynum (Institute for Advanced Study). *Christian Materiality : An Essay on Religion in Late Medieval Europe.* Zone Books, April 2011

Keith Christiansen (Metropolitan Museum of Art) and Stefan Weppelmann (Gemäldegalerie), eds. *The Renaissance Portrait : From Donatello to Bellini*. Yale University Press, November 2011

Gerald L. Early (Washington University in St. Louis). *A Level Playing Field : African American Athletes and the Republic of Sports*. Harvard University Press, April 2011

Susan T. Fiske (Princeton University). *Envy Up, Scorn Down : How Status Divides Us*. Russell Sage Foundation, April 2011

Howard Gardner (Harvard University). *Truth, Beauty, and Goodness Reframed*. Basic Books, April 2011

Annette Gordon-Reed (Harvard University). *Andrew Johnson*. Times Books, January 2011

Greg Grandin (New York University), Deborah Levenson (Boston College), and Elizabeth Oglesby (University of Arizona), eds. *The Guatemala Reader : History, Culture, Politics.* Duke University Press, November 2011

Benjamin Harshav (Yale University). *Three Thousand Years of Hebrew Verse : Encounters of Sound and Meaning*. Yale University Press, January 2012

Eric Hobsbawm (University of London). *How to Change the World : Tales of Marx and Marxism.* Yale University Press, September 2011

Robert Hollander (Princeton University). *La "Commedia" di Dante Alighieri,* with commentary by Robert Hollander ; trans. and ed. Simone Marchesi. Olschki, June 2011 ; *The Elements of Grammar in Ninety Minutes*. Dover Publications, July 2011

Thomas Keneally (University of California, Irvine). *Three Famines : Starvation and Politics.* PublicAffairs, August 2011

Randall Kennedy (Harvard Law School). *The Persistence of the Color Line : Racial Politics and the Obama Presidency.* Pantheon, August 2011

Donald R. Kinder (University of Michigan) and Allison Dale-Riddle (University of Michigan). *The End of Race ? Obama, 2008, and Racial Politics in America*. Yale University Press, January 2012

James Lehrer (News Hour with Jim Lehrer). *Tension City : Inside the Presidential Debates, from Kennedy-Nixon to McCain-Obama.* Random House, September 2011

Errol Morris (Fourth Floor Productions). *Believing Is Seeing : Observations on the Mysteries of Photography.* Penguin Press, September 2011

Henry Petroski (Duke University). *An Engineer's Alphabet : Gleanings from the Softer Side of a Profession.* Cambridge University Press, November 2011 ; *The Essential Engineer : Why Science Alone Will Not Solve Our Global Problems.* Vintage Books, March 2011

Robert C. Post (Yale Law School). *Democracy, Expertise, and Academic Freedom : A First Amendment Jurisprudence for the Modern State.* Yale University Press, January 2012

Richard Rose (University of Aberdeen), William Mishler (University of Arizona), and Neil Munro (University of Edinburgh). *Popular Support for an Undemocratic Regime : The Changing Views of Russians.* Cambridge University Press, May 2011

Nayantara Sahgal (Uttar Pradesh, India). *Jawaharlal Nehru : Civilizing a Savage World*. Penguin, November 2010

Harry N. Scheiber (University of California, Berkeley). *Ohio Canal Era : A Case Study of Government and the Economy, 1820 – 1861.* Ohio University Press, January 2012

Richard Sennett (New York University ; London School of Economics). *Together : The Rituals, Pleasures, and Politics of Cooperation.* Yale University Press, January 2012

Seymour Slive (Harvard University). *Jacob van Ruisdael : Windmills and Water Mills.* Getty Publications, June 2011

Garry Wills (Northwestern University). *Rome and Rhetoric : Shakespeare's Julius Caesar.* Yale University Press, November 2011

Commissions

Elizabeth Diller and **Ricardo Scofidio** (Diller Scofidio + Renfro Architects) were selected to design the Burton and Deedee McMurtry Building at Stanford University.

