

Cultures of Innovation: A Conversation

Agenda
Abstracts
List of Participants

13-15 May 2005
Washington, D.C.

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Smithsonian
National Museum of American History
Lemelson Center for the Study of Invention and Innovation

Cultures of Innovation: A Conversation

The Lemelson Center for the Study of Invention and Innovation
National Museum of American History
Smithsonian Institution

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Cultures of Innovation brings together practitioners and scholars from many disciplines, including history, sociology, anthropology, and policy, to consider ways in which emerging societies develop a social climate receptive to and encouraging of invention and innovation. What do we know of such innovation cultures? What are their necessary conditions? What are their special characteristics? How do they develop? These questions and others provide the focus for a broad, comparative look at innovation across nations and cultures, with an eye to developing a picture of the innovative society, the factors encouraging positive technical change, the factors leading to resistance to innovation, and the consequences of each.

Participants will examine historical cultures of innovation, identify the state of innovation today through examples of exemplary current innovations and innovative cultures, and reflect on the future of innovation and the people and places from which it will arise tomorrow.

AGENDA

Friday, 13 May

Hilton Embassy Row, Board Room

7:00 p.m.

Welcome out-of-town guests

Saturday, 14 May

National Museum of American History, Reception Suite

9:00-9:30 a.m.

Welcome

Art Molella, Lemelson Center

Robert Lemelson and Satheesh Namasivayam, The Lemelson Foundation

9:30-10:00

Keynote

Abdallah Daar, University of Toronto

“Health Biotechnology Innovation in Developing Countries”

Presentations, c. 20 minutes each

10:00-10:20

Ian Inkster, University of Trent Nottingham, United Kingdom

“Aspects of the Great Divergence: Cultures of Constraint on Innovation, Emulation, and Technology Transfer”

10:20-10:30

Break

10:30 –10:50

Vijaya Melnick, University of the District of Columbia and Georgetown University
“Innovation and Development: India as a Case Study”

10:50-11:10

Robert Lemelson, UCLA and The Lemelson Foundation

“Reflections on a Decade of Promoting Innovation and Invention in the United States and the Developing World”

11:10-12:00

General discussion, led by Robert Kargon, Johns Hopkins University

12:00-1:30 p.m.

Lunch and presentation

W. Bernard Carlson, University of Virginia

“Diversity and Progress: Toward a Comparative View of Innovation across Global Cultures”

1:30-1:50

Maha Alsenan, Art Education College, Ministry of Education, Saudi Arabia

“Motivating Innovation through Visual Enrichment: Fine Arts as a Creative Outlet”

1:50-2:10

B.K. Singh, EARTH University, Costa Rica

“Agricultural Innovation in Latin America and South Asia”

2:10-2:30

Elaine Marten, Waste Reduction Partners

“Phoenix Rising from the Ashes: Innovative Products from Waste Materials”

2:30-2:50

Esther Hicks, Stanford Research Institute

“Is a Virtual University in Sub-Saharan Africa an Appropriate Model for Transforming Conventional Higher Education in Sub-Saharan Africa?”

2:50-3:00

Break

3:00-4:30

General discussion led by Morris Low, Johns Hopkins University

4:30-7:30

Reception and dinner at the Museum

Sunday, 15 May

Hilton Embassy Row, Lincoln Room

8:30-10:30 a.m.

Breakfast Session

Recommendations for an Action Agenda

Wrap up

ABSTRACTS

Maha Alsenan

“Motivating Innovation through Visual Enrichment: Fine Arts as a Creative Outlet”

Sponsored by the King Abdulaziz Foundation for the Gifted, the enrichment summer program for gifted and talented teenage girls in visual arts in Saudi Arabia aims to motivate innovation and thinking skills by exposing students’ vision to numerous sources and skills needed to produce creative art. Learners are chosen after passing several phases of school nomination, evaluation, and exams that show their high abilities in visual arts. By exposing learners to numerous sources and subjects, then teaching them artistic techniques combined with problem solving, thinking skills, creativity, communication, and research skills, the program helps them create and display fine art.

