

# INTERNATIONAL SCIENTIFIC COLLABORATIONS IN A CONTESTED WORLD

Summary of the Australian  
Academy of Science's  
national symposium

November 2023



# ACKNOWLEDGEMENT OF COUNTRY

The Australian Academy of Science (the Academy) acknowledges and pays respects to the Ngunnawal people, the Traditional Owners of the lands on which the Academy office is located. The Academy also acknowledges and pays respects to the Traditional Owners and the Elders past and present and acknowledges emerging leaders of all the lands on which the Academy operates, and its Fellows live and work.

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# MESSAGE FROM THE PRESIDENT

Australia's scientific and national security communities are in a period of debate about the balance between preserving the benefits of open and transparent scientific collaborations while also ensuring our prosperity and security.

Australia's national interest is intricately intertwined with global scientific collaboration.

By fostering partnerships and sharing knowledge across borders, we amplify our capacity to navigate and address complex challenges, ranging from climate change to pandemics. In addition, Australia gains access to global knowledge, infrastructure, technology and talent, and importantly, we gain a seat at the table in international decision-making settings.

The symposium 'International Scientific Collaborations in a Contested World' highlighted the imperative of sustaining and expanding these collaborations to safeguard Australia's prosperity and security in an increasingly complex geopolitical climate.

Evidence-informed decision-making is paramount in confronting national security threats and challenges. During the event, we saw an emphasis on the necessity of leveraging scientific expertise to assess risks and formulate evidence-informed and proportional responses.

Moreover, science emerges as a formidable diplomatic asset, offering unique avenues for conflict deterrence and solutions. We also know the pivotal role of science diplomacy in shaping these relations and promoting global stability. It is through these scientific exchanges, collaboration and cooperation that Australia can build trust, foster mutual understanding and deter conflict.

It is imperative for Australia to focus on the indispensable nexus between science, national security and diplomacy. Australia has a burning need to prioritise international scientific collaboration, adopt evidence-informed strategies and harness the diplomatic potential of science to safeguard its interests and contribute to global peace and prosperity.

I would like to thank all involved in the symposium—our convenors Professor Frances Separovic and Professor Steven Chown, our collaborators and sponsors, and the speakers and participants from the science and security sectors who engaged in this meaningful debate with good spirit and honest intentions.

**Professor Chennupati Jagadish** AC PresAA FREng FTSE,  
President of the Australian Academy of Science



# INTERNATIONAL SCIENTIFIC COLLABORATIONS IN A CONTESTED WORLD

The global scientific enterprise and its role in foreign affairs and national security has changed dramatically over the past 20 years. Shifting geopolitical tensions and the emergence of a multipolar research system are profoundly affecting science and international scientific collaboration. Scientific capacity is a powerful asset that nations are keen to possess, vital for success in the global economy and for addressing societal challenges in areas such as health, environment and national security.

Nation-states are positioning themselves in a changing international system by increasing their scientific and technological sovereignty. This is driving strategic competition and a focus on managing national security threats.

Modern science is global. Climate change, pandemics, food security and regulation of seas and space are global, complex problems that necessitate active international science diplomacy and robust multilateralism. Australia benefits from the fruits of international scientific collaborations, including access to knowledge and technology from world-leading nations, access to global research infrastructure, a 'seat at the table' in international governance and research efforts, bolstering our scientific workforce with talent from overseas and sharing our democratic values with students and researchers throughout the world. This contributes to discoveries, technological innovations and security in our region that benefit all Australians.

The conditions in which scientists operate and considerations for Australia's science system are continuously evolving. Advanced technology platforms—such as artificial intelligence, cloud computing and gene editing—and new scientific knowledge can present risks for national security and become an issue of strategic competition and development of sovereign capability.

Governments' responses to these issues—both in Australia and in other countries—can inadvertently hinder Australian scientists' collaboration globally. If we don't strike the right balance, Australia risks losing the ability to meet its needs and tackle important societal challenges, and suffering diminished respect and engagement with the international community.

Australia's national security and defence policy environment is changing, with reforms in progress to enable commitments under the AUKUS partnership. This has implications for scientific collaborations with international partners and foreign persons who contribute to Australia's scientific workforce, particularly involving cutting-edge, dual-use technologies. Balancing risk management with open and effective international scientific research collaboration has become an important issue.

In this context, the Australian Academy of Science held its 2023 national symposium, *International scientific collaborations in a contested world*, to bring together leaders from defence, foreign affairs, security agencies, the university and research sectors and industry to discuss how Australia can address national security concerns while enabling the benefits of open scientific collaboration.

## **Have we reached the right balance between national security and open scientific collaboration?**

This paper summarises the issues examined by the keynote speakers and panellists across the event.

Have we reached the right balance between national security and open scientific collaboration?

# KEY SYMPOSIUM MESSAGES

## **Continued international scientific collaboration is in Australia's national interest**

- International collaboration is central to our ongoing scientific research capability. It is in our sovereign interest to remain engaged in these collaborations; it gives us access to breakthrough innovations, ensures we do not fall behind or are caught unprepared and allows us to leverage global expertise and infrastructure to advance Australia's national interests.
- It is important to maintain international collaborations as much as possible. However, we need to weigh the benefits against the risks.

## **Responses to national security threats need to be evidence-informed and proportional**

- The world order of science is changing, and this has implications for how scientists assess the risks of collaborative activities. This implies a degree of cultural change needed—both by government in its habits of engagement with the scientific community and by scientists to understand the changed geopolitical environment and the perspective of the national security community.
- Geopolitical interests are shaping international scientific collaborations, and policy responses need to be clear and proportionate and manage bureaucratic burden to avoid 'self-censorship'—choosing not to pursue collaborations or research in particular areas—by the research community or restricting academic freedom.
- When risks are managed, we can achieve greater outcomes through international collaboration while maintaining security needs. Responses must be proportional to risk and grounded in evidence rather than fear or ideology.
- It is essential that governments, the national security community and the scientific community work side-by-side to forge an open dialogue on risks and be clear-eyed on the issues this presents for scientific research.
- Scientists have a responsibility to be security aware and do their due diligence. Governments have a responsibility to consider unintended consequences and to measure the impact of security measures on the research ecosystem. The Australian Government has a responsibility to consider how compliance and regulatory burdens are reflected in research administration and funding.

## **Science is a diplomatic asset**

- Science is a critical diplomatic asset and a lever to deter conflict. The scientific community can provide a window of communication to other nations that political leaders can use.

# LIST OF OPPORTUNITIES

The following opportunities were identified based on symposium discussions.

