

The Role of National Academies in National Development
39th Annual General Meeting of the National Academy of
Sciences of Sri Lanka - Address by Andrew Holmes
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President of the National Academy of Sciences of Sri Lanka, Dr Azeez Mubarak, learned Fellows of the Academy, distinguished guests, ladies and gentlemen,

Thank you very much for inviting me to deliver the Special Guest Lecture at the AGM of the Academy. I consider this a singular honour. Although I have never been to Sri Lanka I have a number of friends from this country - a land that I have always wished to visit. I have known President Mubarak for a long time when we were both at Cambridge, and I treasure those memories and the opportunity to renew the friendship during this visit.

To all of you in the Academy I extend my most gracious appreciation for the invitation, and I bring greetings from the Australian Academy of Science

You have invited me to speak on the topic of the Role of the National Academies in National Development. Let me start by telling you a little about the Australian Academy of Science.

The Australian Academy of Science consists of about 550 Fellows, about 33 of whom are Corresponding members (distinguished scientists, both Australian and Foreign, who live outside Australia). These Fellows occupy positions in universities, research organisations, medical institutes and industry and contribute to the work of the Academy in their own time on a voluntary basis.

The Academy is quite young (founded 1954) in its history, but over 50% of our Fellows are over the age of 70. Fellows are elected from all areas of the physical, biological, mathematical and medical sciences. We also have academies of the humanities, social sciences, engineering and technology and a recently established academy of health and medical sciences. All these academies co-operate through the Australian Council of Learned Academies.

The Australian Academy of Science was established in 1954 as an independent non-profit organisation, comprising individuals elected for their outstanding contributions to science and research.

The Academy champions, celebrates and supports excellence in Australian science, promotes international scientific engagement, builds public awareness and understanding of science, and provides independent, authoritative and influential scientific advice. We have identified the key point on our compass as a commitment to be an influential voice in science.

National academies

I would now like to focus on academies of science and the role that they play in society.

Academies of science are typically independent organisations that commit to the role of advancing science and evidence in policy making. They are merit based, with members selected from among leading scientific minds within a country or region. As such they are viewed at home and abroad as places where scientific excellence across disciplines is represented.

Academies are vital civil society institutions that have the credibility to inform public and policy makers about problems and potential solutions. Their credibility comes not only from the scientific excellence of their members but also from their freedom from vested political and commercial interests. Indeed, although many academies were established by national governments and tasked with serving their countries by

bringing scientific perspectives to bear on national and international issues, among other things, they were also constituted as independent bodies.¹

Each of us here understands that science academies around the world play a fundamental role in promoting science that contributes to national development in their own countries, while also enhancing global science and technology.

Academies represent scientific excellence – and it is excellence, brought about by the contest of ideas, that provides the foundation for science, technology and innovation that have a profound effect on national development.

The Australian Academy believes that the purpose of science is to make the world a better place. Whether through applied research that solves immediate problems, or basic research that advances human knowledge and understanding, researchers and innovators are fundamentally committed to improving lives. They do this by developing and applying knowledge for new and better products and services, understanding and manipulating human biology for better

¹ Academies of Science as Key Instruments of Science Diplomacy. *Science & Diplomacy*, March 2015, American Association for the Advancement of Science (AAAS).
<http://www.sciencediplomacy.org/perspective/2015/academies-science-key-instruments-science-diplomacy>

health outcomes, developing solutions for a more sustainable world, creating technologies and applications for enhanced security, and answering fundamental questions that give us a richer and deeper understanding of the world and the universe in which we live.

Innovation and commercialisation are important to the economic development of every nation. It is researchers and innovators – those with the ideas, the knowledge and the drive to solve problems and develop new products and services – who create new businesses and jobs, and who refresh and renew existing industries.

For a country like Australia that is rich in resources but challenged in location and costs of production, knowledge-driven innovation is critical.

Our Government speaks regularly about the need to move to a knowledge-economy; one in which our economic well-being is based more on the knowledge and the skills of our people, and less on the materials we sell to the world.