To view the influence of our enrichment summer program, we used Torrance Tests of Creativity, as well as observation during the program, and followed up projects done in the students’ schools throughout the past year. The results of the program were encouraging and worthy of future pursuit. They also served as a motivation to involve the most discrete girls in other programs.

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W. Bernard Carlson

“Diversity and Progress: Toward a Comparative View of Innovation across Global Cultures”

One of the central challenges confronting historians of technology and policymakers today is reconciling our ideas about diversity and progress. On the one hand, we are coming to appreciate the remarkable and diverse ways by which people across a variety of cultures use technology to shape their lives. Both historical and contemporary examples demonstrate that technology is not something uniquely created by the industrialized West. Hence, we need to recognize diversity in

technological innovation—that all human cultures have technology, but different cultures use technology to achieve different goals.

Yet many of us believe that technology is essential to improving living conditions around the world. We also hope that, by using technology to increase the wealth of a society, people may be inclined toward democracy and freedom and away from violence and prejudice. So given our commitment to using technology for human betterment, how do we go about promoting technological change without losing sight of cultural diversity?

The answer, I believe, is to develop ways to compare how different cultures use technology. I will suggest in this talk that it may be helpful to think about how different societies use technology to pursue material abundance, social order, and cultural meaning. In addition, I will propose that we think about progress by looking at how cultures across history have mobilized different resources, institutions, and ideas. Only by comparing technological activity across cultures and by thinking carefully about how we arrange these cultures can we succeed in reconciling diversity and progress in human experience.



Abdallah Daar
“Health Biotechnology Innovation in Developing Countries”

The Canadian Program on Genomics and Global Health examines how developing countries can benefit from emerging technologies and avoid science and technology divides. Much of our work is based on empirical research that focuses on science and technology policy for health development. I will describe some issues in innovation in developing countries, highlighting recent empirical studies.

Some developing countries are beginning to harness emerging technologies to address developmental needs and have started to innovate around biotechnology/genomics to address local health needs. In the study that I will discuss, we examined the health biotechnology innovation systems of Cuba, Brazil,

South Africa, Egypt, India, China, and South Korea. We gathered both qualitative and quantitative data for each country to document early successes, the main features of the health biotechnology sector, the main challenges, and the reasons for success. We identified a number of important lessons that will be useful for other developing countries wishing to harness health biotechnology to address local health needs and for economic development generally. Some of these may also be applicable to more industrially developed countries.



Esther K. Hicks
“Is a Virtual University in Sub-Saharan Africa an Appropriate Model for Transforming Conventional Higher Education in Sub-Saharan Africa?”

Higher education has a critical role to play in training the human capital that can generate the science, technology, and innovation requisite for economic development and renewal. Introducing imported technology and knowledge requires a critical mass of appropriately trained technicians, scientists, and engineers to adapt and apply these imports to local needs and conditions. Unfortunately, tertiary education in sub-Saharan Africa (SSA) is not up to this task and alternative systems of providing higher education have had to be explored. The emergence of the Africa Virtual University (AVU) constituted such an alternative. It was designed to establish partnerships with institutions of higher education throughout SSA to offer technology-based courses and to involve resource sharing of technology-based degree programs among these institutions. Although the AVU currently operates in 47 centers in 24 African countries, its success has varied from country to country, and has been enfeebled by a variety of technical, political and organizational issues. The question is: will the AVU, as centers within but not of conventional universities, be hamstrung by these same host institutions?



Ian Inkster
“Aspects of the Great Divergence: Cultures of Constraint on Innovation, Emulation, and Technology Transfer”

How did the world become technologically divided by circa 1913? Is culture the deciding factor? The proper identification of cultural processes and constraints distinguishes cultures of initial innovation from those of technological imitation/transfer/adoption/adaptation as well as cultural instigations or barriers. Cultures might retard technological innovation while inducing innovations in organizations, markets, and other aspects of technological change. We must therefore consider the historical force of culture in areas other than the strictly technological.