- 1.** Forge strategic partnerships with like-minded countries and multinational corporations to collaborate on joint research and development (R&D) projects, technology transfer initiatives and the development of and approach to critical infrastructure.
- 2.** Monitor strategic technology trends, competitive landscapes and emerging threats. These can inform strategic decision-making and identify opportunities for proactive engagement, including in science diplomacy, trade and investment.
- 3.** Enhance technology export controls and mechanisms to prevent the proliferation of sensitive technologies and dual-use goods to bad actors or non-like-minded countries.
- 4.** Strengthen Australia's cybersecurity capabilities to safeguard critical infrastructure and national networks from cyber threats. Develop response protocols to mitigate cyber risks and ensure resilience in the face of evolving cyber threats.
- 5.** Leverage existing guidelines and develop new resources to uplift awareness and understanding among the scientific community and build a security-aware culture within research institutions.
- 6.** Develop clear protocols, such as risk assessment frameworks and data security mechanisms, for collaborations with adverse nations. These should be considered outside neutral platforms for science engagement, such as conferences, workshops and symposiums, and hold the potential to build trust and mutual benefit by keeping up to date with developments outside our national technology portfolio.
- 7.** Encourage collaboration initiatives with adverse nations on mutually beneficial topics such as climate change, pandemics and renewable energy technologies.
- 8.** Expand Australia's footprint in international science diplomacy and the science counsellor network.
- 9.** Seize opportunities to participate in initiatives such as Horizon Europe to enhance our intermediary role with partners such as the US, United Kingdom (UK), Europe and China.
- 10.** Diversify scientific engagement and collaboration across multiple regions and sectors to reduce dependency on any single partner. This strategic move not only enhances resilience and sustainability within our domestic capacity and collaborative research initiatives but also opens new avenues for innovation and discovery. Participation in initiatives such as Horizon Europe can help us achieve this.



# LIST OF OPPORTUNITIES

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- 11.** Continue due diligence practices on prospective research partners and collaborators and develop training and capacity-building within our universities to support our researchers in navigating the environment.

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  - 12.** Consider a more systematic architecture for Australian universities, similar to the Federally Funded Research and Development Centres and University Affiliated Research Centres in the US. This architecture can be developed to create environments that support secure collaboration and innovation on sensitive technologies, striking a balance between the need for security and the importance of scientific openness. By implementing robust security measures and clear guidelines, we can ensure that sensitive technologies are protected while still fostering a culture of innovation and collaboration.

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  - 13.** Learn from successes and gaps in Australian and international models for the government and science sectors to maintain dialogue and collaborate on policy development. For example, while the UFIT allows for dialogue at the commanding heights of the science-national security policy interface, what are some other forums or mechanisms to allow dialogue to flourish between the sectors?

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  - 14.** Establish a shared set of principles for international engagement that articulate the need to maintain academic freedom, research excellence and international scientific collaboration while promoting risk management and transparency.

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  - 15.** Develop a data-driven approach to understand Australia's patterns of international research engagement to identify fields where Australia could expand its collaboration with like-minded partners in emerging technologies and diversify its engagements to avoid overdependence on specific countries or regions.

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  - 16.** Australia's security and visa policy settings should work together to ensure measures to address security risks are proportionate and maintain Australia's ability to attract international talent. Unintended consequences of changes in Australian higher education and research should be monitored and addressed.

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  - 17.** Approaches must be socially inclusive to support excellence from our diverse workforce and avoid unfairly targeting academics from particular backgrounds on security matters.

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  - 18.** Foster and facilitate multilateral science programs that promote collaboration between Australian scientists and global counterparts on shared challenges such as climate change to develop shared innovative solutions and leverage global resources and expertise.

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  - 19.** Recognise the role of science in shaping global affairs, promoting sustainable development and advancing Australia's national interests on the world stage.
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# IMPORTANCE OF SCIENCE AND TECHNOLOGY IN STRATEGIC COMPETITION

A strong theme of the symposium was that maintaining international scientific collaboration is in Australia's national interest. Science is an important economic driver and contributes to our collective understanding of the world. Scientific capability is central to strategic competition in the development of critical technologies such as AI, semiconductors and quantum computing.

Speakers painted a picture of rising geopolitical tensions, characterised by the escalation of military power and strategic competition in areas such as cyber security and critical minerals, which are straining current science and technology collaborations. National security and economic competition are linked, and countries find themselves needing to respond to the security implications of global supply chains, which are compromised by geopolitical pressures.

Equally, speakers highlighted that to deal with global crises, no one nation can 'go it alone'. The COVID-19 pandemic provides an example of how scientists all over the world worked together to study the virus and develop vaccines with unprecedented speed.

Particularly relevant to Australia's context is the rapid increase in geopolitical competition in the Indo-Pacific region and the issues of humanitarian needs and climate change affecting food and water security. Collaboration and investment in scientific capability are profoundly important elements of Australia's statecraft.

## Opportunities:

1. Forge strategic partnerships with like-minded countries and multinational corporations to collaborate on joint research and development (R&D) projects, technology transfer initiatives and the development of and approach to critical infrastructure.
2. Monitor strategic technology trends, competitive landscapes and emerging threats. These can inform strategic decision-making and identify opportunities for proactive engagement, including in science diplomacy, trade and investment.

## Australian Academy of Science role:

The Academy plays a key role in regional science diplomacy by leading the [International Science Council Regional Focal Point for Asia and the Pacific](#).



Hon Richard Marles MP, Deputy Prime Minister & Minister for Defence and Professor Tanya Monro, Australia's Chief Defence Scientist, Department of Defence.  
CREDIT: BRADLEY CUMMINGS

"I really think the biggest microeconomic reform challenge that the country [Australia] has is infusing our economy with science and technology."

Hon Richard Marles MP, Deputy Prime Minister & Minister for Defence



# THE DYNAMIC THREAT ENVIRONMENT AFFECTING SCIENTIFIC RESEARCH

Speakers described the constrained environment that Australia is operating in, which affects science and technology research and development. Espionage and foreign interference were highlighted as serious threats to Australia's national interest.

Nathan Smyth, Deputy Secretary of National Security and Resilience, Department of Home Affairs, articulated that the technologies that researchers produce and refine are important to Australia's national interest and are highly desirable to other countries. This makes researchers and research institutions extremely attractive to foreign powers seeking access to valuable intellectual property and know-how for financial gain, military advancement, or to gain an edge in technological development.

It was noted that both state and non-state actors are interested in a range of information and data, including research, methodologies and developments, especially those that provide high economic value and allow foreign powers to shortcut development timeframes for new critical technologies. Research on critical and emerging technologies faces the greatest threat of espionage and interference.

Examples of threats highlighted in the symposium included:

- foreign powers using individuals to steal information from Australian institutions through seemingly legitimate approaches, such as being employed within a research team or collaborating offshore while covertly, directly or indirectly providing data to a foreign power
- stealing information from Australian researchers and employees through normal work and networking, such as inviting researchers on paid international trips to demonstrate their work or in exchange for financial support
- cyber attacks on universities to gain sensitive or personal data, including those individuals who are employees that could be used for future intelligence activities
- stealing intellectual property
- technologies such as AI, unmanned aircraft systems and 3D printing are becoming increasingly accessible to extremists for nefarious objectives.



Nathan Smyth, Deputy Secretary National Security and Resilience, Department of Home Affairs.  
CREDIT: BRADLEY CUMMINGS

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“In terms of defence, the state of human contest is a contest of technology ... The state of human contest now is such that no country, even the US, can really hope to be at the cutting edge of that without there being an international collaboration.”

**Hon Richard Marles MP, Deputy Prime Minister & Minister for Defence**

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“What we would see now is the most challenging geostrategic circumstances that Australia's faced since the Second World War and its aftermath.”

