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Dealing with North Korea's Nuclear Program

Stephen W. Bosworth, Steven E. Miller, and Siegfried S. Hecker



Remembering H.M.

*Robert Desimone, Suzanne Corkin,
Elizabeth Kensinger, and John D. E. Gabrieli*



The Getty Center: Research, Conservation, and Collections

Thomas W. Gaehtgens and James Cuno

ALSO: Commission Meeting Focuses on the Humanities and Social Sciences
in International Relations
Internet Pioneers Discuss the Future of the Web
Nuclear Nonproliferation Diplomats Gather in Vienna

Upcoming Events

Induction Weekend – Cambridge

October 5 – *Celebrating the Arts and the Humanities*

October 6 – *Induction Ceremony*

October 7 – *Symposium: Cherishing America*

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Clockwise from top left: Jim Leach (National Endowment for the Humanities), Danielle Allen (Institute for Advanced Study), Sir Tim Berners-Lee (World Wide Web Consortium; MIT), Siegfried S. Hecker (Stanford University), Robert Desimone (MIT), James Cuno (J. Paul Getty Trust)

Knowing Ourselves and Others: Commission Meeting Focuses on the Humanities and Social Sciences in International Relations

At its April 26–27, 2012, meeting in Washington, D.C., the Academy’s Commission on the Humanities and Social Sciences examined the importance of the liberal arts to America’s national security, to maintaining an effective foreign policy, and to continued U.S. leadership in the global economy.

“Tomorrow’s leaders will require a nuanced understanding of the world beyond our borders and a cosmopolitan approach to cultural difference,” said Academy President Leslie C. Berlowitz. “The Commission is considering a range of issues, including the importance of the humanities and social sciences to international, intercultural communication.”

During the two-day meeting, several current and former high-ranking government officials presented compelling arguments

for the importance of international education, suggesting that skills acquired through study abroad programs, foreign language training, and area studies programs are vital to national interests.

Retired Army Lieutenant General and former U.S. Ambassador to Afghanistan Karl Eikenberry told Commission members that the humanities and the social sciences “are absolutely critical if our nation is to maintain its leading position globally.” Eikenberry noted that America has three kinds of power at its disposal in pursuing its national security goals – coercive, remunerative, and persuasive – and that deep knowledge and expertise in foreign languages and cultures is critical for all three. He cited the 1958 National Defense Education Act as a model for the kind of investment in foreign language learning and regional studies that could benefit the nation today.

National Endowment for the Humanities Chairman Jim Leach also addressed the group. The former senior member of the House Committee on International Relations stated that the humanities – especially history – will be critical if the United States is to succeed as a global power. “As a society, we must know ourselves and how we think, and learn to consider how other cultures and societies think,” he said.

In his keynote remarks to the Commission, then U.S. Secretary of Commerce John Bryson linked future economic growth to the vitality of liberal arts education. “There is an important and greatly underappreciated connection between the humanities and social sciences and the creative, entrepreneurial spirit that drives the American economy,” Bryson said. “We will need not only specialists who can generalize, but the generalists who can specialize.”



Jim Leach (National Endowment for the Humanities) and **Karl Eikenberry** (Stanford University)



Philip Bredeesen (Nashville, Tenn., former Governor of Tennessee) and **George Lucas** (Lucasfilm Ltd.)

The Commission also discussed the future of cultural diplomacy with former U.S. Ambassador to the Netherlands Cynthia Schneider and the evolution of a common, K-12 curriculum with Richard Laine, Director of the National Governors Association's education division.

Four members of Congress called on the Academy to form the blue-ribbon Commission to recommend specific steps to bolster the humanities and social sciences in schools, universities, and public life. Three of the four members – Sen. Lamar Alexander (R-Tennessee), Rep. David Price (D-North Carolina), and Rep. Tom Petri (R-Wisconsin) – also addressed the group during the Washington meeting. The fourth official to call for the Commission is Sen. Mark Warner (D-Virginia).

Commission members include national leaders from higher education, business,

journalism, the arts and humanities, and public affairs. The Commission is cochaired by Duke University President **Richard H. Brodhead** and Exelon Corporation Chairman Emeritus **John Rowe**.

“To sustain our domestic and international security, the strength of our institutions, and even our scientific and technological enterprise, the nation needs to produce citizens broadly literate in the humanities and social sciences as well as in the natural sciences, technology, and engineering,” Berlowitz said.

Commission members are now planning a series of regional forums around the country, to take place before the Commission issues its initial recommendations next year. These gatherings will provide Commission members with new perspectives, engage key stakeholders, and catalyze public interest in the Commission's work. ■



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



Kwame Anthony Appiah (Princeton University), **Pauline Yu** (American Council of Learned Societies), and **Gerald Early** (Washington University in St. Louis)



Tom Campbell (Chapman University School of Law, former Member of Congress from California) and **Richard H. Brodhead** (Duke University)



John Rowe (Exelon Corporation)

Internet Pioneers Discuss the Future of the Web

American Academy and Royal Society Launch Joint Lecture Series on GREAT Science

The Internet has revolutionized how we use, access, and share information. As the technology becomes faster and more affordable, its benefits are reaching even more people and places. Yet as its user base broadens, the global Internet is increasingly fractured along national, linguistic, and cultural lines.

This was just one of several issues discussed at a recent Academy meeting on “The Evolution of the Internet: Challenges and Opportunities.” The meeting, held June 6, 2012, was presented in collaboration with the Royal Society and the British Consulate-General; it was moderated by Tom Leighton, Chief Scientist at Akamai Technologies and Professor of Applied Mathematics at the Massachusetts Institute of Technology (MIT). The program featured talks by Sir Tim

Berners-Lee, Director of the World Wide Web Consortium and 3COM Founders Professor of Engineering at MIT, and David D. Clark, Senior Research Scientist at the MIT Computer Science and Artificial Intelligence Laboratory.

Academy President Leslie Berlowitz and British Consul General to New England Phil Budden welcomed more than 250 guests to the event, which was the first in a series on GREAT Science organized by the U.K. government’s Science and Innovation Network. “Fellows of the American Academy – from Charles Babbage to Tim Berners-Lee – have been instrumental in the creation of the Digital Age,” Berlowitz said. “Many of them have also been members of the Royal Society, so it is fitting that we begin our GREAT Science

collaboration with a conversation about the future of the Internet.”

“The Internet, the World Wide Web, and Big Data are . . . fundamental to our shared prosperity and, indeed, our security going forward,” Budden said in his opening remarks.

Tom Leighton began the discussion by addressing the consequences for governance and science in particular. “Making vast amounts of data freely available on the Web,” he noted, “could have fundamental implications for government transparency as well as for how scientific research is advanced in such areas as drug discovery, climate research, Web analytics, and many other fields.”



From left: David D. Clark (MIT), Tom Leighton (Akamai Technologies; MIT), and Sir Tim Berners-Lee (World Wide Web Consortium; MIT)



Academy President **Leslie Berlowitz** and British Consul General to New England **Phil Budden** offer opening remarks at the American Academy and Royal Society inaugural program on GREAT Science.

American Academy and the Royal Society Launch GREAT Science Lecture Series

On June 6, 2012, the American Academy and the Royal Society launched a nationwide lecture series to celebrate scientific ties between the United States and the United Kingdom. The joint lecture series on GREAT Science was organized by the U.K. government's Science and Innovation Network to profile international science excellence. The U.S. lecture series will feature Fellows of the American Academy and the Royal Society who will discuss scientific topics of significance to society. Future lectures are scheduled for Chicago, Atlanta, Houston, Los Angeles, San Francisco, Washington, New York, Ottawa, and Vancouver.

The panelists then discussed new opportunities and challenges for consumer access, as Web-based information proliferates. Tim Berners-Lee, who invented the World Wide Web in 1989, talked about increasing access through technologies such as mobile devices. "In developing countries, [mobile technology] is all they've got," he said. "So if you can make the Web work on mobile devices, then you can get it to people who don't have Internet connections by wire." When one member of a village saves up to buy a smartphone, for example, the entire village gains access to information and communication capabilities that would not otherwise be available. The challenge, according to Berners-Lee, is for users to "make a connection to somebody who is on the other side of a boundary," whether national, cultural, or geographic.

David Clark, who served as Chief Protocol Architect in the development of the Internet, examined the issues that develop in tan-

dem with increased access and cross-border connections. "At the international level," Clark noted, "we have a lot of disagreement about what the Internet should be." Although the Internet has the technical capacity to carry information between machines anywhere in the world, the user experience differs from country to country – what Clark calls "the local character of the Internet." Websites and content are tailored to local cultural and linguistic preferences: "If you look up something in a different country, it's not just that it's in a different language; you get a different answer," he explained.

The meeting touched on a range of topics – government control, censorship, copyright law, and open data – including many that were explored in the Fall 2011 issue of *Dædalus*, "Protecting the Internet as a Public Commons," which was guest edited by David Clark. To view or listen to the presentations, visit <http://www.amacad.org/events/EvolutionOfTheInternet.aspx>. ■

Nuclear Nonproliferation Diplomats Gather in Vienna



William Potter (Monterey Institute of International Studies), **Steven E. Miller** (Harvard University), and **Scott D. Sagan** (Stanford University)

Every five years, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) comes up for review by member states. The next Review Conference will not take place until 2015, but delegates recently gathered in Vienna, Austria, for the first of three preparatory sessions. From April 30 to May 11, 2012, delegates discussed ways to ensure full implementation of the treaty and to promote its universality. They also considered what progress has been made to strengthen the NPT regime since the 2010 Review Conference.

With 190 member states, the NPT is notoriously difficult to manage and reform. Each state has different perceptions of the NPT's adequacy and fairness, as well as its flaws and weaknesses. Learning how to bridge these differences will be crucial to the future success of the treaty. Over the last four years, the Academy's Global Nuclear Future (GNF) Initiative has become a leader in this effort, publishing new ideas for NPT regime improvement in our occasional paper series and bringing together scholars and policy-makers for debate and collaboration.

On May 4, 2012, the Academy convened more than fifty of the senior-level government representatives gathered for the Preparatory Committee meeting to address challenges facing the NPT regime. Organized in collaboration with the Vienna Center for Disarmament and Nonproliferation and the James Martin Center for Nonproliferation Studies, the symposium was chaired by leaders of the GNF Initiative: **Steven E. Miller**, codirector (Harvard University); **Scott D. Sagan**, codirector (Stanford University); and **Robert Rosner**, senior advisor (University of Chicago). More than twenty-five countries were represented at the meeting.

The off-the-record conversation explored many of the ideas set forth in *Nuclear Collisions: Discord, Reform & the Nuclear Nonproliferation Regime*, a recent publication from

the GNF Initiative. In that paper, Steven Miller outlines the main points of contention within the NPT regime and prescribes five ways to manage, minimize, or even overcome these divergences. "The Academy symposium in Vienna was a tremendous opportunity to share our work and findings with practitioners who are involved in the regular management of the NPT regime," said Miller.

Participants also heard brief opening remarks from Ambassador Susan Burk (Special Representative of the U.S. President for Nuclear Nonproliferation, U.S. Department of State), **William Potter** (Director of the James Martin Center for Nonproliferation Studies at the Monterey Institute of International Studies), **CHIN Siew Fei** (Counselor and Deputy Resident Representative of Singapore to the International Atomic Energy Agency), and Ambassador **CHO Hyun** (Embassy of the Republic of Korea to Austria and Permanent Mission of the Republic of Korea to the International Organizations in Vienna).

Scott Sagan remarked after the Vienna symposium that "these off-the-record meetings have become a valuable forum for sharing ideas about potential 'win-win compromises' between groups of states that have not previously seen common interests in specific NPT reform proposals. Steven Miller's paper on *Nuclear Collisions* usefully outlines principles that could encourage further diplomatic and technical measures to strengthen the regime. Many of the diplomats at our meetings have said that the frank discussions of these kinds of proposals have helped them identify areas of potential common interest."

The GNF Initiative is a comprehensive interdisciplinary, multi-institutional, and multi-national project; it is distinct in bringing together diverse communities to develop pragmatic approaches to limit the safety, security, and nonproliferation concerns associated with the global spread of nuclear energy. The work of the Initiative had an



Susan Burk (Special Representative of the U.S. President for Nuclear Nonproliferation, U.S. Department of State)

impact on the outcome of the 2010 NPT Review Conference and has informed the U.S. President's Blue Ribbon Commission on America's Nuclear Future as well as the 2010 and 2012 Nuclear Security Summits. The Initiative is working with nuclear newcomers to identify paths that permit the peaceful use of nuclear power while minimizing the potential adverse consequences of the spread of inherently risky nuclear technologies. The leaders of the Initiative will continue to inform international policy-makers as they weigh the pursuit of nuclear energy programs alongside safety, security, and economic concerns.