We must also challenge the idea that “culture” exists as an entity, the nature of which is either encouraging or inhibitory of innovation. Industrial revolutions, from that of Britain to that of Japan, have depended on dynamic and more-or-less purposeful processes of cultural engineering, which have in turn influenced the extent and pattern of innovative activities and products. Under what conditions is cultural engineering a salient element in explaining technological success?

I offer five strategies that historians or others might use to investigate the relations among cultures, institutions, and processes or periods of significant innovation:

1. Identification of cultural constraints
2. Initiation: micro-cultures and the notion of proximity
3. Adoption: the role of enclaves and avoidance systems
4. Cultural intrusions: impacts of exogenous institutions on innovation followers
5. Culture and the location of useful and reliable knowledge.



Robert Lemelson
“Reflections on a Decade of Promoting Innovation and Invention in the United States and the Developing World”

This talk will discuss the author's experience as a Board member for the Lemelson Foundation in its attempts to promote, support, and encourage invention and innovation. The Lemelson Foundation is the only foundation whose sole mission is to elevate the status of inventors, educate the public about the roles inventors and innovation play in societal and economic life, and support young inventors and their efforts to bring their new ideas and products to market. However, the ways in which one does this, and most effectively supports and funds the programs, institutions, and approaches to achieve this mission, turns out to be a complex endeavor. One needs to draw multidisciplinary teams of individuals from numerous disciplines, encourage interdisciplinary dialogue and work, and have a vision that encompasses the numerous levels on which innovation and invention operate. This task is made more challenging if an additional goal is making invention and innovation relevant to basic human needs issues and sustainable development, as the Lemelson Foundation has attempted in the last three years in the developing world.



Elaine Marten
“Phoenix Rising from the Ashes: Innovative Products from Waste Materials”

Coal ash, the non-combustible component of the coal consumed to generate electricity, represents an enormous quantity of solid waste both nationally and globally. To eliminate such sacrifice of a valuable by-product, Waste Reduction Partners, a group of volunteer technical retirees in western North Carolina, has explored beneficial uses of coal combustion by-products. With an ecologically responsible strategy and a goal of zero-waste, these retired chemists, engineers, and architects have developed a high-quality, light-weight aggregate from coal ash for

building and construction purposes. The project provides a "green" and sustainable solution to a widespread environmental problem.

Inexpensive conversion programs of this type will be reviewed and are well suited for the resources of developing nations. The raw materials—ash from coal combustion, scrap wood, and organic sludge—are abundant waste products in most emerging economies. They represent opportunities for local residents toward stable and sustaining businesses. Women with diligence and desire to succeed are excellent candidates to lead such initiatives.



Vijaya L. Melnick
“Innovation and Development: India as a Case Study”

Innovation is the key to transformation. The value and advantage of scientific research and novel technologies are actualized only when they are appropriately applied to improve the lives of ordinary people. Innovative approaches anchored in the local context could assume a truly transformative role.

The paper will discuss the role of innovation in development and use India as a case study to examine how well, or not so well, India has facilitated the opportunities for innovation that can play the transformative role for her society and her people.



B.K. Singh
“Agricultural Innovation in Latin America and South Asia”

In the developing world, more than 80% of the population derives its livelihood from agriculture. The region has boosted productivity and food sufficiency has been achieved in many developing countries. However, there has also been an accelerated migration from rural areas, reduction in rural employment opportunities, lack of desire in rural youth to choose agriculture as a career, and limited access to

appropriate technology. With new international policies regarding free and fair trade and a continuing desire to alleviate poverty, a new, values-based culture needs to be developed to establish a sustainable agricultural production base in the developing countries.