**Nathan Smyth, Deputy Secretary National Security and Resilience, Department of Home Affairs**

Other panellists challenged this ‘zero-sum’ framing in addressing these challenges when a more realistic context for Australia as a middle power with limited sovereign capabilities is that other nations have the expertise, knowledge and technologies that we do not have and need to access. The purpose of research partnerships is for joint knowledge creation that is available to both parties. For example, China is the leading contributor to 37 of 44 critical technology areas, including defence and space, AI, robotics, gene editing technologies, advanced materials and key quantum technologies.<sup>1</sup> Although the United States (US) remains a key player in this market, Australia relies on international collaborations for access and insights into horizon technologies and software.

Protecting Australia’s interests from these threats must be balanced against values of the scientific community—of open and transparent collaboration and cooperation, and the movement of researchers and data throughout the world.

This environment introduces additional complexity when making collaborative decisions. Researchers and institutions were urged to consider the prospects of who is gaining access to that knowledge, and to what ends it could be used. This is often at odds with structures and incentives that seek to preserve academic freedom and encourage research partnerships, funding and international higher education rankings.

Speakers highlighted that universities and other research institutions have due diligence frameworks to mitigate these risks while promoting the free exchange of ideas, open research culture and academic freedoms. The University Foreign Interference Taskforce (UFIT) was highlighted as a model for collaboration between government and universities to develop guidelines on foreign interference.<sup>2</sup> ASIO’s resources<sup>3</sup> and the due diligence assistance framework were also mentioned as tools to manage these issues.

#### Opportunities:

3. Enhance technology export controls and mechanisms to prevent the proliferation of sensitive technologies and dual-use goods to bad actors or non-like-minded countries.
4. Strengthen Australia’s cybersecurity capabilities to safeguard critical infrastructure and national networks from cyber threats. Develop response protocols to mitigate cyber risks and ensure resilience in the face of evolving cyber threats.
5. Leverage existing guidelines and develop new resources to uplift awareness and understanding among the scientific community and build a security-aware culture within research institutions.

#### Australian Academy of Science role:

The Academy provides advice on science policy matters that impact international scientific collaboration and national security, to ensure that government policies are fit-for-purpose.

“You’re the experts in your fields, you know the best of the intricacies of your research, how valuable it is, the opportunities that it creates, what it is meant for, and what it could potentially be used for in nefarious hands.”

**Nathan Smyth**, Deputy Secretary  
National Security and Resilience,  
Department of Home Affairs



Left to right: Dr E William Colglazier, Editor-in-Chief Science & Diplomacy, American Association for the Advancement of Science (AAAS); Professor Nerilie Abram, Professor of Climate Change, Research School of Earth Sciences, Australian National University; Professor Tanya Monro, Australia's Chief Defence Scientist, Department of Defence. CREDIT: BRADLEY CUMMINGS

## Australia's defence strategic environment and expanding relationship with the US

The symposium was held against the backdrop of the Defence Strategic Review,<sup>4</sup> which informs how and on what technologies Australia's Defence Force will accelerate its collaboration with the scientific research and industrial sectors. Symposium attendees communicated the need to understand the targets of regulatory restrictions and their implications on the architecture and conduct of research in Australia and its collaborations with foreign partners.

Changes to Australia's defence export regime are intended to create a seamless technology-sharing environment with the US and UK. However, the Australian Academy of Science expressed serious concerns among the research community regarding the impacts that legislative reforms to strengthen export controls, including criminal penalties, will have on research collaborations captured in the Defence and Strategic Goods List with countries and foreign nationals outside this partnership—and the very architecture of our research system.

Positive intent was expressed to continue dialogue to enhance transparency and awareness of the realities of how changes to legislation will play out, how to encourage compliance, and how to minimise unintended consequences.

Chief Defence Scientist Professor Tanya Monro AC FAA FTSE discussed a paradigm shift in international collaboration to focus on working with allies and like-minded partners. Professor Monro urged the symposium not to interpret the AUKUS trilateral defence export reforms as discouraging international collaboration, emphasising that Defence will work with the scientific community to develop regulations that are focused on the areas where they are needed and mitigate the regulatory burden.

“We’re looking at a paradigm shift from excellent science being about working with the best in the world to excellent science being working with the best in the world who share our values so that it can’t be used against us.”

**Professor Tanya Monro** AC FAA FTSE,  
Chief Defence Scientist





His Excellency the Hon Dr Kevin Rudd, Australian Ambassador to the United States of America, addressing the audience at the symposium dinner. CREDIT: BRADLEY CUMMINGS

## Changing geopolitics is shaping Australia's science and technology collaborations

Evolving geopolitics, particularly the US-China relationship, influences the global science system and Australia's strategic environment, including scientific collaborations. Academy President Professor Chennupati Jagadish AC PresAA FREng FTSE highlighted the Cold War and the war in Ukraine as examples of how geopolitical events influence global science.

Addressing the audience at the symposium dinner, His Excellency the Hon Dr Kevin Rudd AC, Australia's Ambassador to the United States, indicated that there may be some areas in the future where normal scientific collaboration with China will become increasingly problematic or impossible. Science in space, cyber, artificial intelligence, quantum and semiconductors is more risk-laden. In other less national security-driven domains in life sciences and medical sciences, collaboration with China may still be possible.

A reflection echoed by symposium speakers was the importance of collaborating with other countries and sharing knowledge and understanding of each other's values. Maintaining collaboration to the greatest extent possible on forefront areas of science is essential. This means continuing and expanding collaboration with allied countries and other democracies.

Australia should also learn from collaborations with countries where the values of their government are not considered the same. Since World War II, science diplomacy and scientific collaborations have been used as a 'window' to understand the capabilities of other nations. Australia's research and education exchange also influences the scientific communities in other countries and can provide opportunities to engage with scientific leaders and influence policy decisions.

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"We learn a lot from engaging if we do it carefully, even with our adversaries."

**Dr E William Colglazier,**  
Editor-in-Chief Science & Diplomacy,  
American Association for the  
Advancement of Science (AAAS)

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"...it's going to be harder and harder as both sides [US and China] seek to de-risk their engagements for what we would describe as normal scientific collaboration to occur."

**His Excellency the Hon Dr Kevin Rudd AC,**  
Australian Ambassador to the  
United States of America

Presenters highlighted that Australia should enter collaborations with ‘eyes wide open’, being aware of with whom we’re collaborating, and the possibilities of inappropriate actions being taken and encouraged by foreign governments. We should preserve as many international collaborations as we can, understanding the benefits Australia stands to lose if we restrict research too much.

“I think it pays for everybody in the business of science and technology, and particularly in the area of innovation more generally, to begin diversifying. That is the most intelligent stratagem to adopt, given the uncertainties of underpinning geopolitics.”

