A STRONG VOICE FOR SCIENCE

RUSH HOLT, CEO
AMERICAN ASSOCIATION FOR
THE ADVANCEMENT OF SCIENCE

Incoming AAAS President and former congressman Rush Holt explains how his tenure in the US House of Representatives has prepared him for steering the Association's well-established science advocacy efforts

As the newly appointed CEO of the American Association for the Advancement of Science (AAAS), in what direction are you hoping to guide the organisation?

It would be presumptuous for me to set forth a comprehensive vision statement too soon after my arrival. In general, AAAS must strive to help improve the entire science enterprise and how it is perceived by the public. Essential to our success will be broad efforts to promote a culture of reverence for facts and evidence. That will require the accurate communication of scientific progress. AAAS serves as a strong voice for science and scientists – through the content published in our journals; through programmatic activities such as communication training for scientists and engineers; and by providing authoritative, objective information to help guide science policy. The organisation has had a long history of science advocacy and, under my tenure, AAAS will continue to speak out assertively on topics such as climate change, the need for innovative energy solutions, and the importance of science diplomacy, R&D funding, and high-quality science education for all children.

How have your past experiences, particularly your time in the US House of Representatives, prepared you for this new position?

AAAS' goal to promote science and innovation has motivated all of my professional efforts over the years – as a teacher at Swarthmore College, as a research physicist for the Princeton Plasma Physics Laboratory and as the Congressional representative for Central New Jersey from 1999 until this year. While I was in Congress, my science- and education-related roles included service with the Committee on Education and the Workforce; the Committee on Natural Resources; and the National Commission on Mathematics and Science Teaching for the 21st Century. I also served as co-Chair of the Research and Development Caucus, and I sat on other caucuses related to children's environmental health, renewable energy, sustainable development, Alzheimer's disease and diabetes, biomedical research, the internet, community colleges, and more.

I am particularly concerned about federal investments in R&D, and this has long been a concern for AAAS as well. While all sources of science funding are critical, governments are more likely than corporations to fund high-risk as well as basic research, which can result in game-changing breakthroughs but may require longer-term investment. The recent trend in US federal R&D funding should therefore be a major concern, not only for Americans, but for any researcher who collaborates with us. Although federal non-defence R&D increased from 1983 to 2003, it has slowly eroded since then.

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During your tenure as a congressman, one of your primary concerns was innovation. Why is this a key issue?

Science and technology drive innovation, which creates new jobs and prosperity: since World War II, US federal investments in R&D have fuelled about half of the nation's economic progress. Providing adequate support for R&D is therefore critical to any nation's future – offer support for bright researchers, and innovation will follow. Larry Page and Sergey Brin did not set out to revolutionise the economy; they were originally curious about a mathematical challenge, and so they created an algorithm to rank web pages. As we all know, their basic research efforts changed technology forever through their company Google. Their story is an excellent example of the power of science and innovation.

Going forward, innovative solutions are urgently needed to reduce our dependency on fossil fuels so that we pump fewer greenhouse gases into the atmosphere, effectively treat or even cure devastating diseases, and feed a world population that might reach 12 billion people by 2100, according to the United Nations.

What is AAAS doing to promote a more innovative and entrepreneurial culture?

At AAAS, we have tried to reward innovation through programmes such as the Golden Goose Awards, a collaborative effort, originally conceived by Congressman Jim Cooper (D-Tennessee), to recognise seemingly obscure studies that led to major breakthroughs. Winners of Golden Goose Awards have included Osamu Shimomura, Martin Chalfie and Roger Y Tsien, whose basic studies of jellyfish nervous systems unexpectedly led to advances in cancer diagnosis and treatment, increased understanding of brain diseases such as Alzheimer's, and improved detection of poisons in drinking water. These three scientists received the Nobel Prize in Chemistry in 2008 for research that may at first have seemed obscure.

> Synthetic biology techniques are allowing researchers to construct biological systems, with possible applications ranging from gene therapies and computational tools to biodegradable plastics and biofuels

AAAS also helps to implement the US State Department's Global Innovation through Science and Technology (GIST) competition, which honours young innovators who leverage science and technology to meet key needs in developing countries. Last year, GIST encouraged innovators who are working to reduce maternal and infant mortality, produce animal feed using

less land and water, and detect outbreaks of poisonous 'red tide' algae in cheaper, easier ways.

What are you hoping to achieve through the collaborative efforts of the Close the Innovation Deficit campaign?