The GNF Initiative is supported by Carnegie Corporation of New York; The William and Flora Hewlett Foundation; The John D. and Catherine T. MacArthur Foundation; the Alfred P. Sloan Foundation; the Flora Family Foundation; and Fred Kavli and the Kavli Foundation. The Academy is grateful to these foundations for advancing the work of the Initiative. ■

Recent Publications from the Global Nuclear Future Initiative

Nuclear Collisions: Discord, Reform & the Nuclear Nonproliferation Regime

Steven E. Miller, Wael Al-Assad, Jayantha Dhanapala, C. Raja Mohan, and Ta Minh Tuan

Lessons Learned from "Lessons Learned": The Evolution of Nuclear Power Safety after Accidents and Near-Accidents

Edward D. Blandford and Michael M. May

The Back-End of the Nuclear Fuel Cycle: An Innovative Storage Concept

Stephen M. Goldberg, Robert Rosner, and James P. Malone

Game Changers for Nuclear Energy

Kate Marvel and Michael May

Nuclear Reactors: Generation to Generation

Stephen M. Goldberg and Robert Rosner

Shared Responsibilities for Nuclear Disarmament: A Global Debate

Scott D. Sagan, James M. Acton, Jayantha Dhanapala, Mustafa Kibaroglu, Harald Müller, Yukio Satoh, Mohamed I. Shaker, and Achilles Zaluar

Multinational Approaches to the Nuclear Fuel Cycle

Charles McCombie and Thomas Isaacs, Noramly Bin Muslim, Tariq Rauf, Atsuyuki Suzuki, Frank von Hippel, and Ellen Tauscher

"On the Global Nuclear Future," vols. 1 – 2, *Dædalus* (Fall 2009; Winter 2010)



For electronic copies of GNF publications, visit <http://www.amacad.org/projects/globalnuclearbooks.aspx>.

How Does the Nuclear Industry Learn and Adapt?

Invaluable lessons can be learned from serious nuclear accidents, such as those at Fukushima, Three Mile Island, and Chernobyl. Yet minor incidents and near-accidents provide important lessons as well. These experiences often reveal not only how to decrease the likelihood that the same mistakes will occur, but also how to avoid larger accidents that may be foreshadowed in earlier, smaller incidents.

In *Lessons Learned from “Lessons Learned”: The Evolution of Nuclear Power Safety after Accidents and Near-Accidents*, Edward D. Blandford and Michael M. May enumerate the lessons from nuclear accidents and incidents, asking whether the nuclear energy community has indeed learned from those lessons. The authors argue that stakeholders must commit to ongoing improvement of their protocols and standards. Each nuclear incident – no matter its size – underlines the importance of pursuing high standards of safety, security, and proliferation resistance.

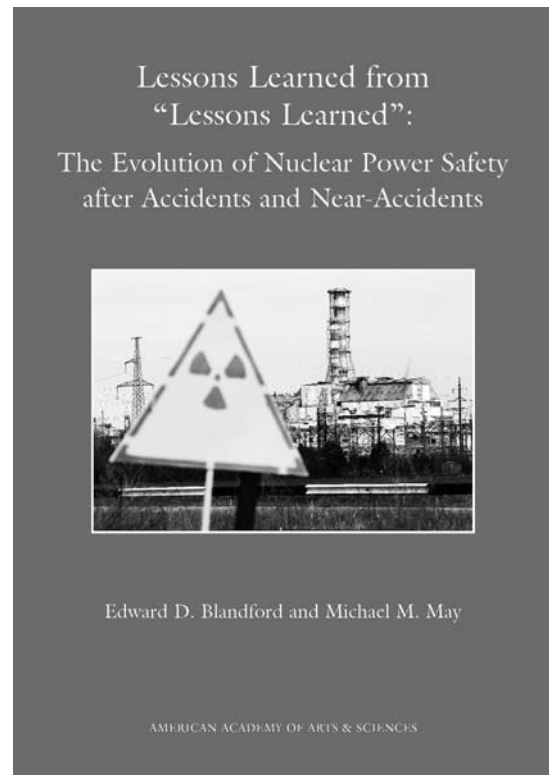
Blandford and May also emphasize the need for coordination among nuclear states. “Mechanisms to facilitate and, where needed, enforce mutual learning have not always been adequate,” they write. “Information-sharing, import/export agreements based on safety standards, agreements to facilitate cooperation among regulatory authorities, and the participation of financial interests such as investors and insurers all have a role to play in improving mutual learning among different states.”

May is Professor Emeritus (Research) in the School of Engineering at Stanford University, where he is also a Senior Fellow in the Freeman Spogli Institute for International Studies. He is former Codirector of Stanford’s Center for International Security and Cooperation (CISAC) and is Director Emeritus of the Lawrence Livermore National Laboratory. Blandford is a Stanton Nuclear Security Postdoctoral Fellow at CISAC; he also serves as an adjunct Research Assistant Professor in the Department of Chemical and Nuclear Engineering at the University of New Mexico.

Lessons Learned is the latest publication from the Academy’s Global Nuclear Future (GNF) Initiative, which is working to identify and promote measures that will limit the safety, security, and proliferation risks raised by the global expansion of nuclear energy. Through innovative scholarship and behind-the-scenes interactions with international leaders and stakeholders, the Initiative is devel-

oping pragmatic recommendations for managing the emerging nuclear order. The Initiative is led by **Steven Miller**, codirector (Harvard University); **Scott Sagan**, codirector (Stanford University); **Robert Rosner**, senior advisor (University of Chicago); and **Stephen M. Goldberg**, research coordinator (Argonne National Laboratory).

The GNF Initiative is supported in part by grants from Carnegie Corporation of New York, The William and Flora Hewlett Foundation, The John D. and Catherine T. MacArthur Foundation, the Alfred P. Sloan Foundation, the Flora Family Foundation, and Fred Kavli and the Kavli Foundation. The Academy is grateful to these supporters and to the project leaders for advancing the work of the Initiative. ■



To download *Lessons Learned* and other GNF publications, visit <http://www.amacad.org/projects/globalnuclearbooks.aspx>.

Dædalus Explores New Directions for Science in the 21st Century

Recent scientific advances have fundamentally changed our understanding of the world. Many of these advances will have an enormous effect on society and the natural environment. For instance, DNA sequencing technologies have implications that range from treating neurologic disorders to optimizing plant cultivation, while tiny machines operating at the nanoscale may someday obscure the distinction between technology and life. Where will these developments take us next? How can they be applied to the most pressing challenges that we face?

In the Summer 2012 issue of *Dædalus*, “Science in the 21st Century,” leaders from the physical and biological sciences present engaging, accessible snapshots of recent research in their fields. They explore the practical applications of new discoveries and identify questions for further inquiry. Guest edited by **Jerrold Meinwald**, the Goldwin Smith Professor of Chemistry Emeritus at Cornell University, and **May R. Berenbaum**, Professor and Head of the Department of Entomology at the University of Illinois at Urbana-Champaign, the volume covers areas of study from planetary science, physics, mathematics, and chemistry to biology, ecology, and evolutionary theory. While celebrating the intellectual accomplishments of recent decades, the issue emphasizes that there is much left to learn.

The essays offer a view of where science is headed in the coming decades – not an easy task, the editors maintain. In his preface to the volume, Meinwald reflects on his own field of organic chemistry: “[M]ost of the work done by organic chemists in the year 2000 and beyond has depended heavily on the application of experimental techniques and on theories that simply did not exist a half-century earlier,” he writes. “The lesson (well known, but easily forgotten) is that anticipating future events is difficult.” Berenbaum echoes this sentiment in her essay:

“The conduct of science depends on cold, hard, verifiable facts, and forecasting the future is necessarily rife with uncertainty.”

In looking to the future, the essays are full of the sense of wonder that drives scientific inquiry. Robotic space exploration is homing in on worlds within our solar system that may have the potential to support life. Mathematical laws help us make predictions about the observable universe, from natural processes to social phenomena such as policy preferences. And new work in microbiology has revealed that bacteria communicate with one another and even organize to act collectively.

Many of the essays confront the most urgent threats to humankind and the planet: feeding a growing population as usable land and resources dwindle; using security, sustainability, and affordability as guideposts to rethink energy systems; mitigating rapid species loss due to pollution, climate change, and land degradation; and promoting biodiversity to restore the ecosystems that all life relies on to survive.

Whether we succeed in benefiting materially from the enormous strides that science is now making will be determined largely by how the public and particularly policy-makers respond to the ever-increasing understanding of where we and our world come from, and where the laws of nature will allow us to go. ■

Dædalus, Summer 2012 “Science in the 21st Century”

Jerrold Meinwald (Cornell University), “Prelude”

James F. Bell III (University of Arizona), “The Search for Habitable Worlds: Planetary Exploration in the 21st Century”

Terence Tao (University of California, Los Angeles), “*E pluribus unum*: From Complexity, Universality”

Paul L. McEuen (Cornell University), “Small Machines”

Daniel G. Nocera (Massachusetts Institute of Technology), “Can We Progress from Solipsistic Science to Frugal Innovation?”

Nima Arkani-Hamed (Institute for Advanced Study), “The Future of Fundamental Physics”

Bonnie L. Bassler (Princeton University), “Microbes as Menaces, Mates & Marvels”

Neil H. Shubin (University of Chicago), “Fossils Everywhere”

Chris Somerville (University of California, Berkeley), “Deciphering the Parts List for the Mechanical Plant”

Gregory A. Petsko (Weill Cornell Medical College; Brandeis University), “The Coming Epidemic of Neurologic Disorders: What Science Is – and Should Be – Doing About It”

David Tilman (University of Minnesota), “Biodiversity & Environmental Sustainability amid Human Domination of Global Ecosystems”

May R. Berenbaum (University of Illinois at Urbana-Champaign), “Postlude”

New York City

May 14, 2012

More than 150 Academy members and guests attended a reception in New York City in honor of New York Area Fellows. Leslie C. Berlowitz (President of the Academy), Alan Alda (actor, writer, and director), Roger W. Ferguson, Jr. (President and Chief Executive Officer, TIAA-CREF), and Carol Gluck (George Sansom Professor of History, Columbia University) spoke about the unique role that the Academy plays as the nation's oldest independent research center, addressing complex challenges to our civil society and national competitiveness.



Carol Gluck (Columbia University), **Roger W. Ferguson, Jr.** (TIAA-CREF), **Alan Alda** (New York, New York), and Academy President **Leslie C. Berlowitz**



Carol Kekst (New York, New York), **Gershon Kekst** (Kekst and Company), and **Gerald Rosenfeld** (Lazard Ltd.; New York University)



James S. Tisch (Loews Corporation), **Billie Tisch** (Tisch Foundation), **Helene Kaplan** (Skadden, Arps, Slate, Meagher & Flom LLP & Affiliates), and **Joel Conarroe** (John Simon Guggenheim Memorial Foundation)

The American Academy is one of the few institutions trusted to bring the best of private sector thinking – academic thinking, business thinking, creative thinking – to our most important national problems.

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

The idea that you have been invited in to this convening of intellect and concern, and that your talent can be combined with that of others in this organization, is an extraordinary idea.

– Alan Alda
actor, writer, and director

The Academy is unusual because it is a nonpartisan place, where people of very different persuasions, whether they be intellectual or political, come together to address an issue.

– Carol Gluck
George Sansom Professor of History,
Columbia University



Steven Siegelbaum (Columbia University College of Physicians and Surgeons), **George Rupp** (International Rescue Committee), and **Shu Chien** (University of California, San Diego)



Daniel Mendelsohn (Bard College), **Thomas Hines** (University of California, Los Angeles), and **Richard Gardner** (Columbia Law School)



Igor Klebanov (Princeton University), **Leslie C. Berlowitz** (American Academy), **Cathleen Morawetz** (New York University), and **Laura Engelstein** (Yale University)



Don Michael Randel (Andrew W. Mellon Foundation), **Roger W. Ferguson, Jr.** (TIAA-CREF), and **Antonio M. Gotto Jr.** (Weill Cornell Medical College)

Dealing with North Korea's Nuclear Program

On April 12, 2012, North Korea unsuccessfully launched a long-range missile that was intended to carry an Earth observation satellite into space. North Korea fired the long-range test rocket in defiance of UN Security Council resolutions and an agreement with the United States. On the eve of the launch, the Academy convened leading North Korea experts to discuss the broader geopolitical and nonproliferation implications of North Korea's nuclear program. The following is an edited transcript of the discussion, which served as the Academy's 1984th Stated Meeting.



Steven E. Miller

Steven E. Miller is Director of the International Security Program at the Belfer Center for Science and International Affairs at the Harvard Kennedy School. Elected a Fellow of the American Academy in 2006, he serves as Cochair of the Academy's Committee on International Security Studies and Codirector of the Academy's Global Nuclear Future Initiative.

The Academy has chosen a propitious time to examine the implications of North Korea's nuclear program. We are expecting that at any moment the country will launch a missile linked to a satellite – an act that the United States and much of

the world regard as provocative. The missile launch is conjoined to speculation that North Korea may be in some stage of preparation for another nuclear test. So the issue is now at a boil. But those of you who follow nuclear affairs will know that this story has at least a twenty-year history. Indeed, the first crescendo was reached in the early 1990s, when a confrontation with the Clinton administration led to serious worries about war and to a last-minute diplomatic solution, the Agreed Framework, under which North Korea agreed to freeze its nuclear program in return for various kinds of U.S. assistance. Ambassador Bosworth played a major role in this process.

From that day to the present, North Korea's nuclear program has never ceased to be a source of concern, though the issue has waxed and waned. Over the course of the last decade, North Korea has all but left the reservation. In 2003, it withdrew from the Nuclear Non-Proliferation Treaty. In 2006, it conducted its first nuclear test (which was not entirely successful, but it did go “boom”). In 2009, it carried out a second test of a nuclear device. Along the way, it has conducted a small number of missile tests. That marriage of missiles and weapons is particularly disturbing to those who are within range of the missiles.

The present is an acute moment in a very long story. Fortunately, we have two exceptionally qualified people to help us understand and decode what is going on. Ambassador Stephen Bosworth is Dean of The Fletcher School of Law and Diplomacy at Tufts University. He has a long and distinguished past in American diplomacy, serv-

ing from 1995 to 1997 as the head of the Korean Peninsula Energy Development Organization, the institution created to help implement the Agreed Framework that was achieved in 1994. He was also Ambassador to the Republic of Korea from 1997 to 2001 and Special Representative for North Korea Policy in the Obama administration from 2009 to 2011.

