

A conversation with Dr. Bruce Alberts on January 29, 2014

Participants

- Dr. Bruce Alberts — Professor of Biochemistry, University of California, San Francisco; former President, National Academy of Sciences.
- Holden Karnofsky — Co-Executive Director, GiveWell
- Dario Amodei — Scientific Advisor, GiveWell
- Cari Tuna — Co-Founder, Good Ventures

Note: These notes were compiled by GiveWell and give an overview of the major points made by Dr. Alberts.

Summary

GiveWell and Good Ventures spoke to Dr. Alberts to learn more about opportunities for philanthropy aiming to improve science policy. Conversation topics included funding and incentives for scientific research, evaluation standards for researchers, science education standards, and engaging scientists in policy.

Funding scientific research

The current funding system for scientific research is biased toward supporting short-term, translational research (research that looks for practical applications of basic science). As someone who co-authors a large cell biology textbook every 5 years, I am painfully aware of the huge gaps in our understanding of fundamental life processes. Many great opportunities to advance this understanding through basic research in biology are not receiving funding from the National Institutes of Health (NIH), the largest funder of biomedical research. Changing incentives to more effectively recognize the critical importance of such understanding would have a strong effect on researchers' choices and help produce more outstanding basic research.

NIH has the ability to change researchers' incentives. It has been overfunding translational research for a long time, in part because of pressure from outside groups, such as Congress and disease-specific organizations, that are not well-informed about how severely our current lack of understanding inhibits advances in health research.

An example of outside pressure leading to a funding bias is the National Center for Advancing Translational Science (NCATS), a new NIH center that resembles a small pharmaceutical company by providing access to drug screening facilities for scientists at academic institutions that lack these capabilities. While the idea of NCATS appeals to Congress, many leaders in biotechnology think that NCATS does not add value because it has a very similar approach to pharmaceutical companies, but without their resources.

Grant reviewers at NIH tend to fund similar projects year after year, and NIH's grant system is often biased toward those researchers who have become savvy about applying

for funding through NIH. Moreover, since 1991, NIH's grant applications no longer require information about researchers' existing resources. Previously, it was possible to evaluate researchers' productivity as a factor of their funding, but now the researchers with the most existing funding appear to be the most productive and so are more likely to receive additional funding. A better mechanism is needed to remove biases in the grant system and reduce the size of some grants. A start has been made: a few NIH agencies, such as the National Cancer Institute (NCI), require an extra review when researchers being recommended for more funding already receive more than \$1M a year from NIH.

NIH is in need of major reforms, but it is a large organization that is difficult to change. It has historically demonstrated a lack of interest in an independent outside review of its programs by organizations like the National Academies (NAS, IOM, NAE, NRC). NIH could fund the National Academies to carry out a major review of NIH once every five years. To conduct an adequate review, the NAS would need access to all of the data, such as the distribution of NIH grants (i.e. detailed analyses of the number of researchers that have received different numbers and types of grants). NIH data can be difficult to interpret, and in the past some of the data that NIH has released publicly has included misleading information.

The system is complex, and attempts to improve NIH funding patterns can fail. Dr. Alberts chaired an NIH committee in 2000 that reorganized the study sections that review different categories of grants. The new study sections were recommended to contain a mixture of both basic scientists and translational scientists. The reform was not well-executed and resulted in most study sections being dominated by translational researchers from medical centers, creating a system in which too many study sections are funding their types of research, with only a few funding the most imaginative work. This outcome reflects the increasingly large number of medical center researchers and faculty supported by NIH.

Dr. Alberts has long been a reviewer for the New Innovator Award Program at NIH, which funds innovative research that might not otherwise receive funding. In its first round, the program funded only 30 of 4,500 grant applications. It would be possible to change the incentives of young biologists by making such a program the predominant way that young researchers begin their careers, which could be accomplished by increasing the number of these awards from around 30 into the hundreds.

Advocating for more investment in basic research

The basic biological sciences are fundamental to medical science. Biologists have gathered large amounts of data but are only a fraction of the way to understanding the cell.

Arguing that important discoveries are more likely to result from basic research could help generate more basic research. A series of pamphlets produced by the National Academy of Sciences (NAS) in the 1990s, "Beyond Discovery: The Path from Research to Human Benefit," used case studies to demonstrate how ideas from basic science have been combined in unpredictable ways to produce medical breakthroughs.

People to talk to in this area include:

- Mary Woolley, the president of Research!America. Ms. Woolley has experience advocating for change in U.S. government. Research!America pushes for more funding for institutions such as NIH and the National Science Foundation. It is not very involved in the debate on the merits of basic vs. translational science.
- Rush Holt, a research physicist and U.S. Representative for New Jersey.
- James Jensen, Executive Director of the Office of Congressional and Government Affairs at the National Academies.