While innovation and invention are very much present in rural communities and urban areas, the number of international patents received by these countries is negligible—and nonexistent in the field of agriculture. Venture capital practically does not exist, resources to build prototypes are scarce, inventors and innovators are rarely known or celebrated, and invention in universities is merely an academic exercise. If Asia, Africa, and Latin America want to boost agricultural output and eliminate rural poverty, efforts need to be made to create a new “culture of innovation” in which universities like EARTH University, a private, nonprofit, international institution recognized for its educational model that helps create change, will have to play a leading role.

PARTICIPANTS

David Allison is chairman of the Division of Information Technology and Communications at the Smithsonian’s National Museum of American History. He served as project director and chief curator for the Museum’s newest long-term exhibit, *The Price of Freedom: Americans at War*, and was lead curator for *September 11, 2001: Bearing Witness to History*, *Behind the Lines: The Universal Product Code at 25*, and *Information Age: People, Information and Technology*, among others. His recent publications include *The Price of Freedom: Americans at War* (2005), “Preserving Software in History Museums: A Material Culture Approach” (in *History of Computing: Software Issues*, 2002), and “Universal Product Code in Perspective: Context for a Revolution” (in *Twenty-Five Years behind Bars*, 2001).

Maha Abdullah Alsenan is a lecturer at the Art Education College, Ministry of Education, Riyadh, Saudi Arabia. As an artist, art critic, and historian, her work has focused on examining women’s role in the cultural life of Saudi Arabia. In cooperation with the King Abdulaziz Foundation for the Gifted in Riyadh, Alsenan is

designing and supervising enrichment programs for gifted girls. She holds bachelor's and master of fine arts degrees in art education, and is currently studying for her Ph.D. in art history at King Saud University in Riyadh. Her dissertation focuses on ancient art in Saudi Arabia.

Ivan Amato is a freelance print and radio writer and the author of *Stuff: The Materials the World Is Made of*, *Pushing the Horizon*, an institutional history of the Naval Research Laboratory, and *Super Vision: A New View of Nature*. He has written for numerous radio programs and print publications, including National Public Radio, *Fortune*, *Technology Review*, *Science Magazine*, and the *Washington Post*.

Joyce Bedi is senior historian at the Lemelson Center for the Study of Invention and Innovation at the Smithsonian's National Museum of American History. She is the co-editor, with Arthur Molella, of *Inventing for the Environment* (2003). Before coming to the Smithsonian, Bedi held research and curatorial positions at the MIT Museum, the IEEE History Center, the Edison National Historic Site, and the Museum of Applied Arts and Sciences (now the Powerhouse Museum) in Sydney, Australia.

W. Bernard Carlson teaches at the University of Virginia, in both the Department of Science, Technology, and Society and the History Department. His research focuses on how inventors, engineers, and managers employed technology to build major companies between 1870 and 1920. His publications include *Technology in World History* (2005) and *Innovation as a Social Process: Elihu Thomson and the Rise of General Electric, 1870-1900* (1991). Along with Wiebe Bijker and Trevor Pinch, Carlson edits a book series for MIT Press on "Inside Technology: New Approaches to the History and Sociology of Technology." To date, the series has published over 25 titles. With support from the Sloan Foundation, Carlson is currently writing a biography of inventor Nikola Tesla.

Michael J. Cheetham has served as director of the U.S. Secretariat to the Indo-U.S. Science and Technology Forum since 2000, joining the Smithsonian Institution in 2004. The Forum, a private foundation based in New Delhi, was created to stimulate collaborative research efforts among government, industry, and the

academy in the two countries. Cheetham has worked for 15 years on international science and technology policy with developing countries, with a focus on energy policy. From 1997 to 2004 he was a program director in international energy and environment at the National Academies, working with China and India to promote clean and efficient energy production and use.

Hyungsub Choi is a graduate student in the Department of the History of Science and Technology at Johns Hopkins University. He is currently preparing his dissertation on the creation of the solid-state electronics industry in the U.S. and Japan during the 1950s.