Siegfried “Sig” Hecker is Research Professor of Management Science and Engineering at Stanford University, where he is also Codirector of the Center for International Security and Cooperation. Sig has also had a long and distinguished career in the American nuclear weapons complex. A metallurgist by training, he served from 1986 to 1997 as Director of the Los Alamos National Laboratory. He has also been a valued member of the Academy's Global Nuclear Future Initiative. Among other distinctions, Sig has had extensive exposure to North Korea's nuclear facilities, visiting North Korea seven times. Along with one or two other individuals, he has seen more of North Korea's facilities than anyone outside of the International Atomic Energy Agency. He is unrivaled as a decoder of the technical dimensions of the North Korean program, both where it is today and where it is headed.



Stephen W. Bosworth

Stephen W. Bosworth is Dean of The Fletcher School of Law and Diplomacy at Tufts University. From March 2009 to October 2011, he was the U.S. Special Representative for North Korea Policy in the Obama administration. He also served as U.S. Ambassador to the Republic of Korea from 1997 to 2001, as U.S. Ambassador to the Philippines from 1984 to 1987, and as U.S. Ambassador to Tunisia from 1979 to 1981. He has been a Fellow of the American Academy since 2010.

When I returned to the problems of North Korea in Spring 2009, having been away from them for almost ten years after I left Seoul as Ambassador, I found a number of fundamental differences. First, the strategic context within which the United States and our allies and partners were dealing with the threat of North Korea had shifted dramatically. In the 1990s, including when I was Ambassador to South Korea, we treated the North Korea issue largely as a matter for the United States to settle. But in 2009, I found an entirely different regional context.

First, in the 1990s, months would pass in which I did not consider China's views on the North Korea issue because China, by choice, was not actively engaged in the diplomacy of North Korea. Second, the South Korea I returned to in 2009 was different in many ways from the one that I had known in the 1990s. In particular, the point of view of the South Korean administration on how to deal with its neighbor was very different from the view held by the Kim Dae-jung administration, which had been in power when I was there previously. Third, in my earlier experience, Japan had been a principal partner to the United States in trying to cope with the problems of North Korea. By 2009, Japan's role was different, in part because Japan had become much more preoccupied with its own domestic condition. Although Japan was still concerned about nukes and missiles, its primary expressed interest was the fate of the Japanese abductees who had been taken by North Korea thirty years ago.

In the early 2000s, these three countries, together with the United States and Russia, formed what was called the six-party process to negotiate with North Korea. This multilateral context was quite different from the era of the early 1990s, when the United States had self-assuredly stepped forward to deal with the threat of North Korea. Some things, however, were the same. And in that sense, we were able to begin putting together a program for dealing with North Korea in the 2000s. All five nations continue to have a common interest in seeing that North Korea does not become a permanent nuclear weapons state. However, in addition to that common goal, each country has specific national interests.

China, for example, does not want to have a nuclear North Korea, but neither does it want to see North Korea collapse. North Korea plays the vital role of a buffer state between China and U.S. military ally South Korea. China's nightmare is to someday wake up in a world where the Koreas have

reunified and have a military relationship with the United States. From the Chinese perspective, that turn of events would be a sharply negative shift in the correlation of forces in Northeast Asia.

As I mentioned, Japanese policy is driven by strong public interest in the fate of the Japanese abductees. That is not to say that Japan is not actively concerned about North Korea's nuclear program. But Japan has taken a somewhat less assertive role in regional diplomacy compared to the 1990s, when it was one of our key partners in dealing with North Korea under the Agreed Framework of Geneva.

The changes in South Korea's role are perhaps the most interesting of all. As China's preeminence in the region has risen, so has South Korea's importance, at least from the perspective of the United States. South Korea has become an even more important U.S. ally and partner within the region than a decade ago. It is a flourishing democracy, a prospering economy, and a growing power both regionally and globally. The United States now looks to South Korea to offset somewhat the rise of China. The United States is very conscious of South Korea's interests, especially with regard to North Korea. The result, from a U.S. policy-making perspective, is that South Korea now has more sway in the formulation of a coordinated U.S.-South Korean approach to North Korea than was the case in the 1990s. I am not saying that the United States failed to consider South Korea's interests in the 1990s; but I can assure you that, based on my experience in both periods, we give much more importance today to what South Korea wants.

For the United States, given this mélange of interests and activities, North Korea's nuclear program is an even more complicated geopolitical issue than it was in the 1990s when we operated under the Agreed Framework. The threat from North Korea has remained much the same. That threat is twofold. One component is the nuclear threat, a strategic concern that has clearly

We need to reduce our focus on the nuclear and missile issues that have constituted the heart of our North Korea agenda over the last twenty years. As long as North Korea feels that it has leverage with us because of our concerns about its nuclear and missile programs, it will use that leverage and will become even more difficult to deal with.

deepened. The fissile material that North Korea had in the 1990s was estimated to be sufficient for one or two nuclear devices. After breaking out of the Agreed Framework, the country was able to produce enough fissile material for an estimated eight to twelve devices, assuming that it has not produced any fissile material from the technology Sig Hecker glimpsed when he visited in 2010: namely, uranium enrichment. In the past, their fissile material was all plutonium based. But we believe that North Korea has made significant progress in uranium enrichment – specifically, that it has enriched uranium to a level whereby it could potentially be used for producing more fissile material and, eventually, nuclear weapons.

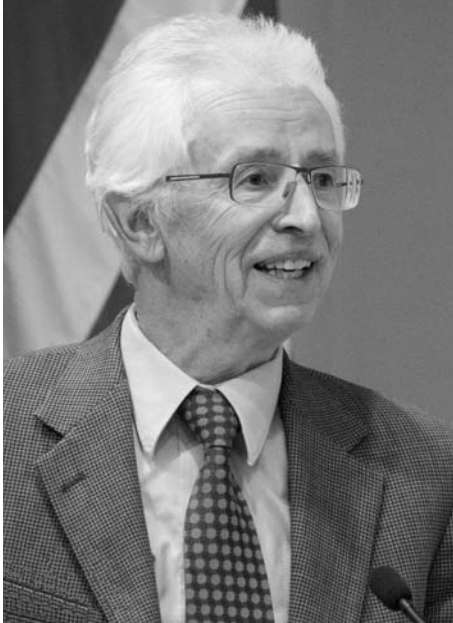
The second, and in some ways the greater, threat that North Korea presents within the region is instability. It is essentially a failed state in the heart of what is perhaps the most important region in the world. Its neighbors are concerned that its instability could explode at any time. That concern has, of course, been exacerbated over the last few months with the death of Kim Jong-il and the coming to power (or at least coming into office) of Kim Jong-un. I am not among the observers who believe that Kim Jong-un has any great degree of authority over decision-making in North Korea. But he clearly has a role; he is the public face of the regime, and he seems to be asserting himself in a fairly vigorous way.

So it is not just the nuclear and missile programs that are worrisome. It is the longer-term problem of a potentially unstable North Korea. Our options for dealing with this second threat are, to say the least, not good. Some argue that our goal should be somehow to prompt regime change in North Korea. Believe me, if I could see a way to do that without putting several million South Koreans at risk, I would be sorely tempted, because this is a despicable regime. But in addition to its nuclear capabilities, North Korea has the capacity to hold the ten to twenty million South Koreans in metropolitan Seoul hostage to its conventional forces – namely, rockets and artillery. The U.S. military has estimated that North Korea could put several hundred artillery shells a minute into metropolitan Seoul. Such an attack would do horrendous damage to South Korea. So North Korea must be dealt with very gingerly.

The other option is to try to engage with the regime, to change its perception of its self-interest. We have been trying to do that for nearly twenty years. The problem is that North Korea is very difficult to engage. Moreover, it is very difficult for democracies to sustain the kinds of policy necessary to maintain engagement on an extended basis. Alexis de Tocqueville was right when he said that exercise of foreign policy is one of the weaknesses of democratic systems because (to paraphrase him) foreign policy success requires the steady application of attention and force over a protracted period of time.

In our system of government, where our perception of interests and the world changes on a fairly frequent basis (or at least with our electoral cycle), that requirement is very hard for us to meet. And unfortunately, North Korea has become a contentious issue within our domestic body politic. It is difficult to sustain the level of commitment and attention required to engage with North Korea over a long period of time. Yet we do not have an alternative. Diplomatic engagement may be challenging, but it is the only mechanism I see us being able to pursue in order to change gradually the environment of the Korean peninsula.

To some extent, we need to reduce our focus on the nuclear and missile issues that have constituted the heart of our North Korea agenda over the last twenty years. We must begin to address the longer-term issue of instability. As long as North Korea feels that it has leverage with us because of our concerns about its nuclear and missile programs, it will use that leverage and will become even more difficult to deal with. While we made some progress during my time as Special Representative for North Korea Policy, that progress has proved not to be lasting. North Korea has now taken us back to where we were in Summer 2009 following its tests of a missile and another nuclear device.



Siegfried S. Hecker

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My role in the North Korea problem has been a technical one. I am not a diplomat and will leave the diplomacy to Ambassador Bosworth; but I will venture into the technical side of how to deal with the impossible situation that he described. First, I will give you a breakdown of the nuclear program and the missile program, then I will discuss the threats we face and where we stand.

I have been to North Korea seven times, so much of what I will tell you I have seen in person. In our Track II diplomacy interactions, the North Koreans have shown me much of their nuclear program. On the basis

of what I have seen, my colleagues and I have put together the best estimate of what their capabilities are. We still have many questions, but we are better off today than we were seven years ago in terms of understanding just what North Korea's nuclear and missile programs entail.

I agree with Ambassador Bosworth that the North Korea problem is much more than a nuclear and missile issue. But in the United States, our glasses have nuclear colors; every time we look at North Korea we see only nuclear issues. Yet we cannot deal with the problem by focusing on nuclear weapons alone. North Korea has the bomb, but it does not have much of a nuclear arsenal. In my view, neither South Korea nor the continental United States and our assets around the world are currently in danger of being attacked by a North Korean nuclear weapon. However, North Korea indeed wants to put us at risk. It has continued to enhance its nuclear program to give the impression that it can do so, and the government has not veered from that objective over the last twenty years. The country has been developing nuclear capability for more than fifty years, but it is only in the last twenty that we have become greatly concerned.

I would give North Korea credit for four to eight plutonium bombs. Because we know that a bomb requires about the amount of plutonium that was in the Nagasaki bomb (approximately 6 kilograms), we can make an estimate based on what I saw in North Korea and on its production records. We can see when its reactors operate. We know that it has conducted two nuclear tests, though we don't know exactly how much plutonium was used in those tests. And we also have an idea of how many processing losses it would have incurred. All this information suggests that North Korea has somewhere between 24 and 42 kilograms of plutonium: that is, enough for four to eight bombs. Some observers estimate twelve; others say that the number is lower.

At less than 1 kiloton, the first test was not very successful (in comparison, Nagasaki was 21 kilotons, or the equivalent of 21,000 tons of TNT). The second test was closer to 5 kilotons; in my opinion, that test was successful. And if they can do 5 kilotons, they can do 20. However, based on those, let's say one-and-a-half, tests, I do not believe that North Korea has the requisite knowledge to miniaturize a nuclear bomb or warhead that it could then mount on a missile. Consider that the United States has conducted 1,054 nuclear tests, and that Russia has conducted 715. North Korea does not yet have that capability, and certainly would not have the confidence to launch a nuclear warhead. To miniaturize a nuclear warhead will be one of the strong drivers for North Korea to conduct further tests.

There is very little question that North Korea is working on miniaturizing. I am sure they have designs and computer calculations. But again, for comparison, the Nagasaki bomb weighed ten thousand pounds and was delivered by a B-29 bomber. To put a bomb on a missile, depending on whether it is short range or an ICBM (intercontinental ballistic missile), it has to be less than 500 kilograms or so. That is a long way from the Nagasaki bomb. Moreover, with a nuclear warhead you not only have to make it go up, but you also have to bring it back down and put it through reentry. There are mechanical and thermal stresses, and you have to do a great deal of testing. North Korea is not there yet.

As far as missiles are concerned, the North Koreans are not calling tonight's launch a *missile* launch; they are calling it a *space* launch. That is, they will attempt to launch a satellite into space. They have already conducted three long-range rocket tests. (Let's just call them rockets, whether they are meant to have a satellite or a warhead on top.) The first test, which took place in 1998, scared the Japanese because it flew over Japan; but it was not fully successful. The second one, in 2006, blew up at the gantry

and was a total failure. In the third test, in 2009, the first two stages were successful, traveling quite far. In the third stage, the rocket either blew up or did not disconnect right. North Korea never did get a satellite into orbit.

Why is North Korea trying another space launch (or missile test) now? First, three previous tests are not very many. We know that they have been preparing to complete the next long-range rocket test for several years, and the centennial of Kim Il-sung's birth seems a good time for them to carry out the test. We have been expecting another launch attempt at some point, but also realize that North Korea's nuclear program is actually quite slow.

North Korea indeed wants to put us at risk. It has continued to enhance its nuclear program to give the impression that it can do so, and the government has not veered from that objective over the last twenty years.

The launch is predicted to take place at 9:30 tonight. Whether or not it is successful, the North Korean public will surely be told that it was. The North Korean people believe that the previous satellite launches (from two of the three long-range rocket tests) were successful, and that North Korea now has two satellites orbiting in space. I saw them personally at the planetarium museum in Pyongyang – two little red dots going around in circles. The guide was telling visitors that those were the two satellites. So as far as the North Korean public is concerned, the launch will be successful. [Note added in print: The rocket launch occurred at 7:37 pm that night and was a dismal failure; enough so that Pyongyang for the first time admitted a failure.]