His Excellency the Hon Dr Kevin Rudd AC,  
Australian Ambassador to the United States of America

#### Opportunities:

6. Develop clear protocols, such as risk assessment frameworks and data security mechanisms, for collaborations with adverse nations. These should be considered outside neutral platforms for science engagement, such as conferences, workshops and symposiums, and hold the potential to build trust and mutual benefit by keeping up to date with developments outside our national technology portfolio.
7. Encourage collaboration initiatives with adverse nations on mutually beneficial topics such as climate change, pandemics and renewable energy technologies.
8. Expand Australia’s footprint in international science diplomacy and the science counsellor network.
9. Seize opportunities to participate in initiatives such as Horizon Europe to enhance our intermediary role with partners such as the US, United Kingdom (UK), Europe and China.

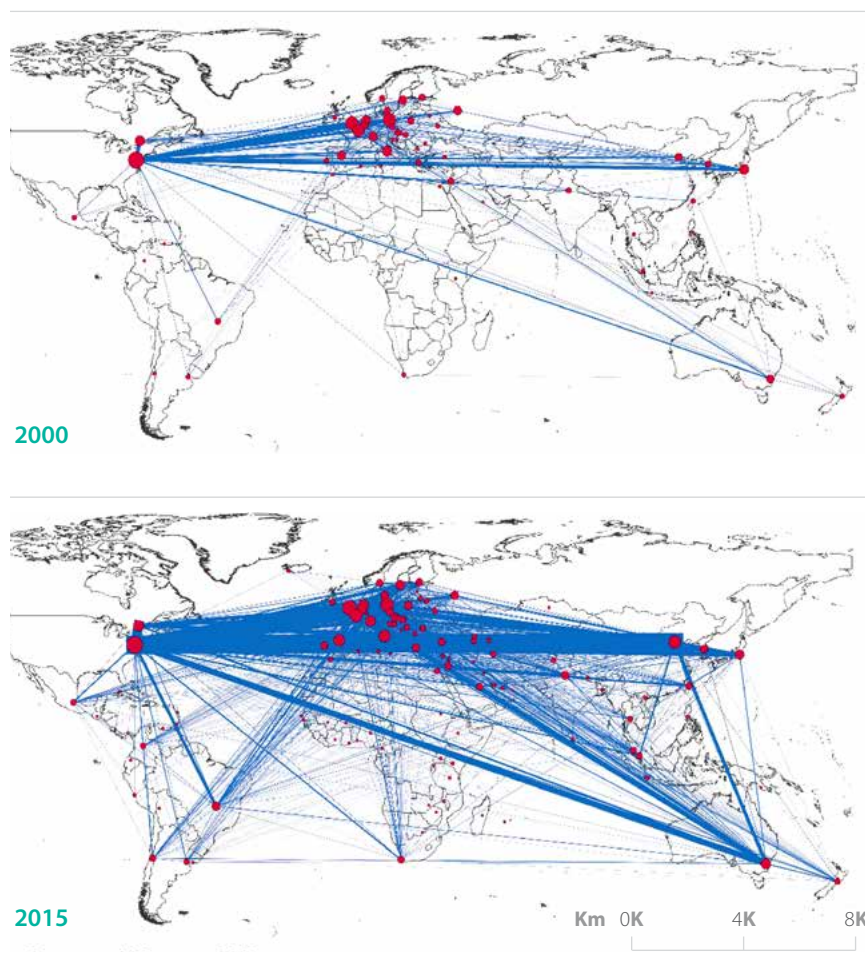
#### Australian Academy of Science role:

Work with the Australian Government to co-design policies to appropriately negotiate the complexities of Australia’s interface with global science in an era of great power competition.

Advise the Australian Government on policy for science to help protect and expand beneficial international scientific collaborations.

## Australia's international scientific collaboration context

The symposium heard that the post-Cold War global science system has become multipolar, evolving into three main centres of activity—USA, Europe and China—with other players in East and South Asia and South America.<sup>5</sup> Many nations have increased their R&D investments and have become major contributors to global research efforts.



**Figure 1:** Spatial patterns of international scientific collaboration network (2000 and 2015). Source: Qinchang Gui, Chengliang Liu, Debin Du, Globalization of science and international scientific collaboration: A network perspective, *Geoform*, vol 105, 2019, pages 1-12<sup>6</sup>

The global response to the COVID-19 pandemic demonstrated the benefits of international scientific collaborations. The architecture of the global science system, including scientists' international research collaborations, were mobilised to enable rapid dissemination of information about the virus, provide scientific advice to leaders and develop vaccines.

“There are local challenges which each country’s scientists will need to work to seek to solve, but the global challenges are different: bigger, harder and more complex, and political. They require global solutions, and that will require researchers and peoples to work together.”

**Professor Chennupati Jagadish** AC PresAA  
FREng FTSE, President of the Australian  
Academy of Science





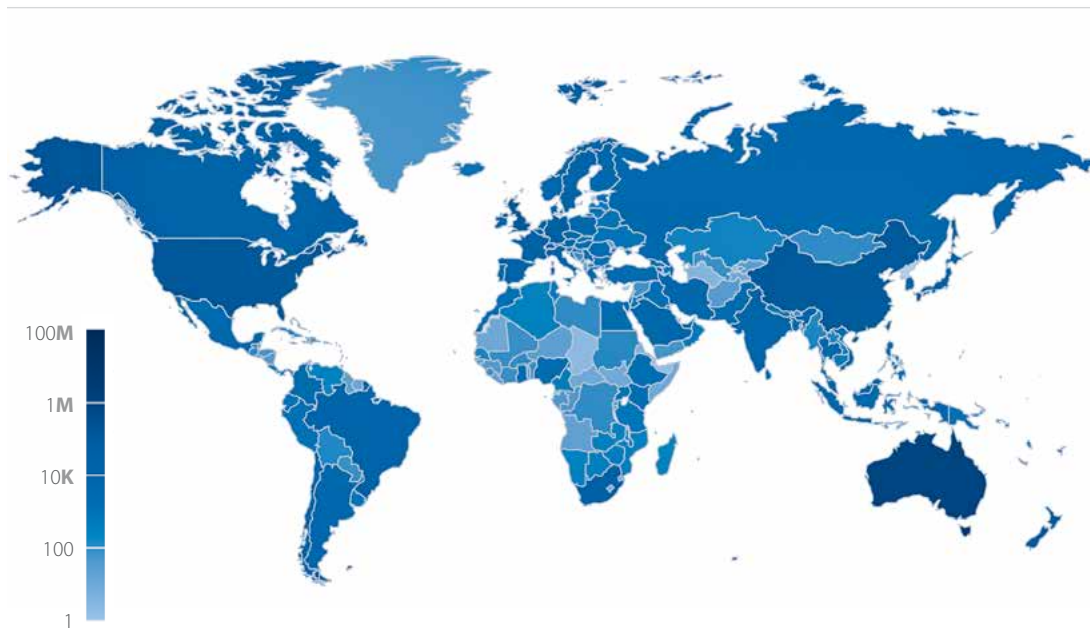
The symposium discussion paper presented data on Australia's place in the global science system. Australia and Oceania together account for 1.1% of the world's investment in research and innovation.<sup>7</sup> Australia's investment in science has been falling for several years and is well below the OECD average.<sup>8</sup> Additionally, Australia lacks the economic complexity and sovereign capabilities of big science and technology powers such as the USA and China.

The symposium heard that Australian scientists and institutions are prolific international collaborators and contributors to global science, and this trend is growing.

