

2019 NATIONAL INSTITUTES GRANT REPORT



Introduction

ANU has a special charter to advance the cause of learning and research in general, and take its rightful place among the great universities of the world.

The Australian Government established ANU in 1946 and endowed it with the National Institutes Grant. This secure and reliable funding has made possible the long-term pure and applied research – and the consequent transformational outcomes – that mark ANU as a nationally and internationally significant research institution and a valuable resource for Australia.

ANU, through the National Institutes Grant, maintains and evolves distinctive concentrations of excellence in research in areas of national importance and at the level of excellence Australians expect. The stories in this 2019 National Institutes Grant Report demonstrate some of the ways the National Institutes Grant allows ANU to make unique contributions in the areas of Indigenous Australia, the Asia-Pacific region, public policy, excellence in research and innovation, and protecting the future of research.

The National Institutes Grant helps develop Australia's national unity and identity, and engage with its Indigenous and non-Indigenous history and culture, and with modern Australia's place in the world. It allows ANU to serve Australia in public policy, developing evidence-based solutions to address major issues confronting governments, business and communities. And, the National Institutes Grant enables access to world-class facilities and infrastructure, and a high-quality training ground for future research and academic leaders.

The ANU National Institutes Grant Framework governs the expenditure and accountability of the National Institutes Grant to ensure its purpose continues to be its guide. The framework strengthens the strategic focus that: underpins expenditure of the National Institutes Grant within ANU; enhances accountability for, and transparency of, that expenditure; enables ANU to remain flexible and agile to meet new and emerging strategic and national priorities; promotes the uniqueness of ANU as Australia's national university and its ability to expertly deliver on key activities of national significance; and demonstrates an outstanding benefit to the nation because of the University's distinctive excellence.

ANU was founded as a university unique in Australia and the world. After more than seven decades it remains so, delivering a legacy of excellence in research, education and public policy.

Further information on the National Institutes Grant at ANU is available at anu.edu.au/about/national-institutes-grant.

Opposite: The Hon Dan Tehan MP, Australian Government Minister for Education, Senator the Hon Zed Seselja, Assistant Minister for Finance, Charities and Electoral Matters, meet with ANU researchers at ANU Acton Campus.



Engagement with Indigenous Australia

The National Institutes Grant enables ANU to support the development of Australia's national unity and identity, including by improving Australia's understanding of itself and the history and culture of its Indigenous peoples.

First Nations Treaty Forum

The 2019 First Nations Treaty Forum, convened on Ngunnawal/Ngambri Country in November, was a central and significant event in a fortnight at ANU celebrating Indigenous Australia, starting with Indigenous diplomacy and concluding with Archie Roach at Llewellyn Hall. Building on the First Nations Governance Forum hosted by ANU in 2018, the 2019 Treaty Forum explored the significance of treaty for Indigenous peoples and communities. Facilitated yarning circles for Indigenous Elders and for Indigenous youth complemented talks, lectures and panel discussions over the Treaty Forum. The yarning circles gave all participants a chance to share opinions and ask questions in a harmonious and collaborative space. More than 100 participants, with links to more than 30 individual First Nations, included people who had travelled from remote communities all over Australia, joining Indigenous students, academics, lawyers and policymakers.

The conversations were Indigenous-led, rich, varied and respectful. Delegates discussed and debated different views and conceptions of what treaty means and what it could bring. No single view emerged from discussion on the role treaty could play, but the need for patience, time, space and resources to properly consider the issues, was acknowledged. A highly valuable dialogue did take place on the range of issues any consideration of treaty would need to address. Four areas of discussion – sovereignty, land, self-determination and truth telling – stood out as signposts for the future. The fact that sovereignty has never been ceded by Australia's First Nations was emphasised. Treaty could clarify the shared sovereignty that common law already recognises. Either way, questions arose around how to balance the sovereignty held by individual First Nations versus that held by Australia's First Peoples as a whole. Land remains a critical issue. Dispossession and its consequences were highlighted by many, as was the uneven legacy left by Native Title laws. Broader issues of what self-determination and sovereignty entail were also raised. Truth telling emerged as a critical issue and many emphasised the importance of investing in an understanding of history at all levels including the local.

The National Centre for Indigenous Studies and Public Policy and Societal Impact Hub collaborated to host the 2019 First Nations Treaty Forum.