North Korea maintains that it has a sovereign right to launch a satellite. Iran has done so, and, in fact, just recently launched its

third satellite since 2009. The United States did not put up a terribly big fuss over Iran, but North Korea is regarded differently. The argument is that the latest UN Security Council Resolution, Resolution 1874, prohibits the country from conducting a missile launch of any kind, including a satellite launch. Certainly, North Korea is breaking the rules of the resolution. Why does this matter? Regardless of whether it is a space launch or a missile launch, the first two stages of this three-stage rocket pose a dual-use problem. Testing also presents an opportunity to learn a great deal about long-range missiles. This fourth test will provide information that could eventually be used to build an ICBM.

North Korea does not now have an ICBM; its rockets take too long to fuel. If we saw North Korea fueling a missile with a warhead to send our way, we would have time to react. The program also lacks the capacity for reentry; our best intelligence indicates that the necessary flight tests have not been conducted. So North Korea is still a long way from launching a missile with a nuclear warhead. However, if they do launch a satellite, they will undoubtedly learn more about the missile.

What worries me the most is the road-mobile, one-stage missile system that was brought out at an October 2010 parade in Pyongyang. Called the Musudan, this former Soviet SS-N-6 submarine ballistic missile system contained nuclear warheads. The fact that it is road mobile makes the threat even greater because such a system is very hard to find. But there is no indication that

the Musudan has ever been tested. However, some of my colleagues have speculated that the second stage of the Unha-3 rocket that is currently sitting on the launch pad looks just like the Musudan. So again, tonight's launch might provide information. But do we have to worry about being attacked tomorrow? The answer is no.

As I mentioned, North Korea has 24 to 42 kilograms of plutonium bomb fuel; we think it takes around 6 kilograms to make a bomb. North Korea has voluntarily not restarted the Yongbyon nuclear reactor that was shut down in 2007. Observers in the United States say that the reactor cannot be restarted because it is decrepit, but I do not think this is true. Again, having been there and having talked to the North Koreans, I believe that they could restart the reactor if they wanted to. Still, the best they could do would be to make enough plutonium to power one bomb per year. But they are not producing plutonium right now; all they have is a handful of plutonium bombs.

When I visited in November 2010, they showed me not only uranium enrichment but also a light water reactor that they are building. The reactor they had was a gas-graphite reactor (gas cooled, graphite moderated) that could be fueled with natural uranium, so they did not have to enrich. They are now building a light water reactor because the Agreed Framework, which Ambassador Bosworth helped put together with KEDO (the Korean Energy Development Organization), fell apart during the Bush administration in late 2002. The agreement had stipulated that the United States would provide North Korea with light water reactors. So North Korea is telling us, "You didn't keep your promise; we're going to build our own." The reactor will also make plutonium, but this fact does not concern me greatly: it will not make high-quality bomb-grade plutonium.

What about uranium enrichment? North Korea took the plutonium path to the bomb, but like every other country that has the

If we do not want North Korea to build more bombs, that means no high-enriched uranium, no plutonium, no better bombs, and, most important, no nuclear tests.

bomb, it also took the uranium path. The difference is that the North Koreans have denied it. They may have admitted to enriching uranium in October 2002, depending on which side of the story you hear. Certainly, they denied it during the first six of my seven visits, claiming they had neither the personnel nor the equipment. But a number of signals pointed to the fact that they have uranium enrichment facilities. I once said to Vice Minister Kim Kye-gwan, “I know, of course, that you have uranium enrichment.” His response was, “You don’t understand our country, Dr. Hecker.”

But in November 2010, they showed me the smoking gun. My jaw dropped. There weren’t just a few dozen centrifuges; there were two thousand of them, housed in an ultra-modern facility. I and my two Stanford colleagues said, “My God! How did they get so many of them?” Our North Korean hosts claimed that they had started enriching only after my visit in 2009. But to amass such a large number of centrifuges from April 2009 to November 2010 would have been impossible. Indeed, they had been working on uranium enrichment for decades, and on this particular setup for a number of years. Even though they say that the facility was designed to make low-enriched uranium – which is reactor fuel, not bomb fuel – it turns out that you can replumb that type of facility to make bomb fuel. I do not think that this facility is making bomb fuel, but there must be another facility – one that is also set up for low-enriched uranium but, in all likelihood, is being used for making high-enriched uranium as well.

The problem is that we do not know how much high-enriched uranium they have made. The best we can do is estimate how

much of the key materials for centrifuges they could have purchased through clandestine networks. These networks include greedy European businessmen who hocked their wares to A.Q. Khan as well as connections in Malaysia, South Africa, and Dubai. All the same materials and facilities that A.Q. Khan, Libya, and Iran have acquired, North Korea has acquired, too. At present, North Korea might have some high-enriched uranium, but only a substantial increase in that capacity would present a grave concern.

The threat of a nuclear attack is very low. Although miscalculations and accidents are worrisome, uranium enrichment does not change the threat much, unless North Korea indeed makes a lot more. What concerns me the most is export of nuclear technologies. North Korea built a reactor in Syria for producing plutonium, which Israel destroyed in 2007. It also exported some of the precursors for uranium enrichment to Libya. This process of export is the main problem.

What should we do to deal with North Korea today? As Ambassador Bosworth noted, there are no good options. However, what we ought not to do is the same thing we have done during all previous crises and then expect different results. More UN Security Council sanctions will not do any good; China will not let sanctions have an impact. Maybe what we ought to do is not say much. Instead, we should focus on the things that will not make the threat worse. I have been pushing the U.S. government to pursue threat reduction. Although domestic politics presents some obstacles, we can go to China and say, “Look, we must reduce the threat, and you don’t want matters to get worse.” I have been trying to relay to our government what I call the “three nos”: no more bombs,

no better bombs, and no export. For the time being, North Korea has nuclear weapons, and there is not much we can do about it. They are not going to give them up in the short term.

But if we do not want North Korea to build more bombs, that means no high-enriched uranium, no plutonium, no better bombs, and, most important, no nuclear tests. We should also work to prevent North Korea from exporting sensitive materials and technologies, though that objective is hard to enforce. Ultimately, our main focus should be to ensure that North Korea does not conduct another nuclear test. In 2009, North Korea walked away from the six-party talks, launched a long-range rocket, and followed that with a nuclear test. We do not want to replay that event. ■

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To view or listen to the presentations, visit http://www.amacad.org/events/statedmeetings/1984_NorthKorea.



Remembering H.M.

The Academy's 1981st Stated Meeting on February 15, 2012, featured members of the Catalyst Collaborative@MIT performing a staged reading of Wesley Savick's play *Yesterday Happened: Remembering H.M.* At the age of twenty-seven, H.M. (as he was known to the world) became frozen in time. After experimental brain surgery, he was unable to form new memories. His personal tragedy became neuroscience's opportunity, contributing more to our understanding of the brain than had been learned in the previous one hundred years. The staged reading was followed by a panel discussion about memory and cognition. Four distinguished neuroscientists, including researchers who worked with H.M., explored the important contributions that this patient made to our understanding of memory, learning, and identity. An edited transcript of the discussion follows. (Image above: Barlow Adamson in *Yesterday Happened: Remembering H.M.*, 2012, MRI scan of H.M. by André van der Kouwe.)



Robert Desimone

Robert Desimone is Director of the McGovern Institute for Brain Research and the Doris and Don Berkey Professor in the Department of Brain and Cognitive Sciences at the Massachusetts Institute of Technology. He was elected a Fellow of the American Academy in 2001.

Statistics suggest that half the people in this room will suffer from Alzheimer's disease by age eighty-five. This extraordinary figure is sometimes dismissed by people outside the field because they believe it must be hype, but it actually is true. The best research shows a remarkable prevalence of Alzheimer's disease. And although hardly a week goes by without some fantastic discovery about memory and Alzheimer's disease being reported in the news (and we all are hoping for a cure very soon), I am 100 percent confident that every person in this room has spent some time seriously contemplating what the loss of their memory would be like. So it is with a combination of fascination and dread that we consider the case of H.M.

H.M. had his hippocampus removed by the neurosurgeon William Scoville, who believed that it would relieve H.M.'s otherwise incurable epilepsy. The surgery resulted in the complete loss of H.M.'s ability to form most types of memory, which therefore localized memory to the hippocampus, a structure roughly the size of your thumb. Why was this discovery so amazing? It was the early 1950s, and the idea that any functions were localized in the brain was not universally accepted until a few years before the

of memory research. His memory impairments were initially reported by Brenda Milner, who is arguably the mother of modern neuropsychology. Just a short time later, she made another, perhaps equally amazing, discovery: that H.M. had not lost the ability to form all kinds of memories. She gave H.M. (who could not even remember meeting her the day before) a test in which he had to learn how to write by watching his hand in a mirror. It was a bit odd and required some practice, but with time, he learned to do the

What occurred was a very sad personal tragedy for H.M., but it opened up the field of memory research. Brenda Milner discovered that H.M. had not lost the ability to form all kinds of memories. That discovery initiated decades of work on trying to understand which forms of memory were dependent on the hippocampus, and which forms were dependent on other structures.

case of H.M. Recall that in the early 1800s, phrenologists who made claims about localized functions in the brain were ridiculed by the scientific establishment. In 1906, Camillo Golgi and Ramón y Cajal shared a Nobel Prize for their work in neuroscience. In his acceptance speech, Golgi said that based on his observations of the brain, all brain cells were part of the same cytoplasm. Therefore, Golgi maintained, localization of function in the brain could not occur: each part was equal to any other part. Cajal proceeded to counter his co-winner, stating that based on *his* observations, the brain is composed of discrete elements, which have unique functions. Can you imagine this happening today with two Nobel Prize recipients reaching the opposite conclusion on the same question?

What occurred was a very sad personal tragedy for H.M., but it opened up the field

task. That observation initiated decades of work on trying to understand which forms of memory were dependent on the hippocampus, and which forms were dependent on other structures. Scoville had not just dissected out the function of memory from the other functions in the brain; his scalpel had in fact begun to dissect memory itself.

All our panelists worked personally with H.M., except for me. My work in memory is at the micro level and involves animals. My role in the case of H.M. is a sort of inherited involvement from my scientific mentor at the National Institutes of Health, Mort Mishkin, who performed a critical experiment in animals. Until that time, scientists trying to replicate H.M.'s amnesia in animal studies had failed to find any convincing evidence of the hippocampal damage causing the profound amnesia from which H.M. suffered. But Mishkin discovered that if he in-

cluded a bit more of the temporal lobe, beyond the hippocampus itself, then the monkeys he used as subjects became similarly amnesic. This finding meant that humans, long thought to be unique in the way their memories were organized, shared many basic memory system properties with animals. That raised all kinds of questions about how the hippocampus interacts with other systems in the brain, and that debate has continued to this day.

Mishkin's research also raised the question, what exactly was removed from H.M.'s brain? And that turns out to be another fascinating detective story. The chief detective in that story, Suzanne Corkin, will tell you a bit about the work involved in trying to figure out precisely what Scoville did. In fact, the surgical notes on the procedure are not quite accurate, and there have been a number of surprises in H.M.'s case throughout the years. I hope the members of our panel will also tell you a bit about their personal involvement with H.M. because I know that every one of them formed warm feelings for H.M. They felt a great deal of compassion for H.M. from working with him over the years. But the irony was that it was not reciprocated. He did not recognize them from day to day. It is interesting to imagine how you would form a relationship with someone who does not recognize you. Our panelists will tell you their accounts of this fascinating story.



Suzanne Corkin

Suzanne Corkin is Professor of Behavioral Neuroscience in the Department of Brain and Cognitive Sciences at the Massachusetts Institute of Technology.

I will first show you an MRI scan of Henry's brain from 1992. Figure 1 is a horizontal section, so imagine that the brain is

used to be. In sections A and B, you can see in the back of Henry's brain that his cerebellum is badly atrophied. This loss is not an effect of the operation; it is because he took large doses of the anti-seizure medication Dilantin for many years. But more important, in sections C, D, E, and F, you can see Henry's lesion in both temporal lobes. The damage extended 5.4 centimeters back from the tip of the temporal lobe on the left side, and 5.1 centimeters on the right side. Scoville estimated that the extent of the lesion was eight centimeters, so he greatly overestimated how much tissue he took out. Only with the advent of MRI have we been able to obtain a more accurate idea of the true size of the lesion.

The night Henry died, a hearse brought his body to the Martinos Center for Biomedical Imaging at the Massachusetts General Hospital, where we scanned him for nine hours in a 3 Tesla scanner. André van der Koewe put together a short movie of the images from one particular scan. These coronal images move from front to back as if you are looking at the front of Henry's brain and progressing to the back. Starting in the front, the images show his eyes, nose, and frontal lobes. Next, the black areas reveal his enlarged ventricles and medial temporal lobe lesions, which are fluid-filled spaces in his brain. The images reveal that his corpus cal-

I worked with H.M. from 1962 until he died in 2008. He didn't really know who I was. He could pick my name out of a list of names beginning with C, but he didn't know whether Corkin was a man or a woman, and he didn't know what I did. But in recent decades, he always thought that I was a friend.

sliced from front to back. In this kind of imaging, the bright white signal is cerebral spinal fluid. It shows where fluid is present and brain tissue is absent. In many cases, the white patches indicate where brain areas

losum is thin, and that, further back in the brain, the ventricles are still large. Finally, in the back, the images show the atrophied cerebellum.