Improving translational research

Some common practices in translational research are not effective. In Dr. Alberts' experience, an effective technique for disease-specific research is to engage scientists who may not be familiar with the disease but who work with cutting-edge technologies that may have relevant applications, and then fund postdoctoral fellows to work with them.

Dr. Alberts has been on the board of Scleroderma Research Foundation (SRF) for 25 years, which was founded in response to a lack of funding and attention from the medical community for scleroderma. By following a strategy of getting top scientists with experience in leading technologies to think about the disease, the foundation has changed the nature of research on this disease, and Dr. Alberts is optimistic that a cure will be found.

Improving data-intensive science research

Philanthropists might have a large impact if they get involved in efforts to improve data-intensive science. A good person to talk to is Vicki Chandler, Chief Program Officer of the Science Program at the Gordon and Betty Moore Foundation. The Moore Foundation has begun to fund data-intensive science research, and it works to make careers in data analysis prestigious and effective, such as by setting up data science departments in universities. Dr. Chandler will continue to fund innovative data science meta-researchers, and joining that effort could be of interest to philanthropists.

Evaluating science researchers

Many of the systems for evaluating science researchers are problematic, particularly in parts of Asia, where researchers tend to be evaluated based on the volume of their publications and the prestige of journals they have been published in. This kind of system encourages scientists to publish large numbers of trivial papers. Dr. Harold Varmus, Director of the National Cancer Institute (NCI), is working to establish a system within NIH in which researchers are evaluated on the basis of their 5 or 10 most important contributions to science, rather than volume of publications or the prestige of journals.

Scientific societies could play a major role in creating a movement for better evaluation standards. The American Society of Cell Biology (ASCB), of which Dr. Alberts was President

for a year, is an active advocate for better standards. Philanthropists could fund a consortium to bring representatives of major scientific societies together to do work in this area. This would be an inexpensive investment; costs include staff members' time and travel. People to talk to about improving evaluation standards include Stefano Bertuzzi, the Executive Director of the ASCB.

Engaging scientists in policy

It is important to empower young scientists to do work in policy by funding them and connecting them with policymakers. Dr. Albert and his colleagues are trying to start a "Young Academy" for young scientists in California, which would connect top scientists and engineers, provide them with a staff member, and give them open-ended encouragement to do something positive for their state. Similar programs have been successful in countries such as the Netherlands, South Africa, and Germany.

The American Association for the Advancement of Science (AAAS) Fellowship Program funds young scientists and engineers to do a year of policy work in US government positions, such as being staff on Congressional committees. AAAS now provides more than 200 such positions every year. Half of AAAS fellows choose to continue working in policy after the fellowship. The presence of AAAS fellows in Washington has a large impact on the amount of attention paid to science.

The Mirzayan Fellowship Program at the United States National Academies is a 12-week policy program for graduate students and recent postdocs, including lawyers with science backgrounds. Fellows are connected to people working in the policy arena, including congressional staff.

The California Council on Science and Technology (CCST) Policy Fellowship Program is a one-year fellowship program in which scientists work with the California State Legislature, in Sacramento. Legislative committees were hesitant to accept fellows in the program's first year, but have since become eager to work with them. Half of CCST fellows have continued to work in Sacramento after the fellowship. CCST is currently fundraising for the next five years of this program. The program clearly represents a high-impact investment opportunity for philanthropists.

Alumni from these fellowship programs might be good candidates to advocate for and help develop better incentives for researchers.

Improving science education

In 1993, Dr. Alberts joined NAS as its president to work on improving science education in the U.S. In 1998, he helped university presidents and several CEOs, including Arthur Levinson, to organize a letter to the California State Board of Education that advocated for better science education standards in California. The leadership of some major companies, including Hewlett Packard, declined to participate due to uncertainty about what the best policy would be. It is important that the CEOs of our major companies become much better

informed about where their interests lie on this important issue.

The Howard Hughes Medical Institute (HHMI) and others are working to improve first-year college science education. Some real progress is being made in this area, which is crucial to support and help drive the major improvements needed at lower levels.

Who else to talk to about these issues

Philanthropists might benefit from spending a week in D.C. interviewing potential advisors for projects in these areas. People to talk to include:

- Stefano Bertuzzi, Executive Director of the American Society for Cell Biology.
- Harvey Fineberg, President of the Institute of Medicine.
- Anne-Marie Mazza, Director of the Mirzayan Fellowship Program.

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