As scientists, we have a vital role to play in this transition.

The discoveries we make and the questions we answer advance global knowledge, and are of course inherently valuable in their own right.

However, it is sometimes not enough for this knowledge to be shared with our colleagues through peer reviewed publication and presentation.

When faced with the really pressing challenges such as feeding our growing population, reducing our impact of the environment, or improving global health, it is necessary to ensure that our knowledge goes further. That it is developed with, or at least ends up in the hands of those able to take the next steps along the pathway of innovation.

Each individual nation has different needs and pressures, and each has different strengths and weaknesses. There is no single preferred way of fostering national development.

However, the sustainable development of our communities must occur within the material limits of the planet.

When talking about how academies can contribute to National Development I consider that a vital starting point is engagement of the members in all Academy activities. I am afraid that many

of us regard election to membership as the finishing point in our careers rather than the starting point in the life of the Academy.

When I became President of the AAS just under four years ago I identified the issue of engagement of the Fellows as a major challenge. This was not something new, but it was an identifiable problem, especially since Australian scientists are largely localized in capital cities widely distributed on the coastal fringe of a vast continent.

At the most basic level I introduced a quarterly letter from the President where I have attempted to inform the Fellowship of the current items that the Academy and Council are undertaking.

In addition we have introduced a national speaker series (in addition to our monthly scientific speaker series in the capital Canberra) around which we can gather the Fellows in one locality for social and scientific interactions. Of course the function of these events is primarily to allow the community to become informed on popular scientific topics. Through the community we can reach our political leaders and contribute to national development.

How else do we contribute to national development? I'd like to make an observation, and that is that when our Academy was formed some 64 years ago there were very few voices for science, and the Academy played a major role in contributing to national development by working closely with government and the community. Today there are many voices (for science) clamouring for the government's attention. How can our voice be heard, ideally in front of all the others?

I would like to describe some of the ways in which the Australian Academy of Science has tried to promote science to improve national development and the human condition.

Science education

Demand for Science, Technology, Engineering and Mathematics, or STEM, skills in the workforce is higher than at any time in history, with 75% of the fastest growing occupations requiring STEM skills². To succeed in tomorrow's economy, the majority of school leavers will need a high level of science and maths literacy, and a growing pipeline of university graduates with specialist training in STEM will be required.

² Office of the Chief Scientist (2014) *Science, technology, engineering and mathematics: Australia's future*, Australian Government, Canberra: http://www.chiefscientist.gov.au/wp-content/uploads/STEM_AustraliasFuture_Sept2014_Web.pdf

Many countries understand that they must have a scientifically literate population in order to secure their future social, health and economic wellbeing, and compete internationally in scientific research and tertiary education. There is a focus currently in Australia on STEM education starting from pre-school or early childhood education and the Australian Academy of Science is committed to improving science education in Australia, both as a contribution to informed citizenship and to encourage young people to prepare themselves for careers based on science and technology.

By developing better understanding of the nature of science within the community, this will increase their ability to engage in scientific debate on issues that affect their work, their community, their personal lives, as well as issues of national importance such as immunisation, food and water security, transport and much more.

With financial support from the Australian government, the Academy has developed three education programs to support effective teaching and learning of science in primary and early secondary schools. They are *Primary Connections: Linking Science with Literacy*, *Science by Doing* and *reSolve: Mathematics by Inquiry*.

These programs draw on the expertise and standing of the Fellows of the foremost body of scientists and mathematicians in Australia. The programs are award winning and independent evaluations undertaken to date show that they have an impact on teaching and learning. Each of the three programs include features to improve teacher quality through professional learning and improve students' skills through a guided inquiry approach that enhances problem solving ability, science literacy and numeracy.

Our Fellows serve on numerous academy committees that are focused on the issues of the Academy and its Australian activities - promoting excellence in science, science education, science policy and international activities.