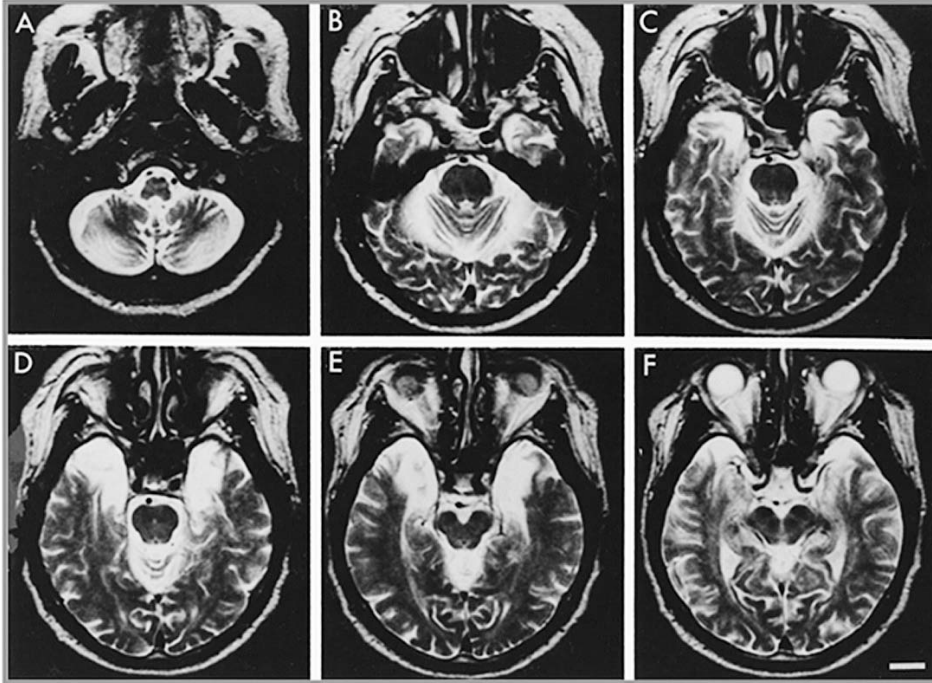


Figure 1. T-2 Weighted Axial Sections indicating the Extent of H.M.'s Anterior Temporal Lobe Resection Bilaterally. © Suzanne Corkin; used by permission of The Wylie Agency LLC.

In photographs of H.M.'s actual brain from right after the autopsy, in a ventral view, you can see the olfactory bulb on one side, both olfactory tracts, and the optic chiasm. In the back is his shriveled cerebellum, which would normally extend out farther on each side and also farther in back. The lesion begins just after the tip of the temporal lobe and progresses back. We think that the surgeon may have deliberately stopped just short of a blood vessel so that he did not cause more damage by cutting it. Similarly, on the left side, is the tip of the temporal lobe. The lesion extends back from here to another blood vessel. A close-up image of the left side of the front of the brain reveals the olfactory tract, the temporal lobe, and the lesion extending back from the temporal lobe and stopping; it is the same on the right side.

One question I am often asked is whether H.M. knew who I was. I worked with him from 1962 until he died in 2008. The answer is no, and yes. He didn't really know who I was. He could pick my name out of a list of names beginning with C, but he didn't know whether Corkin was a man or a woman, and he didn't know what I did. But in recent decades, he always thought he knew me from high school. So when I asked him if we had ever met before, he would say, "Yes, in high school." When I approached him in his room, or in the nursing home where he was living, he always thought that I was a friend.



John D. E. Gabrieli

John D. E. Gabrieli is Director of the Athinoula A. Martinos Imaging Center at the McGovern Institute for Brain Research at the Massachusetts Institute of Technology and the Grover Hermann Professor in Health Sciences and Technology and Cognitive Neuroscience in the Department of Brain and Cognitive Sciences at MIT.

As a graduate student, I had the remarkable privilege of working with Suzanne Corkin and, for much of my Ph.D. thesis, with H.M. He was a wonderfully kind and cooperative participant, and he could not have been a better research collaborator. He did everything he could to help the scientists working with him learn as much as possible. The dramatic feature of H.M.'s condition, as Bob Desimone mentioned, was that the removal of a local section of tissue had resulted in a global amnesia; whether information was verbal or spatial, emotionally powerful or trivial, he remembered no events and very few facts from the day of the surgery to the

day he died. There were some exceptions, but they were small compared to what is typical of a memory.

The primary lesson was that a local injury could have a global consequence for learning and memory. But the second lesson, which Bob also alluded to, was, in a way, the opposite: the short list of skills that H.M. could learn perfectly normally fueled another revolution. In modern understanding, the human brain is like a symphony orchestra of learning instruments. Between your ears are specialized circuits, all learning their own parts, typically collaborating, but operating

We have learned from H.M., and from many researchers, that we have multiple memory systems between our ears, each specialized for learning different kinds of information.

to some degree as islands unto themselves. For an example, we can look to the studies of H.M. that Brenda Milner published in the early 1960s. In one test, H.M. had to trace a star that he viewed in a mirror. The outline of the star and his hand were blocked so that he could only view his hand moving in the mirror. Anyone asked to perform this task is slow at first. You make many mistakes as you overcome robot-like assumptions about how you move your hand and what it looks like when you move it. Like any other kind of skill, everyone gets faster and better with practice. Remarkably, after learning the skill, H.M. would come back the next day having retained it as well as anyone else – even though he had no idea that he had ever done it. This shows a fundamental distinction between, on the one hand, what is called *declarative memory* and, on the other, knowing a *procedure* without being aware of how you know it. It turns out that the basal ganglia, structures deep in our brains, support not only motor skills but also perceptual skills and cognitive skills. That finding provides

an important insight into another separate, independent instrument of memory that allows us to be powerful skill learners.

The second class of learning, *repetition priming*, reminds me of an experiment that gave me the chance to work with H.M. Imagine that I ask you to name any weapons that come to mind. You might think of *gun*, *knife*, or maybe *cannon*. You probably would not list *bazooka* in your top three. Now imagine that before I ask the question, I give you a list of words to read, and on that list is the word *bazooka*. With H.M., I would wait a few moments, then ask him to tell me what the

words on the list were. He would not remember them, or he would say, “What list?” Then I would say, “I’d like you to tell me the first three weapons you think of.” He would respond, “Gun, knife” – wait a moment – “bazooka.” And then he would add, “It’s funny, why did I think of ‘bazooka’?” His response was exciting because I knew that he had made an unconscious memory. He read the word *bazooka*, his brain changed, and when he had to produce the first couple of weapons he thought of spontaneously, one of them was primed to be *bazooka*.

A number of similar experiments have shown that individual words that are instantly forgotten leave another kind of memory trace in the brain that guides subsequent behavior. Psychologists have linked these findings to the experimental study of the human cognitive unconscious. When H.M. responded with the word *bazooka*, he did not know that he had seen the word, but when the moment came to behave and perform in the world, he was influenced by that recent experience as much as you and I

would have been. Now, if you were the subject in that experiment, your response might be, “Do you want me to say ‘bazooka’? It was on the list I just read.” But if people in a psychoanalytic experiment are asked not to do that – if they are asked simply to give the first one that comes to mind – they still come up with *bazooka*. It happens just as often as it did with H.M. – not more, not less. It’s perfectly normal. In this way, he taught us that our brains are symphony orchestras of learning instruments.

We now know that the neocortex supports this kind of learning, and that within the neocortex are parts that support language and the representation of words and their meanings. We have learned from H.M., and from many researchers, that we have multiple memory systems between our ears, each specialized for learning different kinds of information. Remarkably, as much as they interact in everyday life for most of us – supporting each other, interacting with each other – they learn in isolation. They function like departments at a university or different sections of a bookstore, each with different kinds of knowledge and able to be independent. Without the examples that we discovered in H.M., as well as the large body of research that was inspired by those examples, we could have continued thinking that memory is a single entity. But this is not the case: memory is a fantastic diversity of different instruments geared to learn different kinds of things. These various instruments operate and send occasional messages to each other, but they lead independent lives in our brains.



Elizabeth Kensinger

Elizabeth Kensinger is Associate Professor in the Department of Psychology and Director of the Cognitive and Affective Neuroscience Laboratory at Boston College.

Like John, I also was a graduate student with Suzanne Corkin and, in that context, had the opportunity to work with H.M. It is an honor to be here tonight to talk about both my personal experiences with him and what we learned scientifically. I will begin with an anecdote that highlights some of the preserved motor learning and implicit memory that John discussed, and that emphasizes the type of kindhearted person that Henry was. During my first year of graduate school, Henry was spending the night in one of the hospital areas at MIT. He often rode in a wheelchair for longer distances, and I needed to transport him through a series of indoor mazes to where we were doing the testing. Along this route were a number of places where, in order for the wheelchair to

fit through the double door, I had to open not only the door on one side, but the door on the other side as well; and there was a complicated unlocking mechanism that went along with this task. Henry, who had been to MIT and traveled this path many times before, patiently waited as I opened the first door. As I struggled with the lock at the bottom of the second door, he reached down from his chair and effortlessly undid the lock. I don’t know if that showed some type of implicit learning, given that he had likely seen it done many times before. Or perhaps he just had far better engineering know-how than I did. Regardless, his gesture showed the spirit of generosity that was present in every interaction I had with him.

My primary research with Henry was looking for evidence of any new type of learning that was not of the implicit sort, to which he did not have conscious access. We were interested in whether he could consciously tell us about things that had happened after his operation in 1953. Many prior studies had suggested that he had not been able to acquire this kind of new information. A number of John’s studies showed that Henry was largely unable to learn new vocabulary words. If you gave him a word such as *granola*, for instance, he had no idea what it meant. But we decided to give him what seemed to be the easiest possible test, asking him for information about people who had become famous.

We absorb information about famous names all the time. Most of us do it effortlessly; we all probably know of Paris Hilton and Kim Kardashian, even though those names would not have registered with us a few years ago. What if we asked Henry about names of people who, prior to 1953, would not have been on his radar, but whom most of us came to know as household names after 1953? In a test I devised with Gail O’Kane, another graduate student with Suzanne Corkin, we first showed him two names, one of a famous individual and another that we

Henry did have an amazing ability to acquire and consciously generate new information. Certainly, he did not do so in the way that you and I effortlessly absorb new facts and new world knowledge into our repertoire. Nevertheless, it showed that even with the profound amnesia that made him unable to remember any single event after 1953, some kind of slow learning process allowed him to glean new knowledge.

had drawn at random from a Boston phone book. We asked him to select the name of the famous person. And as he started to choose these names, we were almost in disbelief. Not surprisingly, he did very well when presented with names of people that had been famous prior to 1953, choosing the correct name in the pair about 92 percent of the time. But even for the individuals who had become famous after 1953, he chose correctly 88 percent of the time. This performance was not only well above chance, but it was very close to his performance for the individuals that had been famous prior to his operation.

After he selected the name of the famous person, we would ask him to tell us why that person was famous. Often, he wouldn't know, or he would be very wrong. One of his most amusing errors was telling us that Yoko Ono was an important man in Japan. Clearly, there were some names that elicited a sense of familiarity, but he did not have any other information to latch on to. However, for eleven of the forty or so people that he identified as famous, he was very good at providing information about why they were famous. For instance, he told us that JFK became president, that somebody shot him and he didn't survive, and that he was Catholic. He said that Lee Harvey Oswald assassinated the president and that Mikhail Gorbachev was famous for making speeches and was the head of the Russian parliament. He wasn't quite right about John Glenn, the first astronaut to orbit Earth; he said that

Glenn was the first person to travel in space in a rocket, and that he went to the moon, landed, stayed there for a while, and returned safely. Considering that in 1953 space travel had not yet occurred, his answer was remarkable. He told us that Julie Andrews was famous for singing on Broadway, that Liza Minnelli was a movie star, an actress, and a dancer, too, and that Woody Allen was a comic in movie pictures.

So he did have an amazing ability to acquire and consciously generate new information. Certainly, he did not do so in the way that you and I effortlessly absorb new facts and new world knowledge into our repertoire. Nevertheless, it showed that even with the profound amnesia that made him unable to remember any single event after 1953, some kind of slow learning process allowed him to glean new knowledge.

Again, it was a remarkable privilege to work with him and to see what a generous person he was. The patience and the time that he gave allowed all of us, up until his last years, to continue to discover fascinating and novel aspects of how our human memories work.

Questions from the Audience

Question

Now that you know about the local effects and the heterogeneous centers of knowledge acquisition, what would you say is the coordinator of this orchestra in the brain?

Suzanne Corkin

Many scientists have described a central executive in the brain's prefrontal cortex. This area of the cortex carries out the highest, most complex cognitive functions. The current thinking is that this area helps you, first of all, to set goals. Second, it helps you lay out and think through all the steps that you need to take to achieve your goals, and then to perform them in the right order to reach the desired outcome. So, circuits in the prefrontal cortex coordinate the orchestra in the brain.

John Gabrieli

A leader in this field has said that the hippocampus, the structure that was removed from H.M.'s brain, performs the relational role of pulling together different bits of information across the brain – the constituents of the memory – that are not initially connected. In a sense, that's the master orchestrator, though not necessarily the smartest orchestrator; knowledge may be in the cortex and elsewhere, but the hippocampus tells the brain that all these different things

are the stuff of an event. The hippocampus forms the relationship that binds them together. Otherwise, they are isolated snowflakes, falling without leaving an imprint. In memory formation, without the hippocampus pulling everything together, we would be disparate and unconnected.

Question

H.M.'s amygdala was also removed. Were his emotional responses tested?

Elizabeth Kensinger

When we tested Henry on labeling facial expressions, his performance was relatively normal. However, this ability is not unusual for patients with amygdala damage, who often rely on other types of knowledge to discern what, for instance, a caricature of a happy face looks like. In terms of the rigorous testing that we did, we did not see deficits in his ability to perceive whether someone was happy or sad.