Returning Indigenous cultural heritage

The vast task of identifying and returning Indigenous artefacts and material culture held in national and international collections is beyond physically achievable. But the joint efforts of National Institutes Grant-funded researchers across the Research School of Humanities and the Arts in a digital imaging and linked data project is bringing it well into the realms of possibility. The project is a collaborative partnership with Aboriginal and Torres Strait Islander communities to trace items to the communities from which they originate. Significant theoretical work on intangible heritage, cultural production, linked data methodologies and digital tools, and relevance and significance, underscore the process. Collaboration with international cultural collecting institutions, such as the British Museum, has begun the process of populating the database and developing a reliable, transferable digital tool (or tools) to facilitate the recognition of Indigenous objects by scanning and collecting them into a global repository, effectively a virtual museum of distributed Indigenous collections.

Indigenous Australian Dictionary of Biography

The Indigenous Australian Dictionary of Biography project was boosted in 2019 with extra National Institutes Grant investment to fund a part-time Indigenous research editor. The researcher, the only Australian Dictionary of Biography Indigenous scholar employed at ANU, allowed the project to reach more deeply into the biographical and Indigenous communities. The project drew on national networks of Indigenous knowledge and expertise to contribute to global conversations on the historical research and public presentation of the lives of Indigenous people. The representation and recognition of Australia's Indigenous peoples in the project is being built on an understanding informed by historical perspectives at several time scales, from the 'deep history' of human occupation of the continent to the more recent history of colonisation since the 18th Century, and the continuing negotiation of interests and identities.

Engaging with south coast custodians

Kioloa, an ANU off-campus resource and accommodation hub on the south coast of New South Wales, is well used and loved by ANU staff, students, researchers and visitors. The land is on the traditional Country of the south coast custodians, sometimes collectively called the Yuin, and that ownership has not been fully considered until now. An engagement program with south coast Elders is building expertise for engaging with local Indigenous Elders and organisations. ANU can thus give the custodians long overdue thanks for using their lands for research and teaching, and consult and negotiate future permission for research on this Country. In workshops, Elders have expressed a desire for acknowledgement of their existence, history, heritage and custodianship of Kioloa and this region. They aspire to become partners in the educational and economic opportunities that the Kioloa Campus presents. This important, and welcomed, case study will help develop the ANU Indigenous Engagement Strategy and can inform the national approach to Indigenous engagement. All parties want to be involved in developing a world-class educational facility and research hub that partners ANU with the Yuin, not only in teaching and educational programs but also in a meaningful partnership that enables local economic aspirations.

Indigenous diplomacy

Indigenous diplomacy systems maintained broadly peaceful governance between Aboriginal and Torres Strait Islander clans and nations, and with overseas traders, for millennia in Australia before colonisation. They can teach us much that could enable progress in national reconciliation, treaty and truth-telling processes. A new intensive postgraduate course on Indigenous Diplomacy, the first of its kind in Australia and designed with the help of Yolju, Torres Strait and Ngunnawal Elders, was launched in November 2019, by the Asia-Pacific College of Diplomacy in the Coral Bell School of Asia Pacific Affairs. The research-led teaching approach by a group of Indigenous Elders and university-based scholars, focuses on the principles and practices governing dialogue and peace-building between groups. The six-day course was developed in partnership with the College of Indigenous Futures, Charles Darwin University, and has generated a partnership with the Department of Foreign Affairs and Trade, and interest from other organisations.

Blood samples returned home to Arnhem Land

After 50 years away, more than 200 *manggu* (Yolŋu word for blood) samples from people who have passed away are now on Country at a memorial site in the Galiwin'ku community of Elcho Island in East Arnhem Land. The samples were collected from everyone on Elcho Island after a typhoid outbreak in 1968 and 1969, and formed part of the 7,000-strong collection in the John Curtin School of Medical Research. They are the largest sample-set from a single community and have the most detailed information about the original study participants. The samples have been pivotal in advancing health and medical discoveries and their sequencing will deliver important health and medical benefits for all Indigenous Australians. The Galiwin'ku gave permission for the deceased's samples to be sequenced from a small amount of the sample. The remaining material was dried and combined in family groups and stored in timber boxes specially created by artists at the ANU School of Art. Blood samples from those who are still alive (around 400) will be disposed of in Canberra after sequencing. Mrs Azure Hermes, National Centre for Indigenous Genomics' Indigenous Engagement Coordinator, who led the consultation and repatriation process, said: "Our shared ability to bring to realisation a research model that respects Indigenous cultural practices and genomic discovery is a remarkable achievement, and a gift from each of us to the other."