We invite all Fellows and Foreign Honorary Members to send notices about their recent and forthcoming publications, scientific findings, exhibitions and performances, and honors and prizes to bulletin@amacad.org. ■

Remembrance

*It is with sadness that the Academy notes the passing of the following members.**

Ernst Badian – February 1, 2011; elected to the Academy in 1974

Robert Edward Baldwin – April 7, 2011; elected to the Academy in 1995

Paul Baran – March 26, 2011; elected to the Academy in 2003

Michael Andre Bernstein – May 25, 2011; elected to the Academy in 1995

Baruch Samuel Blumberg – April 5, 2011; elected to the Academy in 1990

David Salzer Broder – March 9, 2011; elected to the Academy in 1990

Warren Christopher – March 18, 2011; elected to the Academy in 1988

Joel Colton – April 17, 2011; elected to the Academy in 1979

Thomas Eisner – March 25, 2011; elected to the Academy in 1969

Walter Monroe Fitch – March 11, 2011; elected to the Academy in 1991

Robert Louis Fleischer – March 3, 2011; elected to the Academy in 1981

Lucian Freud – July 20, 2011; elected to the Academy in 2004

Quentin Howieson Gibson – March 16, 2011; elected to the Academy in 1971

Maurice Goldhaber – May 11, 2011; elected to the Academy in 1965

Sidney Harman – April 12, 2011; elected to the Academy in 2003

Leon Alma Heppel – April 9, 2010; elected to the Academy in 1970

Gerhard Paul Hochschild – July 8, 2010; elected to the Academy in 1979

Daniel D. Joseph – May 24, 2011; elected to the Academy in 1993

W. Barclay Kamb – April 21, 2011; elected to the Academy in 1987

David T. Kearns – February 25, 2011; elected to the Academy in 1992

Richard Leacock – March 23, 2011; elected to the Academy in 1978

Ilse Lehiste – December 25, 2010; elected to the Academy in 1990

Donald Benjamin Lindsley – June 19, 2003; elected to the Academy in 1965

John Grimes Linvill – February 10, 2011; elected to the Academy in 1974

William Nunn Lipscomb – April 14, 2011; elected to the Academy in 1960

Max Vernon Mathews – April 22, 2011; elected to the Academy in 1982

Frank Ambrose McClintock – February 20, 2011; elected to the Academy in 1961

Ernan Vincent McMullin – February 8, 2011; elected to the Academy in 1986

David Marshall Prescott – February 19, 2011; elected to the Academy in 1970

Nicholas V. Riasanovsky – May 14, 2011; elected to the Academy in 1987

Warren Max Rohsenow – June 3, 2011; elected to the Academy in 1956

David E. Rumelhart – March 13, 2011; elected to the Academy in 1991

John Henry Sinfelt – May 28, 2011; elected to the Academy in 1980

Fritiof Stig Sjostrand – April 6, 2011; elected to the Academy in 1965

Anatoli Vladimirovich Skorokhod – January 3, 2011; elected to the Academy in 2000

Leo Steinberg – March 13, 2011; elected to the Academy in 1978

William J. Stuntz – March 15, 2011; elected to the Academy in 2008

Leo John Thomas – April 11, 2011; elected to the Academy in 1991

Cy Twombly – July 5, 2011; elected to the Academy in 1998

Simon Van der Meer – March 4, 2011; elected to the Academy in 1984

Harry Blackmore Whittington – June 10, 2010; elected to the Academy in 1953

Bruce Darrell Winstein – February 28, 2011; elected to the Academy in 2007

Jack K. Wolf – May 12, 2011; elected to the Academy in 2005

Rosalyn Sussman Yalow – May 30, 2011; elected to the Academy in 1978

**Notice received from February 25, 2011, to July 29, 2011*

AMERICAN ACADEMY
OF ARTS & SCIENCES

Norton's Woods, 136 Irving Street, Cambridge, MA 02138
telephone 617-576-5000, *facsimile* 617-576-5050,
email aaas@amacad.org, *website* www.amacad.org

Bulletin Summer 2011
Issued as Volume LXIV, Number 4

The Bulletin of the American Academy of Arts & Sciences (ISSN 0002–712X) is published quarterly by the American Academy of Arts & Sciences. Periodicals rate postage paid at Boston, MA, and at additional mailing offices. Postmaster: Send address changes to *Bulletin*, American Academy of Arts & Sciences, 136 Irving Street, Cambridge, MA 02138.

PHOTO CREDITS

Steve Rosenthal	page 1, top
Imijination Photography	pages 2–4, 43
Martha Stewart	front cover, bottom photo; pages 5, 10, 24–27, 29, 32, 34, 39
Eric Craig Studios, Inc.	pages 7–8, 45
Jerry Naunheim Jr.	pages 14, 16, 18, 20
Mary Butkus	page 41
Wendy Barrows	page 42
Stu Rosner	page 44

Correction:
In the Spring 2011 issue, Jonathan R. Cole's presentation "The Great American University" stated that "the father of psychoanalysis and his wife, Sigmund and Anna Freud," were among the émigrés to England and the United States following Hitler's rise to power. Freud's wife, Martha Bernays, did accompany him to England; however, Anna was Freud's daughter, who also joined her mother and father.