Suzanne Corkin

One of the interesting questions about someone who is missing almost all of both amygdalae is whether he can experience a full range of emotions. Henry could do that. If he became frustrated, he could show anger, and when a psychiatrist who was interviewing him told him that his parents had died, he teared up appropriately. He had a great sense of humor. He made up jokes on the spot. One of his often-repeated lines was, "Knock on wood," spoken while knocking on the side of his head. Many people have asked whether he was shocked to see an older man when he looked at himself in a mirror. He never was, and on one occasion said, "Well, I'm not a boy."

Another interesting question is, was he afraid of anything? I have talked to his caregivers in the nursing home, and as far as I have been able to figure out, there was nothing he was afraid of.

Question

Could H.M. walk or dress himself?

Suzanne Corkin

Following his operation, he could still do all the daily activities that we do. Henry could read, write, walk, talk, brush his teeth, shave, get dressed, and so on. Because of the Dilantin, he developed osteoporosis, suffered various fractures, and eventually began walking with a walker. He could still walk, but because of the cerebellar degeneration, he had a very broad-based gait. He walked slowly, with his feet apart for stability. But he walked until his legs could no longer support him.

Question

I tell my students in introductory psychology that the case of H.M. shows that acquiring a new semantic memory requires intact hippocampi on both sides. How do you explain these quite surprising results?

Elizabeth Kensinger

The hippocampus is essential to learning new semantic knowledge in the way that most of us do: that is, after you hear a fact a few times, it becomes part of your knowledge repertoire. If we consider the famous people whom H.M. was able to generate information about, none of them became famous in 1980. We were testing him in 2002, and almost all eleven names he recalled were people who had been famous in 1960. It

seems likely that most of these names were ones that he had been bombarded with over the years. Mikhail Gorbachev and John Glenn were not names that he heard once; those were names he likely heard at least hundreds of times. Even some of the actresses and movie stars whose names seem less familiar to us today could have been in films that were talked about in a number of personal genres. It suggests the existence of other mechanisms that we are largely unaware of because we do not rely on them very often; we do not need to focus on whether we acquire new semantic knowledge through thousands of exposures because we can learn it through a few exposures.

Suzanne Corkin

One of the giants in cognitive science, Endel Tulving, proposed that you can acquire new semantic knowledge without having an episodic memory or an intact hippocampus. He was right. Henry's display of semantic learning was impressive given his profound amnesia, but it was very limited, and it was unlikely that the mechanisms he engaged for learning were identical to those used by the rest of us when we acquire semantic information spontaneously and prolifically.

Question

Memory typically comprises acquisition and recall. Sometimes, there is information that you know you have, but you can't retrieve it and have to learn it again. Could it be that the most impaired part of H.M.'s memory was not the storage or acquisition, but the recall?

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Suzanne Corkin

When we tested H.M. on his semantic knowledge of events that happened before his operation, his capacity for retrieval was very good. We cannot attribute his memory deficits to a retrieval deficit because he could retrieve general knowledge about the world from before his operation. He could not retrieve knowledge about the world from after the operation because the information had never been consolidated and stored; when he tried to retrieve it, it wasn't there.

Robert Desimone

Recall that the damage to H.M.'s brain extended beyond the hippocampus. In research that is now debated, Mort Mishkin and Faraneh Vargha-Khadem studied children who had suffered either prenatal anoxia or anoxia immediately after birth. They found that the damage seemed to be limited to the hippocampus. Those kids were able to learn many things normally: they went to school and learned to talk, but their recall was devastated. They could not recall a story that they had just heard. But they were able to learn many other kinds of information that did not require recall of a specific event.

Question

My question relates to the amygdala and fear. The amygdala is supposed to mediate recognition of the unfamiliar. When something was out of place, such as when a familiar landmark was not present, did H.M. show any sign of surprise?

John Gabrieli

H.M. was never surprised by devices that did not exist before 1953, such as digital clocks or the computers with which we tested him. He was not surprised by the moon landing and would not have been surprised by the possibility of people landing on Mars. Although as a time traveler he should have been in a state of constant amazement, as far as I knew, he was never surprised.

Suzanne Corkin

H.M. learned a great deal by mere exposure. He sort of knew what an astronaut was, and that they were weightless. He knew things you would never expect him to know.

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To view or listen to the presentations, visit <http://www.amacad.org/events/statedmeetings/RememberingHM>.

The Getty Center: Research, Conservation, and Collections



On March 3, 2012, at a meeting sponsored by the Academy at The Getty Center, Fellows **James Cuno**, President and Chief Executive Officer of the J. Paul Getty Trust, and **Thomas W. Gaehtgens**, Director of the Getty Research Institute, spoke about the institution's exhibitions and collections, its global art restoration and conservation efforts, and its research program. The presentations served as the Academy's 1982nd Stated Meeting. The meeting also featured the official Induction of sixteen previously elected Academy members. The following is an edited transcript of the presentations.



James Cuno

James Cuno is President and Chief Executive Officer of the J. Paul Getty Trust. He was elected a Fellow of the American Academy in 2001 and serves as a member of the Academy's Commission on the Humanities and Social Sciences.

The Getty and Its Role in the World

I thought I would begin by introducing you to the Getty and its range of commitments here and abroad. Thomas will take you more deeply into the programs he directs within the Getty Research Institute. The Getty Center, which opened in 1997, includes the Research Institute, the Museum, the Conservation Institute, the Foundation, and the offices of the Trust. The Center is perched high on a hill overlooking Los Angeles, Santa Monica, Marina del Rey, and San Diego (on a clear day). But it is not meant to be up on a hill, except in the physical sense. It is meant to be deeply embedded in the lives of all who come to the hill, or who are reached by the Getty in Los Angeles

and around the world. We are, of course, committed to building collections. Thomas will talk to you about the Research Institute's collections, and I will say a few words about the Museum's collections.

We have made two recent acquisitions. The first is a fifteenth-century Florentine drawing, *Portrait of a Young Man*, from about 1470. The artist is thought to be Piero del Pollaiuolo, though this attribution is not certain. In the virtually life-sized drawing, the subject's gaze and the fact that his shirt is buttoned on the wrong side make it a very convincing drawing of someone viewing himself in a mirror. If this is true, then the drawing is not only an early portrait but a very early self-portrait, completed at the dawn of self-awareness, as the Renaissance is known.

Our second recent acquisition is a painting by Edouard Manet. The year it was completed, 1863, was the year Manet emerged as a leading innovator in French painting, the year he painted *Olympia* and *Le Déjeuner sur l'herbe*. This particular painting is a portrait of a young woman, Madame Brunet. You may think it's wonderful, and so do we. Madame Brunet, however, did not; she rejected it. Fortunately, it stayed with Manet and his studio until later in his career, and ultimately came to the Getty.

We have two sites for the Museum, the Getty Center and a site in Malibu, which houses our ancient Mediterranean collection. But we do not just build our collections and present them in our galleries. We also provide extraordinary settings in which to see works of art. In this sense, there is a context for seeing art in the Museum, and there is a means for connecting with the world when you are here. We not only build our collections, but we teach from them. We have the rich responsibility of connecting with all our visitors, whether they come with specialized knowledge or with no knowledge, whether it is their first visit or their thirty-fifth. One of the great glories of museums is that, unlike universities, we do not

examine people on arrival or on departure. We allow them to make their way as they wish, all the while providing them with informed access to different levels of comprehension or appreciation of works of art.

But we do even more than that. We also bring exhibitions to the museum to complement our collections. We are not an encyclopedic museum in the sense of having representative examples of all the world's cultures under our roof, as the British Museum, the Metropolitan Museum of Art, and the Art Institute in Chicago do. Rather, we feature exhibitions from elsewhere, often in connection with a project that we have undertaken with another program at the museum. The Center's four programs – Research, Conservation, Foundation, and Museum – work together in a collaborative process to deepen the impact of the Getty in the world. In the case of the exhibition *Gods of Angkor: Bronzes from the National Museum of Cambodia*, the Conservation Institute developed, with others, a conservation laboratory in Cambodia to conserve the sculptures. The benefits of that work are being shown in our galleries. The *Aztec Pantheon* and the *Art of Empire*, an exhibition at the Getty Villa, explored Aztec monument-building in relation to ancient Greek and Roman pantheons. Comparing these civilizations, equivalent not in date and time but in mentality, puts the ancient Mediterranean world into richer context. The exhibition *Holy Image, Hallowed Ground: Icons from Sinai* was the result of a collaboration between the Foundation and the Conservation Institute in Sinai. Their work in the monastery where the icons were housed led to the generous loan of the icons to the Getty Museum, presenting a bit more of the world to our visitors in Los Angeles.

We don't just do exhibitions. We also conserve works of art that are in our collection or that come to our collection from elsewhere in the world. Working with our partner colleagues in Italy or in Eastern Europe, for example, we conserve works that then

grace our galleries for a period of time so that we can share the benefit of our work with our larger public. We engage not only in applied conservation but in pure scientific research, both in the Museum and in the Conservation Institute.

Our work abroad includes a project in Ghent, Belgium, where the Foundation has supported the recent renovation, restoration, and conservation of the fifteenth-century Northern European painting *The Ghent Altarpiece*. One of the most important paintings in the history of art, its conservation is part of a program supporting the education of a new generation of conservators working on panel paintings. Panel paintings were the primary medium for painters in Europe from the later Middle Ages to the earliest part of the Renaissance, and the expertise for conserving them was being lost as a generation of conservators was retiring or dying without a new generation taking its place. So the Foundation identified a number of experts in the field, at the Metropolitan Museum, at the Prado Museum, and at the site in Belgium, among others. It brought these senior conservators together with younger conservators to transfer their knowledge to the next generation, to perpetuate the ability to conserve panel paintings. As another example, a team is working on a Dürer panel painting from the Prado's collections.

A website largely supported by the Getty Foundation allows viewers to see the underdrawing beneath the painted surface of *The Ghent Altarpiece* via infrared reflectogram.¹ The website allows you to see how the artist builds the painting from an initial drawing that guides the picture to completion. You can zoom in on the painted surface, then move beneath it with x-rays and with the infrared technology. We are very pleased by this feature and encourage you to visit the website.

¹ "Closer to Van Eyck: Rediscovering the Ghent Altarpiece," <http://closertovaneyck.kikirpa.be/#home>.

Our work is not just in Europe or with European paintings; it's elsewhere in the world, too. It's not just with moveable objects, but includes things that do not move at all – works in Germany, for example, or King Tut's tomb. We collaborate with local conservators not only on the scientific analysis but also on the execution of conservation. And it is not just in the Mediterranean world, but in Western China: in Dunhuang, the Getty has worked with others for decades in the execution of conservation, the analysis of preventative conservation,

surveying and documenting the current conditions of archaeological sites. A geographic information system (GIS), written in Arabic and English, allows you to learn about the sites as well as their present conditions. Because two of the greatest threats to archaeological sites are rapid urban development and looting, the GIS allows Jordanian officials to observe the current state of archaeological sites and monitor changes from day to day. They can also use it as a means of planning how to protect the site. So when a highway is developed between one city and

We not only build our collections, but we teach from them. We have the rich responsibility of connecting with all our visitors, whether they come with specialized knowledge or with no knowledge. We allow our visitors to make their way as they wish, all the while providing them with informed access to different levels of comprehension or appreciation of works of art.

and the site planning to accommodate increased tourist interest in the great caves in the farthest northwest region of China, located on the Silk Road. If you were a traveler leaving China to embark on a journey along the Silk Road – into an unfamiliar world, unsure if you would return – on your way out, you would stop at the cave temples to say a few prayers. On the way back, having achieved success in your journey (and having survived), you would pause to pay gratitude. We are working not only to preserve sites such as this one, but most important, to publish the results of our work so that a collection of best practices can go on to influence the work of others after this project is completed.

Our work is not just conservation in a physical sense. In Jordan, we are developing the Middle Eastern Geodatabase for Antiquities (MEGA-Jordan), a rich platform for

another, it can be designed to go around that site rather than through it. The GIS is now available as a website and software that are provided for free and can be adopted by other countries. Iraq is currently adopting the software, and that is but one example.

Most recently, I joined Thomas, Deborah Marrow, and other colleagues on a trip to India to look at two of the projects that we have been engaged in there. Two hours outside of Jodhpur is a Mughal fort in the town of Nagaur. The fort was a mess, so twenty years ago we awarded a first grant to plan, and a second to execute, its conservation. The fort's extraordinary wall system has now been preserved, restored, and strengthened. After restoring the built structure, we teamed up with colleagues at the Courtauld Institute of Art to preserve the paintings inside. The building is a palace of mirrors with paintings that date from the seventeenth

and early eighteenth centuries. The paintings were in terrible condition, and a great deal of mirrored glass had to be preserved as well. Twenty years of work went into this building, and a book was published documenting all the work done by Deborah, head of the Foundation, and colleagues including Tim Whalen, head of the Conservation Institute, and the preservation architect from India who was employed in the project. There were also local craftsmen who knew how the walls were built and therefore how to preserve them. The published results reveal best practices to be adopted by others concerned with the conservation of Mughal forts.

But we don't just work on structures abroad. We conserve buildings here in Los Angeles. The next project of the Conservation Institute is the Eames House, an icon of mid-century modernism in Los Angeles. The house is sixty years old, and you can imagine how the metal frames for the windows, or the elements of the wall systems, have suffered over time. We are now beginning to understand how we can preserve, and not distract from, the beauty of this great house.