The Close the Innovation Deficit campaign was launched by 133 national businesses, higher education, scientific, patient and other organisations to advocate for increased investments in scientific research and higher education. We see those investments as essential to economic growth and improved lives. The US cannot contribute solutions to global problems, or maintain a vibrant economy that will also benefit other nations, unless we make adequate investments in science and technology. In a letter sent to members of Congress on 12 November 2014, for example, the group wrote: 'The fact that other nations are building up their research and innovation capabilities is not a bad thing. The world benefits from stronger research and education in other countries as well as our own. What should concern us is that those other nations are doing this while the US is essentially standing still'.

Could you summarise AAAS' ongoing Strategic Transformation? What involvement does the Association's *Science* journals have in this initiative?

Over the past several years, the AAAS Board of Directors and my predecessor, former CEO Alan I Leshner, launched a far-reaching transformation initiative. That effort is building upon the Association's strengths by enhancing its engagement with its members and positioning the *Science* family of journals to provide leadership in science communication with more dynamic digital services and capabilities. This year, we launched our first digital-only, open-access journal *Science Advances*, thereby expanding the family of journals that includes *Science Signalling*, *Science Translational Medicine* and our flagship journal *Science*. We are also beta-testing a new scientific collaboration- and community-building platform called Trellis. The goal of the transformation initiative is to make our already-strong organisation even more robust and more useful to members, policy makers and the public.

The latest Pew Research Center survey of citizens and AAAS members completed in collaboration with AAAS suggests that the general public has broadly different views on a number of issues (ranging from genetically modified food to vaccines) when compared to the opinions of the scientific community (see p 89). Is this disparity a problem and how might these differences in opinion be bridged?

Acceptance of scientific facts can be compromised anytime evidence intersects with people's personal, religious or political views. Such conflicts have created tension related to the teaching of evolution in public science classrooms; the reality of global climate change; the safety of childhood vaccines; and even the safety of water fluoridation – despite years of research showing that fluoridation at the acceptable, recommended levels is safe and effective at protecting against tooth decay. The only solution is respectful communication. As Alan Leshner wrote in a 30 January 2015 editorial in *Science*: 'Speaking up for the importance of science to society is our only hope, and scientists must not shy away from engaging with the public, even on the most polarising science-based topics'. He also noted the importance of simply speaking directly to people – and listening as well as sharing information in a 'bidirectional' fashion.

In your opinion, what are the most significant contributions that AAAS has made since its establishment?

As the world's largest general scientific society, AAAS has made significant contributions across many fields, so it would be difficult to provide a 'top 10' list. Our flagship journal *Science* has long published important scientific research articles that have had a major impact on scientific progress. Project 2061 has been an influential voice for improving science literacy and education. The Association's most noteworthy offerings at the science-society interface have included the 43-year-old AAAS Science & Technology Policy Fellowships programme, which places outstanding scientists and engineers in executive, legislative and Congressional branch assignments for one or two years. That programme now includes nearly 3,000 alumni working worldwide in the policy, academic, industry and non-profit realms. In 1982-83, while I was teaching physics at Swarthmore College, I was selected by the American Physical Society to receive one of these Fellowships. The experience was life-changing, and it served as a springboard to my role in Congress. Another historic AAAS programme, the AAAS Kavli Science Journalism Awards, dates back to 1945 and has helped to improve the public communication of science by recognising excellence in science news reporting.

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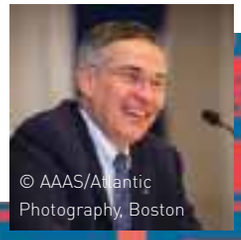
Finally, where do you see advances in science and technology heading?

Basic research is constantly expanding our understanding of the natural world, while other projects are speeding medical advances to improve quality of life and solve global problems such as climate change and the need for expanded energy solutions. I would not venture to predict the future, but *Science*'s *2014 Breakthrough of the Year* edition offers some tantalising clues to the kinds of innovations we might expect in the coming years, including new insights on our universe and origins, cooperative robotic systems, insights on the ageing process, cells that might cure diabetes and chips that mimic the brain.

Across other fields, synthetic biology techniques are allowing researchers to construct biological systems, with possible applications ranging from gene therapies and computational tools to biodegradable plastics and biofuels. The research also raises important ethical questions that will need to be carefully addressed. Similarly, tissue-engineering research could suggest ways to address medical disorders and injuries.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