ACROSS THE DIVIDE

The role of scientists in meeting global challenges.

In each issue, we ask three experts to write an essay from their perspective on one central theme. In this issue, they discuss the role of scientists in meeting global challenges.

MY LIFE AS A SCIENCE ENVOY | PAGE 10

BY: DR. BRUCE M. ALBERTS, SAN FRANCISCO, CALIFORNIA, USA

Dr. Bruce M. Alberts served as Editor-in-Chief of *Science* (2008-2013) and as a U.S. Science Envoy (2009–2011). Alberts holds the Chancellor's Leadership Chair in Biochemistry and Biophysics for Science and Education at the University of California, San Francisco, to which he returned after serving two six-year terms as the president of the National Academy of Sciences (NAS). Dr. Alberts is noted as one of the original authors of *The Molecular Biology of the Cell*, a preeminent textbook in the field now in its fifth edition. Alberts has earned many honors and awards, including 16 honorary degrees. He currently serves on the advisory boards of more than 25 nonprofit institutions, including the Gordon and Betty Moore Foundation and the Strategic Education Research Partnership (SERP).

GLOBAL FOOD SECURITY: HUMANITY'S FOREMOST CHALLENGE OF THE 21ST CENTURY | PAGE 18

BY: DR. GEBISA EJETA, WEST ETHIOPIA

Dr. Gebisa Ejeta is a Distinguished Professor of Plant Breeding & Genetics and International Agriculture at Purdue University. He was born and raised in a small rural community in west-central Ethiopia before attending graduate school at Purdue University. Dr. Ejeta has served the Consultative Group for International Agricultural Research (CGIAR), the largest publicly funded agricultural research consortium in the world as a member of its Science Council (2008–2010) and currently as a member of its Consortium Board. He is also a board member of Sasakawa Africa Program. He was recently designated special advisor to USAID Administrator Dr. Rajiv Shah. Dr. Ejeta was the recipient of the 2009 World Food Prize and a national medal of honor from the President of Ethiopia.

CLIMATE CHANGE: CLOSING THE MISINFORMATION GAP | PAGE 26

BY: DR. JOHN P. HOLDREN, WASHINGTON, DISTRICT OF COLUMBIA, USA

Dr. John P. Holdren is Assistant to the President for Science and Technology, Director of the White House Office of Science and Technology Policy, and cochair of the President's Council of Advisors on Science and Technology (PCAST). Before joining the Obama administration, Dr. Holdren was Teresa and John Heinz Professor of Environmental Policy and Director of the Program on Science, Technology, and Public Policy at Harvard University's Kennedy School of Government, as well as professor in Harvard's Department of Earth and Planetary Sciences and Director of the independent, nonprofit Woods Hole Research Center. Previously he was on the faculty of the University of California, Berkeley, where he cofounded in 1973 and coled until 1996 the interdisciplinary graduate-degree program in energy and resources. During the Clinton administration, Dr. Holdren served as a member of PCAST through both terms and in that capacity chaired studies requested by President Clinton on preventing the theft of nuclear materials, disposition of surplus weapon plutonium, the prospects of fusion energy, U.S. energy R&D strategy, and international cooperation on energy-technology innovation.

Sporting batik, Alberts meets with President Yudhoyono of Indonesia and his cabinet.
See Photography + Art Credit on page 57 for copyright information.

MY LIFE AS A SCIENCE ENVOY

BRUCE ALBERTS

During a lunch break at a meeting of the President's Council of Advisors on Science and Technology (PCAST), President Obama's Science Advisor, Dr. John Holdren, approached me with a startling request. Would I agree to serve as one of Obama's first three Science Envoys to Moslem-majority nations? It was October 2009 and four months earlier, in his famous Cairo speech announcing a new approach to the Muslim world, the President had announced that "We will…appoint new science envoys to collaborate on programs that develop new sources of energy, create green jobs, digitize records, clean water, grow new crops." The other two envoys would be Elias Zerhouni, a distinguished U.S. science leader born in Algeria, and Ahmed Zewail, an Egyptian-born Nobel Prize-winning chemist from Cal Tech. I was born and raised in Chicago and, unlike these other envoys, I knew almost nothing about the two countries that I would be assigned to—Indonesia and Pakistan—nor could I speak the relevant languages.

There were other reasons to consider turning down the offer. Until mid-2013, I would be the Editor-in-Chief of *Science* magazine, a weekly journal that placed heavy demands on my time. And I had serious concerns about the proposed Science Envoy program. During my service as president of the U.S. National Academy of Sciences from 1993 to 2005, I had witnessed the U.S. government sign many formal bilateral science and technology agreements. Repeatedly, expectations would be raised by promises of support for activities that were never undertaken in the end because of a lack of follow-up funding from our government. As one example, in the late 1990s, I participated in an elaborate high-level meeting sponsored by the U.S. Department of State with South Africa, attended by Thabo Mbeki (then South African Vice President, soon to be President) and other dignitaries. From a subsequent visit to South Africa, I learned that very little of what was promised in the agreements signed at that meeting had actually come to pass. Might the high-profile Science Envoy program also create unrealistic expectations that could not be met, thereby negating the goodwill toward the United States that it aimed to create through a new form of science diplomacy?