Launch of Deep History Research Centre

The new Research Centre for Deep History explores the deep human past, which on the Australian continent extends back about 65,000 years. Deep history adopts transdisciplinary and community collaborative approaches to examine humanity's past. This ANU-based research centre is partnering with international groups such as those at Harvard University and Linnaeus University in Sweden to help drive a new global understanding of history and expand the scope of the history discipline. The centre is associated with Professor Ann McGrath's ARC Laureate Project (Rediscovering the deep human past: global networks, future opportunities), and was formed with the support of the National Institutes Grant and the School of History. The centre promises national benefits from a greater understanding of the full span of global human history.



Professor Ann McGrath, ANU School of History, sits within the Acton Grassy Woodlands at the ANU.

Decolonising the academy

The university system was not made for Indigenous peoples; yet, it can challenge and critique ways of marginalising Indigenous voices and experiences. Thus, the Indigenous Remix flagship workshop, in October 2019 hosted by the CHL. The gathering of visiting Aboriginal, Pacific Islander and Taiwanese scholars and artists workshoped Indigenous remix approaches and discussed ways of creating an educational and research environment that is a genuine mix of learning with and from Indigenous peoples, and promotes creative education and research. The aims of the workshop were to foster trans-Indigenous Australian and Oceanic conversations across ANU and more broadly to share de-colonial ways of thinking and doing Indigenous teaching, research and outreach; to strengthen the potential of trans-disciplinary Indigenous studies; and to emphasise the central importance of Indigenous wellbeing within the academy and devise strategies of collective care. A session on the last day was dedicated to participants sharing their plans for how to incorporate observations and solutions discussed into collective practice.

Promoting early screening for cardiovascular disease

One in six Aboriginal and Torres Strait Islander adults is at high risk of a major cardiovascular disease (CVD) event, such as a heart attack, in the next five years. Researchers from the ANU Research School of Population Health – in close partnership with Aboriginal and Torres Strait Islander health researchers, community groups, Australian Department of Health and CVD guideline developers – are improving prevention of CVD for Aboriginal and Torres Strait Islander peoples. The researchers' contributions to this body of knowledge includes identifying the early onset of CVD risk in these adults. Building on these findings, the researchers worked with guideline developers to lower the age for starting heart health screening in Aboriginal and Torres Strait Islander people to 18 years, more than 15 years lower than previously recommended. This evidence-based care improvement will have significant and long-lasting impacts on health, saving lives and reducing suffering in the short- and long-term.

Contributing to Australia's understanding of & role in Asia & the Pacific

The National Institutes Grant enables ANU to support the development of Australia's national unity and identity, including by improving Australia's understanding of its Asia-Pacific neighbours, and its place in the international community.

Launch of the Australia Pacific Security College

Through the National Institutes Grant, ANU has built unparalleled Pacific expertise by focusing on increasing and strengthening Australia's understanding of and connections with the region. This expertise was further consolidated with the creation of the Australia Pacific Security College (APSC) in August 2019. The college will support the implementation of the Pacific Island Forum *Boe Declaration for Regional Security*, and its agenda for climate, environmental, human and traditional security. Climate change is one of the foremost security issues for Pacific island countries, but they also want to respond to other security issues with both regional and national dimensions, such as transnational crime, cybersecurity and human security issues. Funded by the Department of Foreign Affairs and Trade, the APSC is an educational institution servicing all Pacific island countries and helping to strengthen regional security through collaborative learning and better personal relationships. Experts, policymakers and security practitioners from around the region are working through security challenges to inform courses and their contents. The APSC was designed in close consultation with Pacific island countries, and ongoing consultation and cooperative efforts will be its hallmark. The college respects the sovereignty of Pacific governments and works closely with them to identify training requirements.



Director of the APSC, Professor Meg Keen, said that the college leadership would work with Pacific governments to navigate the increasing complexity of regional security and tailor its program to their needs. “Our end objective is to be an asset that Pacific countries can call on to develop their strengths and pursue their security interests,” she said. The APSC has already “hit-the-ground listening”, travelling to meet with leaders in Pacific island countries including Papua New Guinea, Fiji, Samoa and Solomon Islands. The visits are helping with understanding the security priorities and identifying gaps for professional education and training.