National Committees

Many Academies around the world have National Committees for Science. In the case of our Academy, we support 22 National Committees for Science, which play the dual role of guiding the development of Australia's scientific and research disciplines, and connecting Australian researchers with international scientific associations and unions. Many of these National Committees have produced ten-year strategies for

their disciplines that have achieved widespread research and industry-sector consensus on priorities, approaches and outcomes. The decadal plans detail the education and training, public engagement and investment that will be required to allow these disciplines to realise the full potential of their value to Australia's social wellbeing and economic prosperity.

For example, the National Committee for Astronomy has been a pioneer with its decadal plans which have mobilised the astronomy community to present a unified national voice to Government about the needs for their discipline.

This has resulted in major new funding for astronomy infrastructure and strong support for existing national facilities from the federal Government. It has also brought significant contributions from state governments as well as university investment in new astronomical facilities. The primary recommendation of the Astronomy decadal plan was that Australia should bid to host the Square Kilometre Array (SKA) - the world's largest (radio) telescope. This ambition has now been realised. The SKA is hosted by Australia, South Africa, and New Zealand, as well as EU countries, and it will benefit scientists the world over. It is scheduled to begin observing the sky in 2020.

Owing to our isolation Australian scientists have traditionally viewed their international collaborations and partnerships as the lifeblood of their scientific existence. In that context Australians have been very well represented on the international scientific unions at all levels. At present an Australian is the Secretary-General of the International Council for Science (now amalgamated with ISSC as International Science Council), and another Australian is an elected member of the Governing Board. Australia is an elected member of the Executive Committees of the IAP (Research) and IAP (Science). Through those linkages we are able to disseminate information and engage the Fellowship, including nominating contributors to key working groups of these organisations. In particular we place large importance in the regional committees of the IAP (Science). In fact it was here in Sri Lanka about five years ago that the new Association of Academies and Scientific Societies in Asia (AASSA) was created and our then past President became the inaugural President. Today Professor Cheryl Praeger is a member-at-large of the Board of the Executive Committee for AASSA and she plays a leading role as Chair pf

the special committee on Women In Science and Engineering Committee (WISE). In fact at this meeting I have been asked to read out a statement of behalf of Professor Praeger celebrating the launch of the Sri Lankan chapter of *Organization of Women in Science for the Developing World* (OWSD) by the members of the WISE Committee. AAS looks forward to continued engagement with NASSL under the auspices of AASSA.

How do we rally the Fellows to global challenges?

International engagement (another example)

Some of you may have heard of the Falling Walls Labs organised by the Falling Walls Foundation in Berlin. The Falling Walls Foundation is a non-profit organisation, dedicated to the support of science and the humanities. It was established in 2009, twenty years after the fall of the Berlin Wall. At its heart is the question ‘Which are the next walls to fall?’ as a result of scientific, technological, economic and sociological breakthroughs.

Each year, the foundation supports scientific organisations around the world to host a Falling Walls Lab. This international forum promotes interdisciplinary connections between aspiring

academics, innovators, entrepreneurs, investors and professionals, known for their excellent work. Participants are given three minutes to present their research work, business model or initiative to a broad audience from science and industry, including a distinguished jury who selects the most innovative and promising idea.

Starting in 2016, the Australian Academy of Science in partnership with the German Embassy in Australia, have been organising annual Falling Walls Labs in Canberra. The winner of the annual Lab is automatically admitted to the Falling Walls Lab Finale held in Berlin in November of each year.

Falling Walls Lab is a challenging and inspiring format for emerging bright minds, giving them a unique chance to become the next big success story in innovation. Since 2009, there have been over 80 international Labs from close to 50 countries worldwide with over 1,000 participants. Six hundred outstanding individuals have participated in the annual Falling Walls Lab Finales in Berlin from 2014 to 2017.

Engagement with Government

Some countries have one or more Chief Scientist(s) or equivalent that provides high-level independent advice to

Presidents, Prime Ministers and Ministers on matters relating to science, technology and innovation. Dr Alan Finkel, is Australia's current Chief Scientist and is also a Fellow of the Australian Academy. Our Academy has a good working relationship with the Chief Scientist and his office.