On the other side of the argument, while at the Academy I had become a strong advocate for a much larger role for both science and scientists in

the relations between nations. (see twelve National Academy of Sciences annual meeting speeches at www.biochemistry.ucsf.edu/labs/alberts). I appreciated the fact that the envoys would be serving as volunteers, with only our travel expenses paid; thus, we would be acting as individuals whose statements would not need to be approved by the U.S. government. And very importantly for me as a scientist, the Science Envoy program was an "experiment." The initial set of three envoys would play a major part both in defining what it meant to be a "science envoy" and in shaping the program to help make it a long-term success. This final point proved to be decisive. In the end, I accepted the appointment because it promised to be an adventure from which both I and the U.S. government could learn a great deal.

FIRST EFFORTS IN INDONESIA

I would focus most of my effort in Indonesia, the world's most populous Muslim-majority nation—with 250 million people spread out over more than 10,000 islands that span a considerably greater distance than the continental United States. Very importantly, I was quickly introduced to a wise and reliable partner in Indonesia, Dr. Sangkot Marzuki. Marzuki is a molecular geneticist who heads the outstanding Eijkman Institute for Molecular Biology in Jakarta, while also being the president of the Indonesian Academy of Sciences (AIPI). By working closely together, we aimed to design activities of high potential impact—both for Indonesia and for the United States.

It turned out that Marzuki and I share a strong interest in supporting and empowering the best young scientists as the future science leaders of our two nations. This focus has guided many of our activities in Indonesia. We were fortunate that Dr. Jason Rao had moved from the U.S. Department of State to oversee the new Science Envoy Program at the Office of Science and Technology Policy (OSTP). He was instrumental in lining up funding from the U.S. Department of State to support some initial joint activities, thereby overcoming my fear that my service as Science Envoy would be remembered as "all talk and no action."

Skillfully supported by Embassy staff, Jason and I spent a very productive eleven days in Indonesia in May 2010. I met with President Susilo Bambang Yodhoyono for an hour and visited some of Indonesia's leading science centers. But even more impactful for our future activities was the 3-day meeting that Marzuki organized on the remote "spice island" of Ternate. He had invited 40 of Indonesia's best

The local Sultan officially welcomes Alberts and delegation to Ternate, one of the oldest Muslim kingdoms in Indonesia. See Photography + Art Credit on page 57 for copyright information.

younger scientists, ages 35 to 40, in order to solicit from them what they most wanted from a scientific partnership with the United States. After lively initial discussions, these scientists broke up into 3 groups that worked late into the night to prepare their summary recommendations for the final morning of the meeting. Most memorable for me was their repeatedly stated desire for a "merit-based system of science and education." They were also enthusiastic about establishing an annual U.S.-Indonesia Frontiers of Science meeting that would bring together 40 of Indonesia's best young scientists with a similar number of young Americans, a shared goal that we would soon be able to meet.

BUILDING INTERNATIONAL BRIDGES BETWEEN YOUNG SCIENTISTS

To date (September 2013), I have completed five trips to Indonesia—the most recent in June of this year, even though my formal Envoy appointment ended in 2011. As part of my latest visit, I attended the third annual U.S.-Indonesia Frontiers of Science event. Modeled after similar workshops that the U.S. National Academy of Sciences conducts with China, Germany, India, Japan, and other nations, each Frontiers meeting is organized by a bilateral committee of young scientists who select six different topics for a 3-day workshop (see www.nasonline.org). The multidisciplinary Frontiers

format promotes creative thinking through interactions of scientists from disparate backgrounds, stimulating what I like to call a "random collision of ideas." The young scientists are encouraged to apply for competitively awarded Partnerships for Enhanced Engagement in Research (PEER) collaborative grants—which are funded by U.S. Agency for International Development (USAID) jointly with the U.S. National Science Foundation (NSF) and our National Institutes of Health. During the three Frontiers meetings that I attended, I met many talented young Indonesian scientists, and, thus far, Indonesia has been highly successful in competing for PEER awards.

I view the annual Frontiers of Science meetings as a valuable legacy from my term as Science Envoy, one that is building strong personal relationships of trust between the future scientific leadership in our two nations. I am pleased that the fourth such meeting in Indonesia will be held in the summer of 2014.