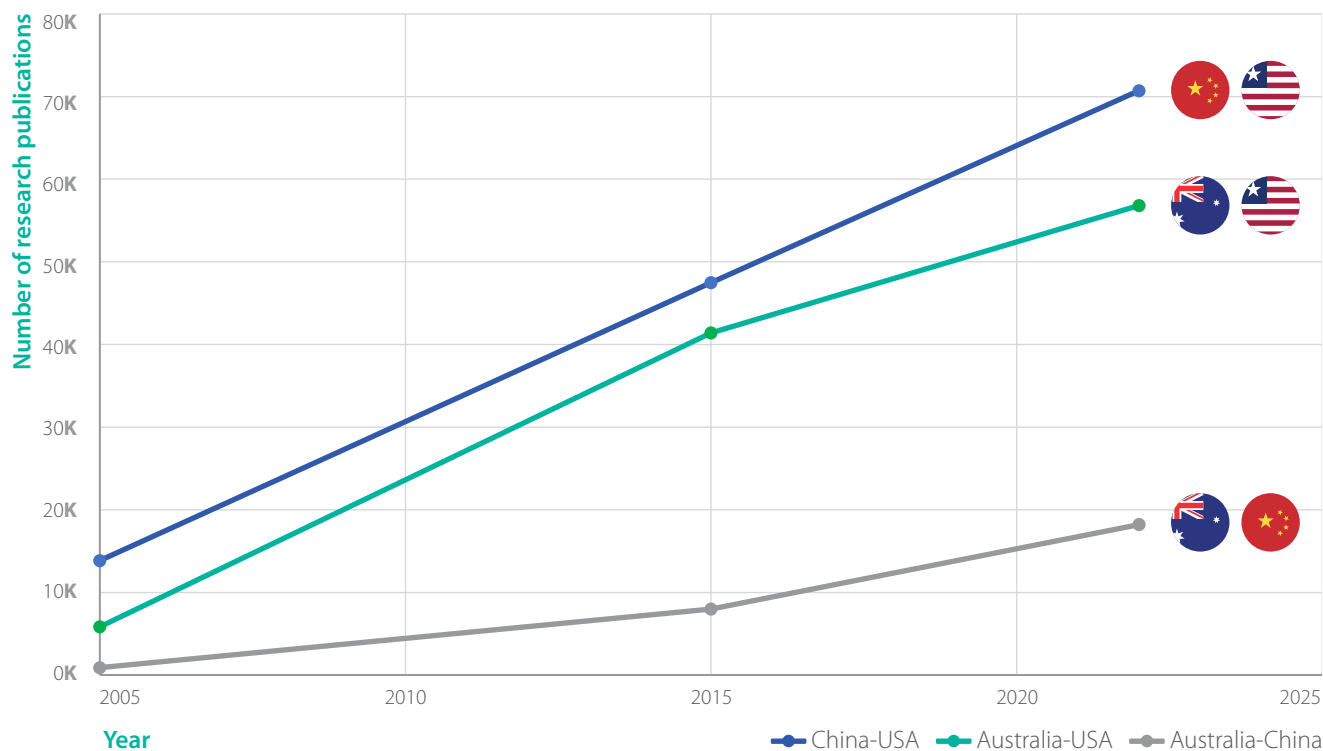
Professor Jagadish noted that Australia collaborates with almost every country in the world, with a strong focus on the US and UK, although collaborations with China have grown in recent decades, and it is now among our most important international partners.<sup>9</sup> This is coupled with the internationalisation of Australia's science workforce and higher education sector, producing a science sector that relies on attracting talent from overseas and revenue from international student fees to subsidise research.

"As a nation I feel we need to change our cultural relationship to science. We need to see it much more front and centre in terms of what we value in the country."

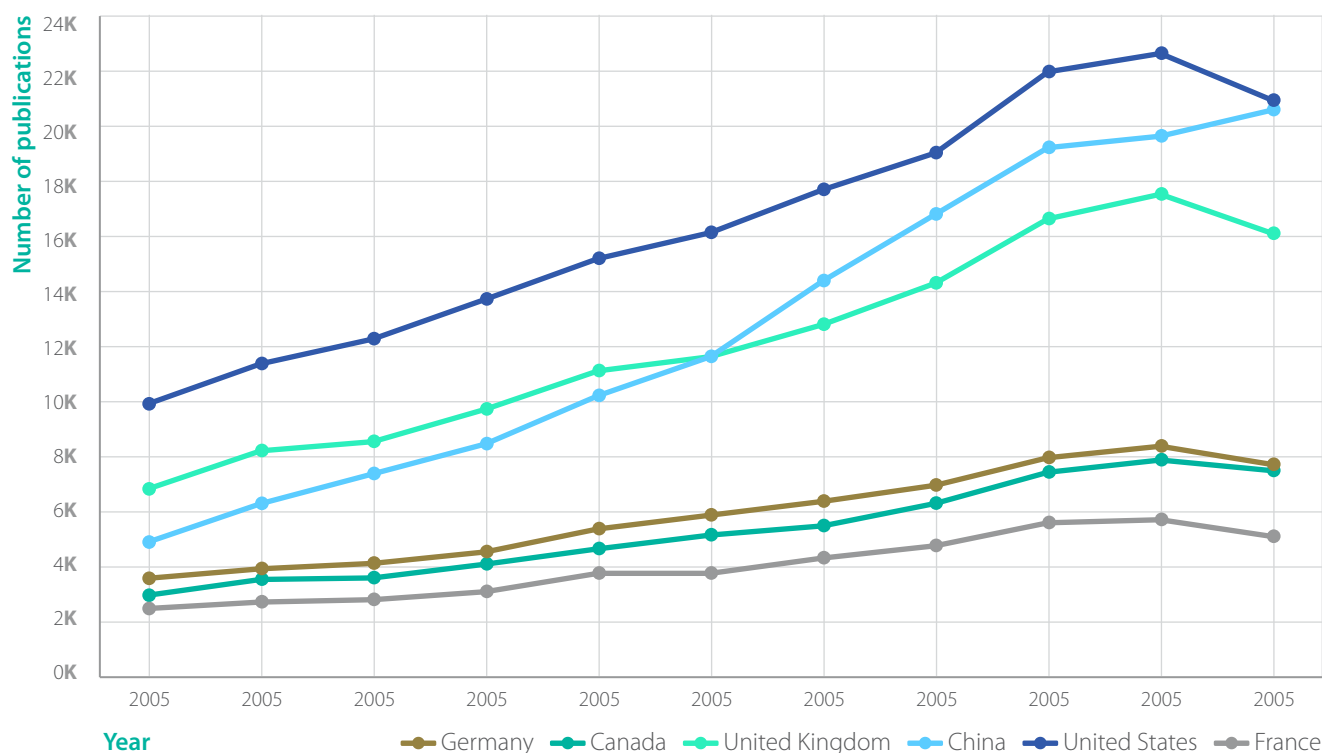
Hon Richard Marles MP, Deputy Prime Minister & Minister for Defence



**Figure 2:** Australia's international collaborations, by scholarly output, 2013 – 2022. Source: Dimensions AI, 2023



**Figure 3:** Collaborations between Australia, the USA and China (number of research publications) 2005 – 2022. Source: Clarivate InCites.