Interactions between national Academies and Chief Scientists occur on a regular basis to discuss areas of mutual interest, including science matters relating to national development.

In 2015, the then Chief Scientist, Professor Ian Chubb, and the Australian Academy of Science commissioned a group of economists from the Centre for International Economics to develop two complementary reports on the importance of recent advances in a selection of the sciences. The reports provided rigorous estimates of the extent to which the Australian economy, our health and our environment is based on global advances in specific fields over the past 20 to 30 years. The reports presented results for the core sciences—physical, mathematical and biological. The reports found that if advances in the physical, mathematical and biological sciences over the past 20 to 30 years had not occurred, and those advances had not been incorporated into a range of products

and services, the Australian economy would be between 20% and 30% smaller than it is today.

It is estimated that if advances in the biological sciences over the past 30 years had not occurred, and the new medical products and practices underpinned by those advances had not been created, the burden of disease in Australia would be 18% to 34% higher than it is today.

Much of the impact of new knowledge on the economies of countries is incremental, but the cumulative effect of these changes is undoubtedly substantial. Science is and will continue to be, important to the national development of countries around the world.

The Academy also engages actively with *Innovation and Science Australia*, an independent statutory board that provides strategic whole-of-government advice on all innovation, science and research matters. It provides advice to the Australian Government, through the Minister for Jobs and Innovation, to the Investment, Infrastructure and Innovation Committee of Cabinet.

Innovation Science Australia has developed a strategy looking out to 2030 to advise the Australian Government on how to generate and capture the benefits of innovation for Australians. The strategy makes 30 recommendations that are framed in the context of five strategic imperatives:

- **Education:** Respond to the changing nature of work by equipping all Australians with skills relevant to 2030
- **Industry:** Ensure Australia 's ongoing prosperity by stimulating high-growth firms and raising productivity
- **Government:** Become a catalyst for innovation and be recognised as a global leader in innovative service delivery
- **Research & Development:** Improve R&D effectiveness by increasing translation and commercialisation of research
- **Culture & Ambition:** Enhance the national culture of innovation by launching ambitious National Missions.

Our Academy supports these strategic imperatives that we believe will help Australia to remain a leading global economy.

Gender equity

Improving diversity and equity has major economic benefits and increased personal wellbeing for employees.

As we move into a more technology-based and innovative future the need and demand for individuals, both women and men, with STEM-based skills is critical.

Many countries are investing in programs and initiatives that target inequity, particularly in STEM education, research and industries. The Australian Government has committed \$13 million to support the greater participation of girls and women in the STEM education and research sectors, STEM industries, start-ups and entrepreneurial firms. The goal of this measure is to implement a national effort to “overcome the cultural and organisational factors that discourage girls and women from studying in the STEM areas, and which subsequently limit their career opportunities”.

Part of this funding supports the Science in Australia Gender Equity (SAGE), a partnership between the Australian Academy of Science and Australian Academy of Technology and Engineering. SAGE was launched at Australia’s Parliament House in 2015 and is piloting the successful UK Athena SWAN

accreditation program that targets higher education and research.

We have forty-five institutions around Australia participating in the SAGE program, and interest continues to grow in Australia and across our region. In 2016, SAGE organised a trilateral Women in STEM workshop in New Delhi convened by the governments of Australia, India and the UK. India has commendable initiatives by government and science academies to boost prospects for women scientists, but no comprehensive national program to encourage institutions to undertake active measures themselves.

The trilateral workshop identified areas of best-practice for gender equity in STEMM and with support from Australia and the UK, the hope is that it will encourage the government and scientific community of India to implement the recommendations of the workshop.

Another successful initiative is the *Male Champions of Change*, whose strategy involves enlisting the support of a high-profile coalition of men, often in decision making positions, to achieve change on gender equity issues in organisations and communities.

I shall now describe two further initiatives of the Australian Academy that contribute to national development.

Future Earth

I am sure that many of you have heard of the International Council for Science (ICSU) initiative called Future Earth.