INCREASING THE INFLUENCE OF SCIENCE ON GOVERNMENT POLICY

A second focus as Science Envoy has been to increase the influence of the Indonesian science community on government policy making. On issues that range from the health hazards of drinking water, to the use of vaccination or genetically modified crops, wise long-range decisions can only be made if each nation's scientists play important roles in educating and informing both their fellow citizens and their government. This requires building institutions in each nation that become effective and respected conduits for providing such advice. In the United States, the primary such conduit is the National Academies, which publishes more than 200 reports a year, most of which present the scientific consensus on a topic relevant for government decision makers (see www.nap.edu).

Building on past efforts with the South African Academy of Sciences and other academies (see www.nationalacademies.org/asadi/), we have sought with USAID support to help the Indonesian Academy of Sciences become a trusted, independent advisor to the Indonesian government through a series of joint studies by the U.S. and Indonesian academies on Indonesian issues. The first such report, entitled Saving Lives, Saving the Future: Reducing Maternal and Newborn Mortality in Indonesia, has recently been completed and is scheduled for release in late 2013 (see www.nap.edu). This report is extremely relevant and timely, because Indonesia continues to fail to meet this important United Nations Millennium Development goal. As a central part of this project, an experienced staff officer of the U.S. Academy, Dr. Michael Greene, has worked closely with the Indonesians. With support from USAID, a second joint report is planned.

Alberts plants roots at the Indonesian Institute of Sciences (LIPI). See Photography + Art Credit on page 57 for copyright information.

CREATING A MERIT-BASED SYSTEM OF SCIENCE AND EDUCATION

The mission most urgently desired by the young Indonesian scientists in our initial workshop in Ternate was that of helping Indonesia create a "merit-based system of science and education." In my first visit, I was amazed to learn that Indonesia has essentially no competitive grant programs to make resources available for scientific research by their most outstanding scientists. Instead, very limited resources are provided to research institutions, amounting to only about 0.06 percent of gross domestic product (20-fold lower than in more developed nations). As a result, Indonesia, which is the 4th most populous nation in the world, ranked 64th among nations in numbers of research publications in the period 1996–2010 (OECD, Science, Technology, and Industry Scoreboard 2011). Indonesia lacks a vibrant industrial base, at least in part because there are not enough scientists and engineers to support one.

How might Indonesia do a much better job of investing in its future, given its widely expressed aim to become an "innovation nation"? With the support of the World Bank and Australia, the Indonesian Academy of Sciences has produced a very important report entitled Creating an Indonesian Science Fund (see www.aipi.or.id). Coauthored by Dr. Michael Greene from the U.S. National Academy of Sciences and the newly elected Vice President of the Indonesian Academy, Dr. Satryo Soemantri Brodjonegoro, this 50-page report skillfully analyzes the current problems with Indonesia's scientific funding system. It recommends that a new independent agency be established in Indonesia to administer an NSF-like competitive grant program that is designed to directly fund the best Indonesian scientists, regardless of their age.

Representatives from the U.S. National Science Foundation (NSF) have made major contributions to this effort, and our nation has promised to help both with grant reviewers and the grant review process. My most recent trips to Indonesia have placed great emphasis on the importance for Indonesia's future of establishing such a new funding agency.

SUPPORTING THE PROMOTION OF SCIENCE IN INDONESIA BY U.S. EMBASSY STAFF

Last but not least, I believe that my role as Science Envoy has been useful to our Embassy in Jakarta in encouraging talented people from different parts of our government to work synergistically and more effectively to promote quality science and science education in Indonesia. I view it as a great sign of progress that the USAID Mission in Jakarta will be the first USAID Mission in recent times to have a science, technology, and innovation track as one of its four formal development objectives. Hopefully, the Indonesian Embassy can serve as a model for many other U.S. embassies to follow, as the U.S. government strives to use our global leadership position in science and technology to help all nations develop in highly productive ways.

My service as Science Envoy would not have been possible without the strong support of energetic and impressive U.S. government staff in both Jakarta and in Washington. In addition to Dr. Jason Rao, special appreciation is due to Dr. Kendra Chittenden and Dr. Ali Douraghy at USAID/Indonesia, and to Dillon M. Green with the U.S. Embassy in Jakarta—and to many others, as well.

It will take more time to judge how successful the ongoing Science Envoy Program has been. However, I now believe that this experiment has great potential for deepening the connections between the United States and other nations, with the critical aim of harnessing science to create a more rational and peaceful world. ■

ABOUT BRUCE ALBERTS

Bruce Alberts served as Editor-in-Chief of Science (2008–2013) and as a United States Science Envoy (2009–2011). Alberts is also Chancellor's Leadership Chair in Biochemistry and Biophysics for Science and Education at the University of California, San Francisco, to which he returned after serving two six-year terms as the president of the National Academy of Sciences (NAS).