Abdallah S. Daar is professor of Public Health Sciences and of Surgery at the University of Toronto, where he is also director of the Program in Applied Ethics and Biotechnology, co-director of the Canadian Program on Genomics and Global Health, and director for Policy and Ethics at the McLaughlin Centre for Molecular Medicine. He has published four books and more than 250 publications in immunology, immunogenetics, transplantation, surgery, and bioethics. He chaired the WHO Consultation on Xenotransplantation and wrote the WHO Draft Guiding Principles on Medical Genetics and Biotechnology. He is a Fellow of the New York Academy of Sciences. Daar's current research interests are in the exploration of how science and technology can be used effectively to ameliorate global health and developmental inequities.

William W. Ellis is a research and development manager with experience as a senior university administrative aide, Federal official, university professor, and executive in private research firms. He is currently serving as special assistant to the vice president for Academic Affairs at the University of the District of Columbia. Earlier in his career, Ellis was a senior official of the Congressional Research Service, National Science Foundation, and Library of Congress. He has been a faculty member at Northwestern University, the University of Michigan, and Howard University. Trained as a quantitative social scientist, Ellis holds a Ph.D. from New York University and an A.B. from Oberlin College, both in government. He is an Andover graduate.

John Fabel is an inventor and educator who serves as a principal in the Product Development Group LLC and teaches in the schools of Management and Engineering at the University of Massachusetts, Amherst. He has concentrated his career on the applied aspects of sustainable development and design, especially the linkage between sustainability and the marketplace and the role of sustainable development as a strategic planning tool. Fabel's work as an entrepreneur includes founding the Ecotrek Company, whose award-winning backpacks and other outdoor products demonstrated that the comprehensive use of environmental materials could be combined with high-performance design and successfully introduced to the marketplace. Fabel holds B.S. and M.S. degrees in Geography, with specialization in climate change, sustainable development, and environmental design.

Brent D. Glass is director of the Smithsonian's National Museum of American History. Before joining the Smithsonian in 2002, he served as the executive director of the Pennsylvania Historical and Museum Commission for 15 years. During this time, he managed the largest and most comprehensive state history program in the country and oversaw 25 historical sites and museums, the State Archives and State Museum, the State Historic Preservation Office, public history programs, and historical publications. Glass has also served as executive director of the North Carolina Humanities Council, and as a member of the national council of the American Association for State and Local History and the National Historical Publications and Records Commission. Glass, who received a Ph.D. in history from the University of North Carolina-Chapel Hill, has authored books and articles on industrial history and various topics related to the history of Pennsylvania and North Carolina. He is currently a member of the Flight 93 Memorial Commission.

Esther K. Hicks is an anthropologist and Near Eastern archaeologist, philologist, and historian. She earned her bachelor's and master's degrees in anthropology/archaeology and ancient history at the University of Michigan, Ann Arbor, and holds doctorates in cultural anthropology from the University of Leiden, and in the social sciences from Erasmus University, both in the Netherlands. She has worked on development-related research policy at the Dutch Ministry of Foreign Affairs, Directorate-General for International Development Cooperation, serving as General Secretary to the National Development Research Advisory Council and

project director of a multi-country study to generate policy strategies for improving the flow of social scientific information in sub-Saharan Africa. Most recently, she has been a senior policy analyst with Stanford Research Institute.

Ian Inkster is research professor of International History at Nottingham Trent University. He has also held visiting appointments at Hitotsubashi University, Japan; the Institute of Developing Economies, Tokyo, Japan; the National Institute of Science, Technology and Development Studies, New Delhi, India; the Institute of European Studies, Nanhua University, Taiwan; and the University of Pennsylvania. The author of several books on industrialization in Asia, his recent publications include *Culture and Technology in Modern Japan* (2000), *Japanese Industrialisation: Historical and Cultural Perspectives* (2001), *The Japanese Industrial Economy* (2001), and "Technological and Industrial Change: A Comparative Essay" (in *Cambridge History of Science*, 2002). Inkster is a Fellow of the Royal Historical Society.