Asia-Pacific satellite of Global Institute for Women’s Leadership

The Global Institute for Women’s Leadership (GIWL) based at King’s College London has partnered with ANU to establish a ‘sister institute’ at ANU, with an Asia-Pacific focus. The memorandum of understanding was signed in September 2019. The Institute works towards a world in which being a woman is not a barrier to becoming a leader in any field. Chaired and founded by Australia’s first and (so far) only female Prime Minister, the Hon Julia Gillard AC, the Institute encapsulates the pursuit of research excellence and transformative public policy and societal impact. King’s College London launched the Global Institute for Women’s Leadership in April 2018 to bring together rigorous research, practice and advocacy to better understand the causes of women’s under-representation in leadership positions across sectors and countries, the impact gender has on perceptions of leaders and the most effective ways to bring about change. The new sister Institute is the first international ‘branch’ of GIWL, and takes full advantage of the Gender and Asia-Pacific scholarly expertise on offer at ANU. It will add depth and an Asia-Pacific perspective to the Institute’s research streams, advocacy and engagement activities, expanding the reach and scope of the Institute to help achieve truly global impact.

The Vice-Chancellor in Fiji

On a June trip to Suva, Vice-Chancellor Brian Schmidt met with ANU alumni, members of the Pacific Islands Forum secretariat, diplomats in the Australian High Commission, and many leaders of the University of the South Pacific. It was thought to be the first such visit to a Pacific island country by a sitting ANU Vice-Chancellor, and will lead to closer relationships to share ideas, co-create research, and support student and faculty exchange between the two universities. More than 60 alumni – including staff of non-government organisations (NGOs) working in remote locations, senior business leaders, highly regarded academics and a government minister – joined the Vice-Chancellor at an event hosted by the High Commission. The Vice-Chancellor is planning to return to the Pacific in the near future.

Science engagement in the Pacific

The Australian National Centre for the Public Awareness of Science (CPAS) encourages democratic ownership of science by increasing community science awareness, fostering public dialogue and improving the communication skills of all scientists, especially in the Asia-Pacific. Science Circus Pacific, a travelling science, technology, engineering and mathematics (STEM) engagement and capacity building program of ANU, is working in partnership with Pacific universities and NGOs to build capacity in science communication in Pacific countries. ANU-Pacific teams are co-developing and co-delivering science engagement programs focused on youth, schools and the community. In 2019 they reached 4,535 people through 44 hands-on exhibitions, workshops and shows in five visits to Fiji and Samoa. Fifty-eight Pacific science communicators, trained through the project, were key contributors and most continue to run independent programs. The project is fostering ongoing Australia-Pacific partnerships, people-to-people links, and empowering Pacific science communicators to tackle regional issues including climate, innovation, gender and STEM skills and careers, particularly in Pacific youth. The project will expand in 2020, with pilots in Kiribati and the Federated States of Micronesia, and emerging partnerships in the Solomon Islands. CPAS is creating a network for science engagement in the Pacific, which will expand regional expertise, grow research and engagement capacity, be a conduit to Australian policymakers working in the Pacific, and contribute to wider Australian Government priorities such as the Pacific Step-up.

Pacific regional diplomacy

The third and final stage in the pioneering Pacific Regional Diplomacy project of the Coral Bell School's Asia-Pacific College of Diplomacy and University of the South Pacific is underway. The project is completing a comprehensive scholarly analysis of the dynamics of regional diplomacy in the Pacific Islands region. The first stage brought together Pacific Islander and Australian academics, diplomats and journalists to understand the innovative and dramatic developments in regional diplomacy in the past decade. The second stage focused on regional diplomacy in relation to regional security, development and climate change over the past 50 years and examined the diplomatic agency of the small island states. The third stage of the project is exploring an under-researched aspect of the dynamics of regional diplomacy, Indigenous diplomacy – diplomatic protocols and practices that emanate from the long history of engagement between cultural groups in this region and the ways in which they are adapted in current diplomatic engagements. Examples are the use of *talanoa* in Fiji's global diplomacy or the use of Indigenous diplomacy in the reconciliation of Fiji and Vanuatu in the Melanesian Spearhead Group. The first research workshop was held at the University of the South Pacific in April 2019, with more planned over the next two years.