Future Earth is a global research framework that brings the world's researchers together with leading thinkers in business, public administration, the humanities and social sciences and the community to build the cooperation, trust and tools to create long-term solutions to global challenges in which economic, social and environmental values can coexist and thrive.

Many countries have established Future Earth networks. Two years ago, the Australian Academy established Future Earth Australia, a national peak initiative that enables Australian scientists, governments, industry and NGOs to collaborate both with each other and with international networks and programs.

The aims and objectives of Future Earth Australia are to:

1. Coordinate and leverage research relevant to the eight focal challenges identified by Future Earth globally - water, energy, food for all; decarbonize socioeconomic systems; safeguard natural assets; build healthy resilient cities;

sustainable rural futures; improved human health; sustainable consumption and production; social resilience to future threats - as well as other key challenges for Australia and the Oceania region.

2. Link the expertise of networks of researchers with policy-makers, business leaders, industry, practitioners and community stakeholders and facilitate interdisciplinary activities and partnerships to collaboratively produce solutions-oriented research.
3. Deliver research products and services including convening a periodic Future Earth Australia conference, and linking Australian and regional activities to Future Earth internationally.
4. Contribute to knowledge and solutions that will support transformations to global sustainability.

Australian Brain Alliance

The second initiative of our Academy is the recently established Australian Brain Alliance that aims to create advanced industries in neurotechnology, develop treatments for debilitating brain disorders, and produce high-impact

transdisciplinary collaborations that will increase our understanding of the brain.

This initiative, which was an idea of our National Committee for Brain and Mind, is expected to help in making major advances in understanding healthy, optimal brain function, and create advanced industries based on this unique understanding.

Finally the opportunity to work with the other Australian academies through the Council of Learned Academies has allowed us to engage our Fellows on some major science policy projects in jointly preparing thirteen reports on the topic “Securing Australia’s Future” and more recently on Horizon Scanning projects of contemporary interest to the Commonwealth Science Council.

Communications

The Academies role in national development also goes towards improving scientific literacy and make science accessible.

In August last year the Academy’s Council agreed to pilot the development of a video production capability for a six-month

period with a focus on publishing this video content on social media.

The introduction of this capability at the Academy addressed a major objective within the Academy's Strategic Plan (2015-2020) of expanding public awareness and understanding of science.

As a result of this new capability millions of members of the public who didn't know the Australian Academy of Science even existed now do, and are engaging with credible science content by choice. (See www.science.org.au/curious).

- More than 230,000 people have signed up to see everything the Academy posts on Facebook, from 9,058 page likes just 5 months ago.
(see <https://www.facebook.com/AustralianAcademyofScience/>)
- Our new videos have been viewed on Facebook 13.5 million times, through widespread sharing.
- Our Facebook posts have appeared to 19.5 million Facebook users.

The Academy's videos and social media pages offer the following points of difference:

- **Credibility:** Our content is peer reviewed by Academy staff, a senior expert in the field, a Fellow of the Academy who is an expert in the field wherever possible, and an Academy Oversight Committee
- **Quality:** the production values used in the videos are of the highest standard. They are produced by a former TV Executive Producer and former head of TV Graphics, and scheduled by a former TV Supervising Producer. The articles are written by a team of science communicators with science qualifications who understand the need for rigor and accuracy. All content is quality checked by a science-savvy editor.

Closing remarks

The interactions between the National Academy of Sciences of Sri Lanka and the Australian Academy have mostly been through the Association of Academies and Societies of Sciences in Asia (AASSA). I am aware that Professors Kurt Lambeck, and Jenny Graves, former President and Foreign Secretary of our Academy have visited Sri Lanka in the last few years when attending AASSA related activities hosted by your Academy. I hope that we may continue to develop links between our two organisations.

In summary, we are making progress. We could do better, but all new initiatives require funding, and that is our major sticking point.

I would like to thank you all for giving me this opportunity of sharing some thoughts with you.

Andrew Holmes

27th March 2018

(President, Australian Academy of Science)