**Figure 4:** Australia's international collaborations outputs (number of publications), 2005 – 2022, Web of Science. Source: Clarivate InCites.



Can science and technology help solve global challenges with the current constraints on international engagement?  
A panel discussion with (left to right): Dr Marcus Doherty, Co-founder and chief scientific officer, Quantum Brilliance Pty Ltd;  
Professor Jacqui True, Director ARC Centre of excellence for the elimination of violence against women, Monash University;  
Dr Vaughan Turekian, Executive Director, Policy and Global Affairs Division, National Academy of Sciences (US); Moderator  
and contributor, Professor Steven Chown, Director, Securing Antarctica's Environmental Future. CREDIT: BRADLEY CUMMINGS

## De-risking international scientific collaboration

Presenters discussed the significant risks Australia faces in not engaging in international collaborations, risking a decline in publications and global standing. While some advocate for a slowdown and even complete cessation of international collaborations to minimise risks, in a geopolitically volatile world dependent on international collaborations, such a strategy would be impractical given the interconnectedness of global scientific co-networks.

Presenters highlighted that Australia would need to find the right balance between risk and reward if Australia's scientific community is to build sovereign capabilities in novel and innovative research. Future thinking will necessitate strategic navigation of current and future international collaborations while mitigating and taking proactive action over potential risks. This will require streamlined administrative processes, diversifying funding sources, commercialisation and maintaining a delicate balance between security concerns and open science to foster a vibrant and sustainable global scientific community. Additional complexities further emphasise the need to reduce bureaucratic burdens and ensure the flow of international students and researchers.

The stakes for Australia are undeniably high but will require balancing risk with desirable outcomes. Professor Sir Peter Mathieson FRCP (London) FRCPE FMedSci FRSE FRSA warned that Australia's risk appetite should increase since by choosing not to engage in international collaborations, we risk declining publications and losing our standing on the global stage. While the immediate effects of low-risk appetite may not be apparent, there is an expected lag phase before the decline sets in. Initially, there may even be a surge in publications, but over time, the consequences of isolation could become dire.

Dr Diarmuid Cooney-O'Donoghue suggested that taking a cautious, nationalist approach to risk minimisation is fraught with its own dangers. In a world where major scientific powers like the US, UK and China heavily engage in international collaboration, isolating oneself entirely is not a feasible strategy for a country like Australia. Maintaining a leading position in global science necessitates active participation in the international scientific community, even if it means accepting some level of risk.

Panelists agreed that balancing risk and reward is essential for Australia's scientific community. The risks of international scientific collaboration, such as intellectual property theft and reputational damage, must be weighed against the rewards, such as access to global talent and resources.

“De-risking itself is oftentimes in the eye of the beholder ... I think everybody would like to get de-risking. We just need to better understand what those look like. And so, I think that any kind of effort that can be done to bring together those communities is part of a de-risking in and of itself.”

**Dr Vaughan Turekian, Executive Director,  
Policy and Global Affairs Division,  
National Academy of Sciences (US)**





Participants seated in the Shine Dome. CREDIT: BRADLEY CUMMINGS

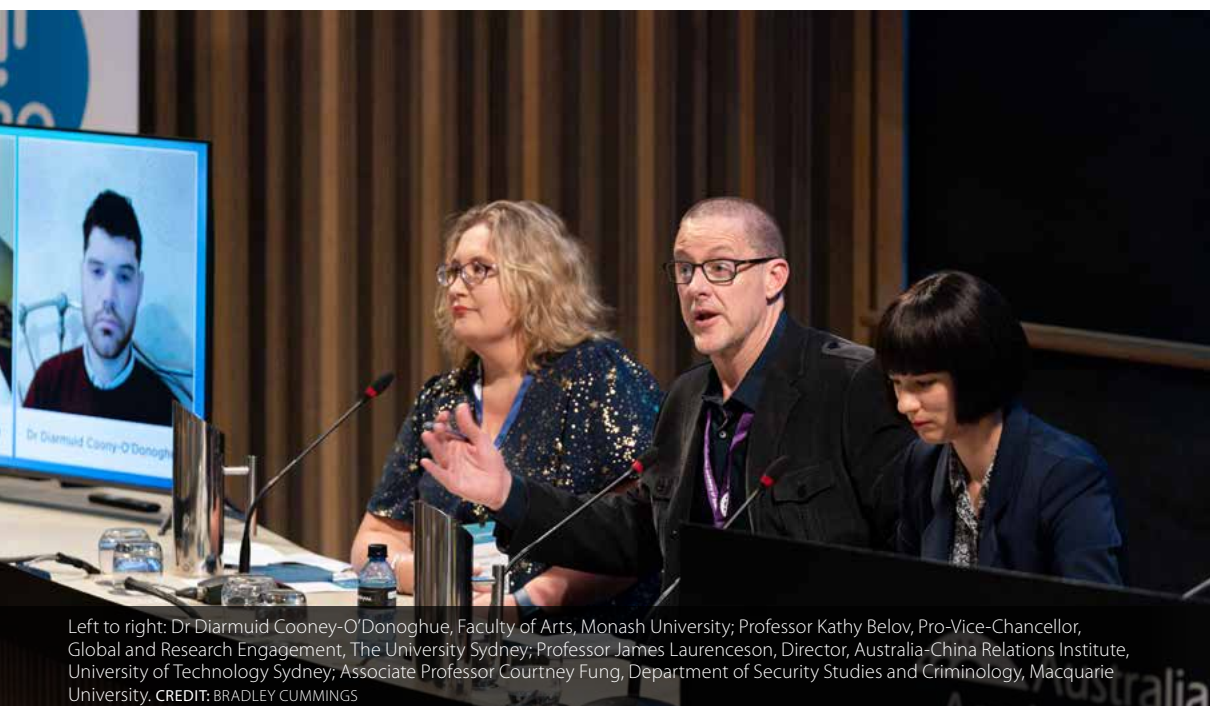
While avoiding all risks may seem tempting, it could ultimately lead to stagnation and irrelevance in the global arena. Instead, Australia must navigate the complexities of international collaboration with a strategic mindset, identifying and mitigating potential risks while leveraging the opportunities that come with global engagement. This approach requires foresight, adaptability, and a willingness to embrace uncertainty, but it is essential for ensuring Australia's continued leadership in scientific research and for Australia to benefit from international scientific collaboration.

### Opportunities:

- 10.** Diversify scientific engagement and collaboration across multiple regions and sectors to reduce dependency on any single partner. This strategic move not only enhances resilience and sustainability within our domestic capacity and collaborative research initiatives but also opens new avenues for innovation and discovery. Participation in initiatives such as Horizon Europe can help us achieve this.
- 11.** Continue due diligence practices on prospective research partners and collaborators and develop training and capacity-building within our universities to support our researchers in navigating the environment.
- 12.** Consider a more systematic architecture for Australian universities, similar to the Federally Funded Research and Development Centres and University Affiliated Research Centres in the US. This architecture can be developed to create environments that support secure collaboration and innovation on sensitive technologies, striking a balance between the need for security and the importance of scientific openness. By implementing robust security measures and clear guidelines, we can ensure that sensitive technologies are protected while still fostering a culture of innovation and collaboration.