Our work is not just the execution of conservation but the training of a new generation of conservators. I mentioned our program that trains conservators of panel paintings. We have a similar program for conserving mosaics, called MOSAIKON, which is operating in the eastern part of the Mediterranean world, from Tunisia through Syria. It has not been an easy time to be involved in this region, but the Getty has benefited from the training of these conservators, who have the great responsibility to steward the safety of the legacy of ancient Rome as contained in these mosaics. Many mosaics are on-site; some have been lifted and put into museums due to a loss of knowledge of conservation and a decline in training officials to protect archaeological sites. The program is being undertaken in Rome because of the precari-

ous situation in Tunisia, Jordan, and Syria. Fortunately, we have been able to transport Syrian conservators out of Syria to Rome, and back to Syria again, in the education process. And we are not just in Europe and the Mediterranean but in Africa, where one project trained museum management professionals and photography conservators to preserve the great legacy of photography in Africa.

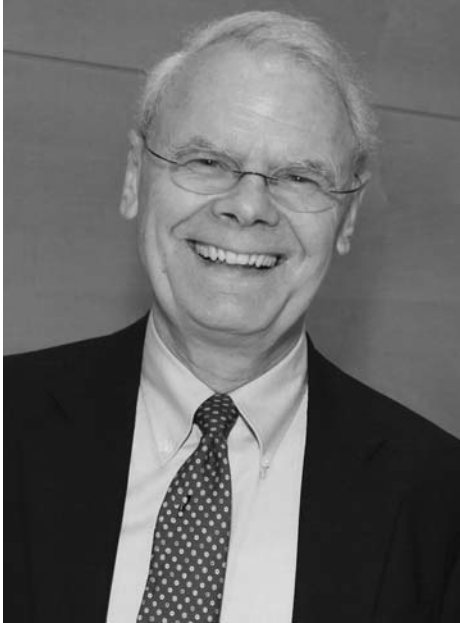
The Getty Foundation also supports programs that connect art historians. For many decades, art historians have tended to focus on their own specialized field and to be in the company of only their fellow specialized art historians. The Foundation aims to bring people from a range of fields together. For example, Thomas, Deborah, Tim, and I met with colleagues at Nehru University in Delhi as part of a program the Getty has funded to introduce art historians in India to art historians with other specialties. Art history scholars in India could find themselves studying only the history of Indian art, so the program brings in art historians who specialize in Greek or Roman, medieval European, or contemporary American art, among other disciplines. With that comes not only new subject matter but different methodologies for studying the history of art. Scholars visit for a few months and then are replaced. The exchange is a way to recognize that we live in a world without borders. We bring a community of scholars together in India, or take them from India to international conferences that might occur in South America or North America.

The Foundation also encourages the publication of scholarship in print or digital form (and even as an app), and it invests locally in Los Angeles. After taking you around the world, I am bringing you back to the Pacific Standard Time exhibition here at the Getty Center. We funded the publication of a number of books and digital media showing works of art by Los Angeles artists in the postwar period, from 1945 to 1985. The exhibi-

tion began as a research project dedicated to finding, recovering, and preserving the archives of artists, dealers, collectors, museums, and galleries, to ensure that this explosive moment in the history of art in Los Angeles is saved for posterity.

To promote the conservation of the Eames House, we engaged in a kind of guerrilla activity, bringing together unlikely supporters and interested individuals to promote the project. Ice Cube (a rapper whose discography I'm sure you all have) studied architecture, and he particularly liked the Eames House and the principles employed in devising that great structure. So he helped demonstrate the public interest in our projects.

I have given you a snapshot of the Getty, and Thomas will discuss aspects of our work more deeply. We strive to do good work here and around the world, in terms of both research and applied conservation as well as presentation to our publics, scholarly and otherwise. It is an obligation we feel we have because the legacy of artistic creation in the world is common to all of us, and we want to be an important part of that legacy.



Thomas W. Gaehtgens

Thomas W. Gaehtgens is Director of the Getty Research Institute. He was elected a Fellow of the American Academy in 2011.

The Getty Research Institute's Global Commitment to Research Projects and Resources

As Jim explained, the Getty is not only a museum, but consists of four institutions that work together: the Museum, the Conservation Institute, the Foundation, and the Research Institute. Everything depends on the cooperation of these four entities. Though this relationship between the four Getty programs is often not well understood, this arrangement provides a unique opportunity for research and for the development of public initiatives. The programs work closely together. Here on the hill, the president, vice presidents, and four directors have lunch every Monday to talk about policies and initiatives in a collaborative spirit.

As part of its mission, the Getty Research Institute (GRI) “creates and disseminates new knowledge through its expertise, its active collecting program, public programs, institutional collaborations, exhibitions, publications, digital services, and residential scholars program.” The GRI is not the only Getty program involved in research – the Conservation Institute and the Museum also carry out research, and the Foundation supports research financially – but the Research Institute provides the general art-historical research component.

Our research facilities include, first of all, a library. This library is probably one of the best art history libraries in the world. With more than a million volumes of books and periodicals – no other library in the field of art history has this amount of materials – it is exceptional not only for its size, but also for the quality of the collections. That does not mean that we do not miss a book from time to time, but we try to fill the gaps. We have 3,500 periodicals and 5,500 collections of manuscripts and personal archives from artists, art historians, collectors, architects, and art dealers. Our collections are rich for contemporary art, especially since the launch of the Pacific Standard Time initiative. Collections embrace audio, video, and film as well as two million photographs in the Photo Study Collection.

Our Special Collections contain rare books, photographs, architectural models, drawings, sketchbooks, and more than 12,000 linear feet of archives. To give you an example, we have the agendas of the artist Man Ray, in which you can find appointments for “Lunch with Picasso” or “Dinner with Gertrude Stein.” We conserve rare photographs, as well as nearly 68,000 rare books, including materials from the fifteenth century to the present. The GRI is a treasure trove of material for studying the history of art.

One of our aims is to support and develop the discipline of art history. Our Scholars Program invites researchers from all over the world to work on an annual research topic. In 2011, the topic was the Display of Art. This year, we are working on Artistic Practice. Next year, the subject will be Color. We try to bring together scholars from different backgrounds. Lectures, colloquia, and perhaps even exhibitions or publications develop from the year, half-year, or three months the scholars spend at the GRI. We host about fifty scholars annually. Some of them are delegated to the program from the Museum and from the Conservation Institute. The GRI oversees the administration of all these Getty scholars.

Given that art history is largely a Western discipline, most of our visiting scholars are from Europe, the United States, and Canada. Of the 803 scholars that have received residential Getty scholarships since 1985, 410 have come from the United States and 393 from other countries. The program is still very Western-oriented, and we are endeavoring to change that. The challenge is not only the discipline's Western focus, but also that our resources are predominantly Western. We have to expand our collections to represent the artistic traditions from other countries and to reflect this new global world. We have begun to take on this enormous challenge. In October 2012, for example, we will hold a symposium in Beijing on the subject of artistic exchanges between China and the West. Additionally, we will invite sixteen students and eight professors to our Summer Research Academy, bringing Western professors and students together with colleagues from other cultures. To support such programs, we work closely with the Getty Foundation.

Another focus is our digitizing initiative. In the past few years, we have digitized an impressive 2.6 million images. The seven

thousand books we have digitized are not sufficient, but we will do more to increase this number. Though we face limitations in staff and resources, we will continue to digitize books and share them on the Internet, so that they can be consulted and read all over the world, especially where scholars may not have access to this art-historical literature. We are currently developing a project that will revolutionize the discipline of art history: together with the Avery Architectural and Fine Arts Library at Columbia

The Getty Research Institute creates and disseminates new knowledge through its expertise, its active collecting program, public programs, institutional collaborations, exhibitions, publications, digital services, and residential scholars program. One of our aims is to support and develop the discipline of art history.

University, the Frick Art Reference Library, and the Thomas J. Watson Library of the Metropolitan Museum of Art in New York; the Biblioteca de la Universidad de Málaga in Málaga, Spain; the Institut national d'histoire de l'art in Paris; and the Universitätsbibliothek Heidelberg in Heidelberg, Germany, we are digitizing the entire literature of the history of art before 1923. (Because 1923 is the American copyright date, we cannot digitize material published after that year.) We are bringing all this literature into a portal so that readers can access it whether they are in Peru, Germany, Russia, or China. From the beginning, the project has focused not only on Western art history but also on art from China, India, Brazil, and other countries. We plan to launch this digital library on May 31, 2012. In a couple of years, it will certainly be a major tool to conduct art historical research.

The Getty vocabularies form another important project. Consider this example: the *Mona Lisa* is also known as the *Portrait of Lisa Gherardini*, *La Gioconda*, and *La Joconde*. All these different descriptions have to be linked for a computer search to recognize all the variable titles used for the *Mona Lisa*. Even more important, the vocabs can be used all over the world because they are being translated into numerous languages. The Research Institute continues to develop this essential tool.

Another research tool is the Provenance Index, a vast database of inventories, sale catalogs, and collection catalogs. Take for example a beautiful painting by Rubens at the Getty Museum, *The Entombment*, which should really be called *Lamentation*, completed circa 1612. When the Getty bought this painting from a catalog, no one knew exactly what had happened to it before 1868. On the surface of the picture is the number 146, and if one types Rubens and 146 into the search boxes of the Getty Research Provenance Index, one learns that this painting was in the collection of Gaspar de Haro y Guzmán in Spain, from 1600 to 1653. This database documents the painting's entire history up to the nineteenth and twentieth centuries, demonstrating how important this resource is for the art market, for the art collector, and for those who are interested in the reception of paintings. It is a vital tool for art history in general.

The Getty Research Institute is also engaged in a number of research projects, including: the Art of Alchemy; Art on Screen; Book Art of the Russian Avant-Garde; The Display of Art in Roman Palaces, 1550–1750; German Sales, 1930–45: Art Works, Art Markets, and Cultural Policy; Los Angeles Architecture, 1940–1990; Orientalist Photography; Pacific Standard Time; Printmaking in the Age of Louis XIV, 1660–1715; Surrealism in Latin America; and The Future of Art Bibliography.

How do we come up with all these research projects? We conceptualize them by looking for ways to make our collections accessible to the public. We find scholars who can help us and invite them to work on these projects. For instance, *The Display of Art in Roman Palaces* was launched because we have a large number of inventories of Roman palaces. *Los Angeles Architecture* will be a major exhibition next year at the Getty Museum. *Pacific Standard Time* is the initiative that started with the collections of the GRI and, as Jim mentioned, is funded by the Foundation; we participated in curating the exhibition at the Getty Museum. In two weeks, the *Pacific Standard Time* exhibition will travel to Berlin.

We are trying to incorporate a global focus into our work. We will not give up our past in art history as a Western discipline, but will expand it to include the topic of encounters between different cultures. Because of our location in California, with close proximity to Mexico, Latin America is of significant interest to us, and we have a major collection of Latin American art historically relevant photographs and other materials. Furthermore, the GRI holds scholarly resources on Chinese art, and we are trying to be more involved in India, the Near East, and Africa, as you can see from our exhibitions.

Members Gather at the Getty Center

Managing the abundance of material on the GRI's website is a challenge. Because our website has 32,000 pages, it is difficult to find what one is searching for. Making all our material accessible to the outside world is impossible, but we are trying to make a significant number of our resources available to our many online visitors. From May 1, 2009, to February 27, 2012, we had more than 2.6 million visits to the website, including 1.7 million from the United States, 131,911 from England, and significant numbers from other Western countries. Outside the West, the numbers diminish. There were 27,956 visits from Mexico and 18,823 from India. That we have 17,723 online visits from Brazil probably reflects the fact that the Getty Foundation and the Research Institute traveled to Brazil to develop a new initiative, which the Foundation is funding, to connect the international art-historical community with that of Brazil. By contrast, online visits from Japan totaled only 17,312; from Russia, 17,405; from China, 14,711; and from Taiwan, 10,079.

We still have a lot of work ahead of us to move Western art history into the global present. We have to make our vast resources accessible to scholars in other countries, where these resources may not exist. As a philanthropic institution, we are proud to provide free access to our materials. The maps and statistics I have shown in this presentation indicate where more engagement is needed in the future. ■

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To view or listen to the presentations, visit <http://www.amacad.org/events/statedmeetings/GettyCenter>.