Robert Kargon is the Willis K. Shepard Professor of the History of Science at Johns Hopkins University. His research has focused on science and its applications in the United States and Great Britain from the seventeenth through the twentieth centuries. His books include *The Rise of Robert Millikan: Portrait of a Life in American Science*, *Science in Victorian Manchester: Enterprise and Expertise*, and *Atomism in England: from Harriot to Newton*. He is currently working on projects involving the comparative history of science and its applications in several contexts.

Robert Lemelson is co-vice president and secretary of The Lemelson Foundation. An anthropologist who received his M.A. from the University of Chicago, and Ph.D. from the Department of Anthropology, UCLA, Lemelson is currently a lecturer in the departments of Anthropology and Psychology at UCLA. He was a Fulbright scholar in Indonesia in 1996-1997, has conducted research for the World Health Organization, and is additionally trained as a clinical psychologist. His area of specialty is Southeast-Asian studies, psychological anthropology, and transcultural psychiatry. He is also the president and founder of The Foundation for Psychocultural Research, a nonprofit research foundation supporting research and training in the neurosciences and social sciences.

Morris Low is assistant professor in the Department of the History of Science and Technology at Johns Hopkins University, where he is also professor of East Asian Sciences and Technology. He completed his Ph.D. at the University of Sydney, and taught at Monash University, the Australian National University, and the University of Queensland, where he was senior lecturer in Asian Studies. His new edited volume *Building a Modern Japan: Science, Technology, and Medicine in the Meiji Era and Beyond* (2005) has just been released. A research monograph entitled *Science and the Building of a New Japan* is due out in August, and he is currently completing *Japan on Display: Photography and the Shōwa Emperor*.

Elaine Marten made her career in the chemical industry with DuPont and Eastman Kodak. She has authored a variety of technical publications and has contributed to a number of industrial patents. After retirement in 1991, she taught as a volunteer instructor at the University of North Carolina Asheville College for Seniors. Her major volunteer activity for the past 8 years has been with Waste Reduction Partners, a non-profit group of technical retirees. She works collaboratively with clients at no charge to improve economic competitiveness and to preserve and enhance environmental resources. In addition to their efforts in energy-saving and water conservation, her group has been recognized for conversion of solid wastes into useful products. Marten holds a Ph.D. in organic chemistry from the University of Rochester.

Vijaya L. Melnick is director of the Office of Sponsored Research and Programs at the University of the District of Columbia (UDC), Washington D.C.; associate director of the International Center for Interdisciplinary Studies in Immunology at Georgetown University Medical Center; a member of the Health Care Ethics Faculty at Howard University Medical College; and the first vice president of the International Health Awareness Network, a United Nations affiliated organization. She has served as professor of Biological and Environmental Sciences and director of the Center for Applied Research and Urban Policy at UDC, and has been science advisor and member of the faculty of the Einstein Institute for Science, Health, and the Courts. Trained as a cell biologist, Melnick received her Ph.D. from the University of Wisconsin, Madison.

Dan Melnick is a social science consultant focused on facilitating the infrastructure for understanding, finding, and using statistical information to solve complex problems. He was previously a senior analyst on the staff of the Library of Congress and held senior positions at the National Science Foundation and the U.S. Public Health Service. His current work focuses on health and economic statistics. His clients include U.S. government agencies and the National Academy of Sciences, for which he has served as a consultant to the Committee on National Statistics since 2001. He has also been a consultant to panels working on statistical issues in formula allocation, drug abuse statistics, and labor conditions of U.S. companies with foreign facilities. He founded Dan Melnick Research Inc. in 1997.

Arthur P. Molella is Jerome and Dorothy Lemelson Director of the Lemelson Center for the Study of Invention and Innovation at the Smithsonian's National Museum of American History. He served as head curator of the Smithsonian's *Science in American Life* exhibit and co-curator of the international exhibition, *Nobel Voices*. He has written widely on the relations among science, technology, and culture, and on the politics of science museums and displays. His recent publications include "Exhibiting Atomic Culture: The View from Oak Ridge" (in *History and Technology*, 2003) and *Inventing for the Environment* (2003), co-edited with Joyce Bedi. He received his Ph.D. in the history of science from Cornell University.