Pacific Gender Research Portal

An increase in National Institutes Grant funding to the Coral Bell School of Asia Pacific Affairs from 2020, will see ANU Department of Pacific Affairs work with regional stakeholders to establish the Pacific Gender Research Portal. The portal, to be established as a regional public good, is intended to make gender research more readily accessible to scholars, practitioners and policymakers. It will build on the school's long-term research and engagement in women's political participation and economic empowerment. The portal will allow the school to lead understanding and support for positive social and political change in our region, while extending the reach of the University's world-class Pacific gender research. It is envisaged as a moderated resource for the wide range of users conducting and using gender research in the Pacific – hosting a library of relevant academic research, papers and other resources; offering knowledge translation services; building and facilitating linkages within a Pacific gender research community of practice; providing commentary as a form of peer review; and helping new and emerging scholars and gender practitioners to learn the art of critical research. The portal furthers the University's partnership with the Department of Foreign Affairs and Trade, and its national responsibilities to conduct and share world-class research, and advise government and national policymakers.

Physics outreach in Southeast Asia

Lecturers from the Research Schools of Physics and Biology made a capacity-building visit to Timor Leste in 2019, partly funded by the Physics National Institute Grant. The team works in collaboration with ACT high school teachers to train Timorese science educators through practical teaching methods involving experiments. The project builds on previous experience of international development work, in collaboration with the ANU College of Arts and Social Sciences, that has been facilitated by the National Institutes Grant. Dr AJ Mitchell of the Research School of Physics established a program to train academics at the University of Yangon in southern Myanmar, from across the STEM and humanities and social sciences (HASS) disciplines, in aspects of research development and student supervision. He hopes to establish these trips as a regular part of the outreach calendar.

Innovative study of languages in Asia & the Pacific

Understanding our neighbours, one of the ANU founding objectives, is built on language. The School of Culture, History and Language (CHL) takes academic leadership to foster new directions in language education and hosted the Innovative Language Education Symposium in September 2019 to discuss and share innovative language education matters. Over the three days of the symposium, a diverse and interdisciplinary set of language education minds shared the latest research in Asian language teaching and talked about developments in language teaching pedagogy. Discussion centred around topical themes like language and policy, the definition of innovation in the context of language education, the growing global relevance of Southeast Asian and Pacific languages, and intercultural education. The symposium was an ideal, and practical, platform for collectively brainstorming and learning about the future of language education in the Asian century. The school's ePub website was also launched at the symposium.

Synapse seminar – culture, history & language

The ANU CHL has a long tradition of pioneering field research into the deep history of Asia and the Pacific, drawing on its strengths from across the school, and across the University. The school has launched a series of initiatives aimed at integrating these different disciplinary approaches and skills in the design of a new Evolution of Cultural Diversity Initiative. The inauguration of the CHL Synapse seminar series in 2019 is part of CHL's Flagship program on trans-disciplinary approaches to the past. Synapse – the gap that transfers impulses throughout the body's nervous system and allows us to move from thought to action, or theory to practice – is an appropriate metaphor for a project that tries to identify the gaps and build the connective tissue between different disciplines, move from theory to practice, and generate concrete projects. In its first year, the CHL Synapse seminar featured presentations from geneticists, linguists, historians, archaeologists and trans-disciplinary theorists to an even more diverse audience. The series will continue into 2020 and beyond.

Better hygiene & health outcomes in the region

Bacteria, viruses and parasites are spread through poor sanitation, causing gastrointestinal infections and mortality. In Indonesia, tens of thousands of deaths are caused by gastrointestinal infections each year, including 31 per cent of infant deaths due to diarrhoea. The ANU Research School of Population Health is tackling this issue of poverty and development in Asia and the Pacific through its innovative 'BALatrine' project. Professor Darren Gray and Honorary Professor Donald Stewart AO led a team from around Australia and Indonesia in a research program evaluating the impact of sanitation, hygiene education and deworming on health in Central Java. Their collaboration with local NGO, Yayasan Wahana Bakti Sejahtera Foundation, has directly installed 2,400 culturally acceptable latrines to date, giving about 8,600 people a personal toilet and its sanitation benefits for the first time in their lives. This research and associated advocacy has led to the installation of another 1,000,000 latrines across Indonesia, facilitated by the foundation and the Indonesian Government.