Jesse Choper (UC Berkeley School of Law) and **Winslow Briggs** (Carnegie Institution for Science)



Lothar von Falkenhausen (University of California, Los Angeles), **Thomas Gaehtgens** (Getty Research Institute), and **Thomas Levy** (University of California, San Diego)



Deborah Marrow (The Getty Foundation), **Louise Bryson** (J. Paul Getty Trust), and **Bill Viola** (Bill Viola Studio)

Select Prizes and Awards

Presidential Medal of Freedom, 2012

Madeleine Korbelt Albright (Washington, DC)

Bob Dylan (Beverly Hills, CA)

Toni Morrison (Princeton University)

John Paul Stevens (Supreme Court of the United States)

Academy Members elected to the National Academy of Sciences, 2012

Susan Athey (Harvard University)

Larry M. Bartels (Vanderbilt University)

Jagdish N. Bhagwati (Columbia University)

Randolph Blake (Vanderbilt University)

John Carlson (Yale University)

Richard W. Carlson (Carnegie Institution for Science)

Demetrios Christodoulou (Eidgenössische Technische Hochschule Zürich)

Pablo G. Debenedetti (Princeton University)

Ronald A. DePinho (University of Texas M.D. Anderson Cancer Center)

Joseph M. DeSimone (University of North Carolina, Chapel Hill; North Carolina State University)

François N. Diederich (Eidgenössische Technische Hochschule Zürich)

Gideon Dreyfuss (University of Pennsylvania School of Medicine)

Denis Duboule (University of Geneva)

Carol S. Dweck (Stanford University)

Matthew P. Fisher (University of California, Santa Barbara)

Wendell H. Fleming (Brown University)

Susan Gelman (University of Michigan)

John T. Groves (Princeton University)

Tina Henkin (Ohio State University)

Hiroo Kanamori (California Institute of Technology)

Guinevere Kauffmann (Max Planck Institute for Astrophysics)

Bruce R. Levin (Emory University)

Barbara H. Liskov (Massachusetts Institute of Technology)

Liqun Luo (Stanford University)

Ann E. Nelson (University of Washington)

Monica Olvera de la Cruz (Northwestern University)

Nai Phuan Ong (Princeton University)

Roy Parker (University of Arizona)

Mary Power (University of California, Berkeley)

Louis J. Ptáček (University of California, San Francisco)

Stephen W. Raudenbush (University of Chicago)

Marcia J. Rieke (University of Arizona)

Giacomo Rizzolatti (University of Parma)

Bernard Sadoulet (University of California, Berkeley)

Pedro A. Sanchez (Columbia University)

Eric U. Selker (University of Oregon)

Daniel Simberloff (University of Tennessee)

James L. Skinner (University of Wisconsin, Madison)

Gisela T. Storz (National Institutes of Health)

Peter L. Strick (University of Pittsburgh)

Subra Suresh (National Science Foundation)

Robert M. Townsend (Massachusetts Institute of Technology)

Ruth J. Williams (University of California, San Diego)

Melinda A. Zeder (National Museum of Natural History)

Other Awards

Daniel Aaron (Harvard University) was awarded a 2012 Centennial Medal from Harvard University.

Cornelia Isabella Bargmann (Rockefeller University) was awarded the Kavli Prize in Neuroscience. She shares the prize with Ann M. Graybiel (Massachusetts Institute of Technology) and Winfried Denk (Max Planck Institute for Medical Research, Germany).

William Drayton (Ashoka: Innovators for the Public) received the 2012 Richard E. Neustadt Award, given by Harvard Kennedy School.

Mildred S. Dresselhaus (Massachusetts Institute of Technology) was awarded the Kavli Prize in Nanoscience.

David A. Evans (Harvard University) is the recipient of the 2012 Welch Award in Chemistry.

Ann M. Graybiel (Massachusetts Institute of Technology) was awarded the Kavli Prize in Neuroscience. She shares the prize with Cornelia Isabella Bargmann (Rockefeller University) and Winfried Denk (Max Planck Institute for Medical Research, Germany).

Nancy Hopkins (Massachusetts Institute of Technology) was awarded a 2012 Centennial Medal from Harvard University.

Sarah Blaffer Hrdy (Winters, CA) received the 2012 J. I. Staley Prize for *Mothers and Others: The Evolutionary Origins of Mutual Understanding*.

James Earl Jones (Pawling, NY) is the recipient of the 2012 Marian Anderson Award.

Robert Keohane (Princeton University) was awarded a 2012 Centennial Medal from Harvard University.

Yo-Yo Ma (Cambridge, MA) was awarded the 2012 Polar Music Prize. He shares the prize with Paul Simon (New York, NY).

Margaret H. Marshall (Harvard Law School) was awarded the Radcliffe Institute Medal.

Bill McKibben (Middlebury College) is the inaugural recipient of the Sam Rose '58 and Julie Walters Prize at Dickinson College for Global Environmental Activism.

Mike Nichols (New York, NY) won a 2012 Tony Award for Best Direction of a Play, Arthur Miller's *Death of a Salesman*.

Carole Pateman (University of California, Los Angeles) was awarded the 2012 Johan Skytte Prize in Political Science.

Lisa Randall (Harvard University) is the 2012 recipient of the Andrew Gemant Award, given by the American Institute of Physics.

Amartya Sen (Harvard University) is the recipient of the 2012 Thomas C. Schelling Award, given by Harvard Kennedy School.

Laurence Senelick (Tufts University) won the Betty Jean Jones Award of the American Theatre and Drama Society.

Paul Simon (New York, NY) was awarded the 2012 Polar Music Prize. He shares the prize with Yo-Yo Ma (Cambridge, MA).

Bess Ward (Princeton University) is the recipient of the 2012 Procter & Gamble Award in Applied and Environmental Microbiology.

New Appointments

Dennis A. Ausiello (Harvard Medical School; Massachusetts General Hospital) was elected to the Board of Directors and Scientific Advisory Board of Alnylam Pharmaceuticals, Inc.

David Eisenbud (University of California, Berkeley) was named Director of the Mathematical Sciences Research Institute.

Mary Ann Glendon (Harvard Law School; Pontifical Academy of Social Sciences) was appointed to the U.S. Commission on International Religious Freedom.

Kathleen Kennedy (The Kennedy/Marshall Company) was named Board Cochair at Lucasfilm Ltd.

Jim Yong Kim (Dartmouth College) was named President of The World Bank.

Steven E. Koonin (Science and Technology Policy Institute) was named Director of the Center for Urban Science and Progress at New York University.

Paul LeClerc (New York, NY) was appointed Director of Columbia University's Global Center in Paris.

Earl Lewis (Emory University) was elected President of The Andrew W. Mellon Foundation.

Michael A. Marletta (Scripps Research Institute) was appointed to the Independent Citizens Oversight Committee, the governing board of California's stem cell agency, the California Institute for Regenerative Medicine.

Richard A. Meserve (Carnegie Institution for Science) was elected President of Harvard University's Board of Overseers.

David Robertson (St. Louis Symphony) was appointed Artistic Director and Chief Conductor of the Sydney Symphony in Australia.

Select Publications

Poetry

Jorie Graham (Harvard University). *Place: New Poems*. Ecco, May 2012

A.E. Stallings (Athens, Greece). *Olives: Poems*. Triquarterly, April 2012

Fiction

Francine du Plessix Gray (New York, NY). *The Queen's Lover*. Penguin Press, June 2012

Elie Wiesel (Boston University). *Hostage*. Knopf, August 2012

Nonfiction

Paul Auster (New York, NY). *Winter Journal*. Henry Holt and Co., August 2012

William J. Baumol (New York University). *The Cost Disease: Why Computers Get Cheaper and Health Care Doesn't*. Yale University Press, September 2012

Henry E. Brady (University of California, Berkeley), **Kay Lehman Schlozman** (Boston College), and **Sidney Verba** (Harvard University). *The Unheavenly Chorus: Unequal Political Voice and the Broken Promise of American Democracy*. Princeton University Press, May 2012

Leo Braudy (University of Southern California). *The Hollywood Sign: Fantasy and Reality of an American Icon*. Yale University Press, March 2012

Eli Broad (Eli and Edythe Broad Foundation). *The Art of Being Unreasonable: Lessons in Unconventional Thinking*. Wiley, May 2012

John W. Dower (Massachusetts Institute of Technology). *Ways of Forgetting, Ways of Remembering: Japan in the Modern World*. New Press, July 2012

J. H. Elliott (University of Oxford). *History in the Making*. Yale University Press, October 2012

Günter Grass (Lubeck, Germany). *From Germany to Germany: Journal of the Year 1990*. Houghton Mifflin Harcourt, November 2012

Linda Greenhouse (Yale Law School). *The U.S. Supreme Court: A Very Short Introduction*. Oxford University Press, March 2012

Vartan Gregorian (Carnegie Corporation of New York). *The Emergence of Modern Afghanistan: Politics of Reform and Modernization*. Stanford University Press, January 2013

Douglas Hofstadter (Indiana University) and **Emmanuel Sander** (University of Paris). *Surfaces and Essences*. Basic Books, September 2012

Charles Larmore (Brown University). *Vernunft und Subjektivität*. Suhrkamp Verlag, Berlin, April 2012

Arend Lijphart (University of California, San Diego). *Patterns of Democracy: Government Forms and Performance in Thirty-Six Countries*. Yale University Press, September 2012

Donald S. Lopez, Jr. (University of Michigan). *The Scientific Buddha: His Short and Happy Life*. Yale University Press, September 2012

Jennifer Jane Marshall (Visiting Scholar, 2005–2006; University of Minnesota, Twin Cities). *Machine Art, 1934*. University of Chicago Press, June 2012

James M. McPherson (Princeton University). *War on the Waters: The Union and Confederate Navies, 1861–1865*. University of North Carolina Press, September 2012

Mary E. Miller (Yale University) and **Barbara E. Mundy** (Fordham University), ed. *Painting a Map of Sixteenth-Century Mexico City: Land, Writing, and Native Rule*. Yale University Press, December 2012

Victor S. Navasky (Columbia University) and **Evan Cornog** (Hofstra University), ed. *The Art of Making Magazines: On Being an Editor and Other Views from the Industry*. Columbia University Press, September 2012

Amos Oz (Ben-Gurion University) and **Fania Oz-Salzberger** (University of Haifa). *Jews and Words*. Yale University Press, November 2012

Gustavo Pérez-Firmat (Columbia University). *Life on the Hyphen: The Cuban-American Way*. University of Texas Press, May 2012

Martin Rees (University of Cambridge). *From Here to Infinity: A Vision for the Future of Science*. W.W. Norton, June 2012

Robert I. Rotberg (Harvard University). *Transformative Political Leadership: Making a Difference in the Developing World*. University of Chicago Press, June 2012

Kay Lehman Schlozman (Boston College), **Sidney Verba** (Harvard University), and **Henry E. Brady** (University of California, Berkeley). *The Unheavenly Chorus: Unequal Political Voice and the Broken Promise of American Democracy*. Princeton University Press, May 2012

Silvan S. Schweber (Brandeis University). *Nuclear Forces: The Making of the Physicist Hans Bethe*. Harvard University Press, June 2012

Ian Shapiro (Yale University). *The Moral Foundations of Politics*. Yale University Press, October 2012

Theda Skocpol (Harvard University). *Obama and America's Political Future*. Harvard University Press, September 2012

Richard Slotkin (Wesleyan University). *The Long Road to Antietam: How the Civil War Became a Revolution*. Liveright, July 2012

Robert Somerville (Columbia University). *Pope Urban II's Council of Piacenza (March 1–5, 1095)*. Oxford University Press, December 2011

Wole Soyinka (Abeokuta, Nigeria). *Of Africa*. Yale University Press, November 2012

Peter Stansky (Stanford University) and William Abrahams. *Julian Bell: From Bloomsbury to the Spanish Civil War*. Stanford University Press, January 2012

Sidney Verba (Harvard University), **Kay Lehman Schlozman** (Boston College), and **Henry E. Brady** (University of California, Berkeley). *The Unheavenly Chorus: Unequal Political Voice and the Broken Promise of American Democracy*. Princeton University Press, May 2012

Robert Louis Wilken (University of Virginia). *The First Thousand Years: A Global History of Christianity*. Yale University Press, November 2012

Edward O. Wilson (Harvard University) and Alex Harris (Duke University). *Why We Are Here: Mobile and the Spirit of a Southern City*. Liveright, October 2012

Wu Hung (University of Chicago). *A Story of Ruins: Presence and Absence in Chinese Art and Visual Culture*. Princeton University Press, May 2012

Luigi Zingales (University of Chicago). *A Capitalism for the People: Recapturing the Lost Genius of American Prosperity*. Basic Books, June 2012

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. **

Frederick Herbert Bormann – June 7, 2012; elected to the Academy in 1972

Michel Boudart – May 2, 2012; elected to the Academy in 1991

William Francis Brace – May 2, 2012; elected to the Academy in 1971

Thomas M. Cover – March 26, 2012; elected to the Academy in 2003

George A. Cowan – April 20, 2012; elected to the Academy in 1997

Dietrich Fischer-Dieskau – May 18, 2012; elected to the Academy in 1984

Robert W. Floyd – September 25, 2001; elected to the Academy in 1974

Carlos Fuentes – May 15, 2012; elected to the Academy in 1986

George Peabody Gardner – May 9, 2012; elected to the Academy in 1960

Robert Joy Glaser – June 7, 2012; elected to the Academy in 1965

Avram Goldstein – June 1, 2012; elected to the Academy in 1995

David Sutphin Heesch – April 13, 2012; elected to the Academy in 1972

Friedrich Ernst Peter Hirzebruch – May 27, 2012; elected to the Academy in 1992

Andrew Fielding Huxley – May 30, 2012; elected to the Academy in 1961

Nicholas DeBelleville Katzenbach – May 8, 2012; elected to the Academy in 1988

Richard Wall Lyman – May 27, 2012; elected to the Academy in 1971

Helen Florence North – January 21, 2012; elected to the Academy in 1975

Elinor Ostrom – June 12, 2012; elected to the Academy in 1991

Louis Heilprin Pollak – May 8, 2012; elected to the Academy in 1972

Aaron Jeffrey Shatkin – June 4, 2012; elected to the Academy in 1997

Robert Summers – April 17, 2012; elected to the Academy in 2001

Phillip V. Tobias – June 7, 2012; elected to the Academy in 1986

Edward Reed Whittemore – April 6, 2012; elected to the Academy in 1975

*Notice received from April 11, 2012, to June 15, 2012

AMERICAN ACADEMY
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The Nominating and Governance Committee, chaired by Emilio Bizzi, is seeking recommendations for positions on governing bodies, including Officers and Directors and Council members. All candidates must be Fellows of the American Academy and interested in being actively involved in Academy work. Please submit suggestions via email to secretary@amacad.org or in writing (postmarked by August 31, 2012) to the Nominating and Governance Committee, American Academy of Arts and Sciences, 136 Irving Street, Cambridge, MA 02138.

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The views expressed in the *Bulletin* are those held by each contributor and are not necessarily those of the Officers and Fellows of the American Academy of Arts & Sciences.

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