Satheesh Namasivayam is a senior program officer at The Lemelson Foundation, where he supports the development and implementation of the Foundation's U.S. and international Programs. He recently served as a teaching fellow at Harvard University's John F. Kennedy School of Government and conducted research there on varied institutional approaches to technology-enabled development. Namasivayam earned a Masters Degree in Public Administration from Harvard University, an MBA and M.S. in Information Management from Arizona State University, and a B.S. in Engineering at Regional Engineering College in Trichy, India. During his bachelor's work, Namasivayam co-designed a "shrimp-peeling" machine, an innovative model that was awarded funding by the state government. He was also a member of the team that created the first intra-city ATM banking network in India.

Harry Rand is senior curator of Cultural History, Division of Politics and Reform, at the Smithsonian's National Museum of American History, and former chairman of the Department of 20th Century Painting and Sculpture at the Smithsonian's National Museum of American Art. He is the author of numerous books on international modern art and artists including *Seymour Lipton: Aspects of Sculpture* (1979), *Arshile Gorky* (second edition, 1991), *Manet's Contemplation at the Gare St. Lazare* (1987), *Paul Manship* (1989), and *Friedensreich Hundertwasser* (1991). His work has been translated into a dozen languages. Rand received his Ph.D. from Harvard University.

Sorosh Roshan is president of the International Health Awareness Network, an organization dedicated to improving the health and welfare of women and children worldwide, and past president of the National Council of Women of the United States, Inc., a coalition of organizations and individuals dedicated to the realization of full participation by women in every aspect of society. She is a board certified obstetrician and gynecologist, a member of the American Medical Women's Association, and a Fellow of the American College of Obstetrics and Gynecology and the American College of Surgeons. Born in Iran, Roshan received her medical degree from Tehran University, and completed her residencies at London University and Albert Einstein College of Medicine, Bronx, N.Y.

Abigail Sarmac joined The Lemelson Foundation as program officer in April 2005. Prior to The Lemelson Foundation, Sarmac lived and worked in Senegal, Ecuador, Italy, and the U.S. with several international environmental organizations, including the World Conservation Union, the Food and Agriculture Organization of the United Nations, the United Nations Forum on Forests Secretariat, and the Wildlife Conservation Society. Her work centered on participative development of environmental conservation policy. Sarmac earned her M.Sc. in environmental science from Yale University's School of Forestry and Environmental Studies, with a certificate in industrial environmental management. She also holds a B.Sc. in international politics from Georgetown University's School of Foreign Service.

B.K. Singh is professor of soil science at EARTH University in Costa Rica. He teaches soil fertility and plant nutrition and carries out research on biostimulants for

plant growth, sports drinks with natural ingredients, microbial metabolites for sanitation, plant metabolites for drug development, slow release intelligent fertilizers, and the creation of community centers to promote invention, innovation, and entrepreneurship. He has developed commercial plant biostimulants derived from naturally occurring humic substances. He has also participated in coordinating a seminar series entitled "Sustainability, Education, and Management of Change in the Tropics," conducted for a period of five years in Africa, Asia, Europe, and Latin America. Singh holds an M.S. in Agrochemistry from Lumumba University, Moscow, and a Ph.D. from the University of Florida.

Douglas Steinberg joined The Lemelson Foundation as senior program officer in April 2005. He has 20 years of experience in developing countries in Africa and Asia. After serving as a Peace Corps volunteer on an agro-forestry project in northern Cameroon, Steinberg worked with CARE, one of the foremost international relief and development agencies. Just prior to joining The Lemelson Foundation, Steinberg served as CARE's country representative in Angola. He has also worked for CARE in Bangladesh, Mali, and Niger. Steinberg holds a bachelors degree in political science from the University of Michigan and a masters of science in natural resource policy analysis from the University of Washington.