### Australian Academy of Science role:

The Academy acts as a trusted broker that can facilitate holistic discussions of risk between the research community, universities, the national security community and other stakeholders.



## Less bureaucracy, more collaborative processes

Acknowledging and addressing these multifaceted challenges is imperative for navigating the intricate landscape of international scientific collaboration. Efforts to streamline administrative processes, diversify sources of funding and talent, and balance security concerns and scientific openness are essential to fostering a vibrant and sustainable global scientific community.

By proactively addressing these issues, researchers and policymakers can better position themselves to harness the collective expertise and resources of the international scientific community to tackle pressing global challenges and drive innovation forward.

Dr Diarmuid Cooney-O'Donoghue presented an overview of tools used by the US, UK, Australia and Sweden to manage research security (Table 1). Approaches in Australia, the US and UK are more heavily driven by collaboration and partnership between the university sector and the government.<sup>10</sup> Additionally, the government tries to reshape collaborative linkages based on geopolitical interests and increases due diligence expectations, particularly in areas such as critical technologies. Sweden's approach is more research sector-led and focussed on guidelines and increasing risk-awareness. Dr Cooney-O'Donoghue recognised a need to balance compliance with institutional autonomy and a commitment to international collaboration.

Speakers highlighted that there are additional administrative burdens associated with measures such as defence export control processes, which can impede the progress of collaborative R&D projects. Only by streamlining these processes will administrative burdens be reduced and future R&D collaboration between nations strengthened. Time spent away from research in navigating export controls will detract from the core objectives of scientific collaboration, posing a significant challenge for researchers and institutions alike.

Moreover, any added complexity to existing bureaucratic layers will impede the flow of international students and researchers, which Australia has come to rely on. Professor Sir Peter Mathieson spoke of the substantial reliance of universities, particularly in the UK and Australia, on international student recruitment from China.

Any decline in international recruitment as a result of geopolitical tensions or disruptions will have disproportionate impacts on universities and scientific institutions, affecting not only their financial stability but also their ability to attract talent and foster international collaboration. This highlights the interconnectedness of global scientific networks and the need for diversified strategies to mitigate risks associated with overdependence on specific countries or regions.

**Table 1:** Overview of tools used by different countries to manage research security.  
Source: Dr Diarmuid Cooney-O'Donoghue.

Country	US	Australia	UK	Sweden
<b>Guidelines for international collaboration</b>	✓	✓	✓	✓
<b>Mandatory disclosures of foreign affiliations</b>	✓	✓		
<b>Funding for research with like-minded partners</b>	✓	✓	✓	✓
<b>Restrictions on collaboration with competitors</b>	✓	✓	✓	
<b>More stringent export controls</b>	✓	✓	✓	
<b>Government contact point for research security</b>			✓	

Dr Cooney-O'Donoghue raised a critical point regarding the balance between national security concerns and the pursuit of scientific excellence through international collaboration: while it is essential to address legitimate security risks, an overly restrictive approach could hinder the advancement of cutting-edge technologies and scientific discoveries. The collaborative interests shared by many nations in pushing the boundaries of scientific knowledge rely on open exchange and cooperation. Striking the right balance between security imperatives and scientific progress is a delicate task that requires nuanced policies and careful consideration of the broader implications for global scientific advancements.

Approaches that encourage and maintain academic freedom and excellence while minimising risk would foster greater security and trust in research institutions. A principles-based approach to risk management, coupled with practical step-by-step procedures, could bolster Australia's sovereign capabilities through scientific research. Supplemented by integrating risk management principles into everyday practices, institutions can effectively navigate potential threats while upholding their commitment to academic freedom.

Professor Kathy Belov AO FAA underscored the need for such measures to protect institutional autonomy and promote a conducive environment for research innovation. Establishing an agreed set of first principles for open science collaborations is vital if the scientific community wants to build transparency and trust, as a foundation for navigating the complexities of risk management with international collaborations while safeguarding the integrity of scientific research and promoting responsible conduct.

Professor Sir Peter Mathieson highlighted the UK's Research Collaboration Advice Team (RCAT) as an example of a mechanism for rapid and frequent information sharing between the government and the university sector on security risks, enabling academics to better navigate national security concerns associated with international research.<sup>11</sup>





Professor James Laurenceson. CREDIT: BRADLEY CUMMINGS

### Opportunities:

- 13.** Learn from successes and gaps in Australian and international models for the government and science sectors to maintain dialogue and collaborate on policy development. For example, while the UFIT allows for dialogue at the commanding heights of the science-national security policy interface, what are some other forums or mechanisms to allow dialogue to flourish between the sectors?
- 14.** Establish a shared set of principles for international engagement that articulate the need to maintain academic freedom, research excellence and international scientific collaboration while promoting risk management and transparency.
- 15.** Develop a data-driven approach to understand Australia's patterns of international research engagement to identify fields where Australia could expand its collaboration with like-minded partners in emerging technologies and diversify its engagements to avoid overdependence on specific countries or regions.

#### Australian Academy of Science role:

The Academy is an independent convenor of science evidence and advice for decision-making. All advice provided by the Academy is non-political and founded in principles of excellence, quality, independence and transparency.

## Competing for the best and the brightest

Symposium discussions highlighted that international students have a crucial role in Australia's higher education research system. Currently, 36% of Australia's postgraduate research students are from overseas, and they make up nearly a quarter of the country's research workforce.<sup>12-15</sup> The top five citizenship countries for postgraduate research sector student visas granted in 2022–23 were China (18%), India (9%), Saudi Arabia (9%), Sri Lanka (7%) and Bangladesh (7%).<sup>16</sup>

Additionally, in 2016, 57% of Australia's university STEM-qualified labour force were born overseas.<sup>17</sup>

Not only are overseas students of fundamental importance to Australia's research ecosystem, they also provide clear economic benefits. Professor Kathy Belov pointed to a study that showed that, in 2022, international students from the University of Sydney contributed \$2.5 billion to the economy of New South Wales.<sup>18</sup> This, combined with the dependency of Australian universities on international student fees, makes overseas students a fundamental pillar of Australia's research sector.

However, Australia faces significant challenges in attracting talented scientists and researchers. There is global competition for talent, with countries including Canada, China and the UK all enacting policies and visa settings to attract international students and qualified scientists within the last 10 years. In the past, Australia has responded by enhancing post-study work rights and introducing specific talent attraction schemes in science, such as the Australian Research Council's Laureate Fellowship scheme.

This competitive landscape is becoming more challenging, with the risks to Australia's research culture coming from an overly cautious and disproportionate approach. Speakers warned that uncertainty on proposed regulations and compliance could directly affect Australia's ability to attract the best and brightest talent globally, including inducing risk-averse behaviour from universities, researchers and administrators.

Speakers discussed how international students who live and study in Australia can benefit our national interests by becoming conduits of science diplomacy and bringing back to their country-of-origin Australian democratic values and research relationships.

### Opportunities:

**16.** Australia's security and visa policy settings should work together to ensure measures to address security risks are proportionate and maintain Australia's ability to attract international talent. Unintended consequences of changes in Australian higher education and research should be monitored and addressed.

**17.** Approaches must be socially inclusive to support excellence from our diverse workforce and avoid unfairly targeting academics from particular backgrounds on security matters.

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*"In fact, Australia is a product of the freedom of movement of scientists and our ability to collaborate and welcome talent like them to our shores."*

**Professor Chennupati Jagadish** AC PresAA  
FREng FTSE, President of the Australian  
Academy of Science

## Scientific collaboration drives science diplomacy

The symposium heard of the fundamental importance of science diplomacy and its ability to establish and maintain windows of communication between nations during times of geopolitical instability and uncertainty.



Speakers used the example of science diplomacy's impact during the Cold War, where dialogue was maintained between scientists in the US and the Soviet Union that was actively encouraged in part by both governments. Panellists noted that the same scientists who were involved in direct communication with the US were the ones who became scientific advisors when Mikhail Gorbachev came to power, opening a window of opportunity in the diplomatic sphere that otherwise would not have existed. Maintaining scientific dialogues, even during adversity, allows nations to benefit from such windows of opportunity and cannot be underestimated.

Not only does science diplomacy maintain active communication between nations, it also offers a unique tool to learn about other nations. Speakers highlighted that science diplomacy is a two-way street.

While other nations learn from Australia, Australia can also learn from other nations. An active scientific dialogue with these nations could make Australia aware of key scientific breakthroughs and advances.

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"I think that a real challenge for us as a scientific community is to work towards a reinvigoration of the soft diplomacy that might then reinvigorate the diplomacy itself in some sectors."

**Professor Steven Chown** FAA,  
Director, Securing Antarctica's  
Environmental Future

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"To the extent we can at least have the science community being a window of communication between societies that are really at loggerheads, I think it can actually turn out to have value when windows of opportunity open in the diplomatic sphere."

**Dr E William Colglazier**, Editor-in-Chief  
Science & Diplomacy, AAAS

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"I profoundly think that science is a critical way to deter conflict."

**Professor Tanya Monro** AC FAA FTSE,  
Australia's Chief Defence Scientist





Participants seated in the Shine Dome. CREDIT: BRADLEY CUMMINGS

A key benefit of science diplomacy is the ability of Australia to influence other countries' scientific leaders through developing strong scientific collaborations. Speakers discussed that the exchange of ideas and values between different countries' scientific communities, and the understanding borne from this exchange, cannot be underestimated and that scientific leaders can have a far greater influence on their nations' governments and decision-making than Australia can itself.

Panellists highlighted the great success of global scientific diplomacy institutions in making progress on grand challenges, including the Intergovernmental Panel on Climate Change (IPCC) and the Antarctic Treaty. The IPCC and the Montreal Protocol were mentioned as examples of diplomacy, negotiation and collective action with scientific evidence at their core.

Antarctica was described as an exemplar and bellwether in this space, where many countries come together and depend on each other for their very survival. However, it is also a contested environment where international tensions play out. Despite the challenges and increasing tensions, a common language and dialogue are made possible through scientific dialogue and collaboration.

The Antarctic Treaty has enabled Antarctica to be free from military conflict and nuclear proliferation despite individual nations' interests and international challenges. Speakers noted that Antarctica has its exemplar status as countries have learned to how to collaborate despite difficulties and have learned to 'agree to disagree' about politics.

Panellists urged that the key lessons learned from Antarctica should be used to inform other areas of science diplomacy. Additionally, the role of science diplomacy in avoiding a worst-case scenario where the future direction of science in Antarctica is characterised by regional rivalries was noted.

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**"Their scientific community is going to have more influence over their government in the long run than we probably ever will."**

**Dr E William Colglazier, Editor-in-Chief  
Science & Diplomacy, AAAS**

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**"The absolute worst-case scenario in terms of what we look at as possibilities for the future is one that's characterised by regional rivalry."**

**Professor Nerilie Abram FAA,  
Research School of Earth Sciences,  
Australian National University**



The Square Kilometre Array was also highlighted as an example of large-scale collaborative infrastructure beyond the capacity of any one country that will profoundly impact scientific discovery. The two sites, one in Australia and one in South Africa, create a global observatory achieved through collaboration between member states and institutions from Australia, China, Italy, the Netherlands, Portugal, South Africa, Spain, Switzerland and the UK.

#### Opportunities:

**18.** Foster and facilitate multilateral science programs that promote collaboration between Australian scientists and global counterparts on shared challenges such as climate change to develop shared innovative solutions and leverage global resources and expertise.

**19.** Recognise the role of science in shaping global affairs, promoting sustainable development and advancing Australia's national interests on the world stage.

#### Australian Academy of Science role:

Scientist-to-scientist engagement needs to transcend political and religious beliefs and provide continuing opportunity for nations to engage in harmonious dialogue and co-existence. The Australian Academy of Science plays an active role in international science diplomacy through:

- its responsibility for Australia's representation on the International Science Council and other international scientific unions that convene scientists and address issues of global significance
- facilitating strategic partnerships with Australian and overseas researchers
- administering funding programs to promote international scientific collaboration and strengthen diplomatic ties.



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## Symposium conveners

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Professor Frances Separovic AO FAA

Professor Steven Chown FAA

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## Keynote speakers – Symposium dinner

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Her Excellency Ms Caroline Kennedy, Ambassador of the United States of America to Australia

His Excellency the Hon Dr Kevin Rudd AC, Australian Ambassador to the United States of America

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## Keynote speakers – Symposium

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Professor Chennupati Jagadish AC PresAA FREng FTSE, President, Australian Academy of Science

Hon Richard Marles MP, Deputy Prime Minister and Minister for Defence

Professor Tanya Monro AC FAA FTSE, Australia's Chief Defence Scientist, Department of Defence

The Hon Tim Watts MP, Assistant Minister for Foreign Affairs

Nathan Smyth, Deputy Secretary National Security and Resilience, Department of Home Affairs

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## Symposium panellists

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Professor Nerilie Abram FAA, Research School of Earth Sciences, Australian National University

Dr E William Colglazier, Editor-in-Chief Science & Diplomacy, American Association for the Advancement of Science

Associate Professor Courtney Fung, Department of Security Studies & Criminology, Macquarie University

Professor Kathy Belov AO FAA, Pro-Vice-Chancellor, Global and Research Engagement, University Sydney

Dr Diarmuid Cooney-O'Donoghue, Faculty of Arts, Monash University

Professor James Laurenceson, Director, Australia-China Relations Institute, University of Technology Sydney

Professor Sir Peter Mathieson FRCP (London) FRCPE FMedSci FRSE FRSA, Chair, Task Force on Security Issues in UK Higher Education, and Principal and Vice-Chancellor, University of Edinburgh

Dr Marcus Doherty, Co-Founder and Chief Scientific Officer, Quantum Brilliance Pty Ltd

Professor Jacqui True FASSA FAIIA, Director, ARC Centre of Excellence for the Elimination of Violence against Women, Monash University

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