Contributing to public policy

The National Institutes Grant enables ANU to provide a national, regional and global public policy resource that addresses major issues confronting governments, business and communities.

The Institute for Water Futures

Water management poses wicked public policy challenges involving communities, government, industries and the environment. How do we balance the needs of today's increasingly thirsty and demanding world with the needs of future generations? Decisions taken to maximise the social, cultural, economic and ecological benefits we get from water today need to reflect a shared, long-term vision for water and its role in society. This will be effective when backed by science that outlines plausible water futures, technologies that enable innovative social and economic change, and policies that demonstrate equity and a holistic understanding of the complex, multi-faceted role water plays in our communities.

The Institute for Water Futures was set up in 2019 to identify transformative, innovative and robust strategies to build Australia's collective national capacity to tackle the water challenges of today and tomorrow. The National Institutes Grant will invest \$2 million in 2020 with ongoing funding to support this ongoing challenge. The interdisciplinary Institute brings together expertise and decades of experience in the sciences, technology, social sciences and public policy from across ANU. Academic leaders in the Institute include an ARC Laureate Fellow, and several fellows of the Australian Academy of Science and Australian Academy of Social Sciences. New staff have been attracted from overseas, and include two Discovery Early Career Researcher Award recipients. The Institute has active partnerships with leading researchers in the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and in important decision-making organisations such as the Murray-Darling Basin Authority and Bureau of Meteorology.

The Institute's goals are to: unite science, policy and community through developing a shared vision for water futures; develop and assess model outcomes, and the tools and systems for investigating the range and scope of plausible water futures; assimilate measurements into quantitative scientific information relevant to key policy challenges; and identify transformative and innovative strategies that bring about robust socio-economic, cultural and ecological benefits. Transforming policy, management and governance systems demands deliberative and iterative engagement with decision-makers and local communities, trust between parties, and a comprehensive understanding of local, regional and national current situations and governance regimes. The Institute will work closely with policymakers at all levels, using new and emerging methods and new media technologies, to build our capacity to integrate long-term thinking into managing our country's water and secure our water futures. The Institute's first priority water catchments are the Murray-Darling Basin and Great Barrier Reef.

Policy Greenhouse Initiative

The Policy Greenhouse Initiative utilises contributions from the National Institutes Grant to promote public policy contributions, to encourage collaboration within the University, and to build direct engagement opportunities and connections between ANU and policymakers. It attracted a challenging array of projects and collaboration initiatives to its inaugural funding call this year. The policy areas of the nine funded projects include Australia's policy choices in a new geoeconomic world order, which will facilitate deep and broad conversations between academics and policy-makers on the changing global landscape. Projects that were also funded focused on new policy approaches to addressing childhood poverty, policy and legal revision around armed conflict at sea, a framework for best practice around community consultation for major infrastructure projects, the National Disability Insurance Scheme (NDIS), disinformation campaigns, and economic and social transformation in Australia's coal-producing areas. The five funded collaboration initiatives, focused on direct collaboration with policymakers and seeding of future projects, take in areas such as mental health, Indigenous language and improving the impact of research on public policy.

Taking the HECS system to South America

Professor Bruce Chapman from the ANU College of Business and Economics was an architect of Australia's Higher Education Contribution Scheme (HECS), an income-contingent loan scheme allowing students to attend university without paying upfront fees. Professor Chapman's research has since informed multiple changes to HECS, which is now known as the Higher Education Loan Program (HELP). Professor Chapman has also been instrumental in establishing income-contingent loan systems around the world and, in doing so, removing financial disadvantage as a hurdle to accessing tertiary education. In July 2019, Professor Chapman led a team of researchers attending the Income Contingent Financing Conference in Brazil. There they met with representatives from South and Central American countries looking to implement similar systems in their respective nations. At least 20 million people from countries including New Zealand, England, Hungary, Japan, South Korea and the United States have benefited from this 'global rollout', with another four countries set to follow suit. By improving access to tertiary education, the systems have seen significant growth in higher education and skills development in adopting countries. The National Institutes Grant's long-term support of Professor Chapman's research continues to pay dividends to students and institutions globally.

Making a difference to the nation's mental health

Suicide is the leading cause of death in Australia in people aged 15–44 and affects friends, families and communities. It is a key public policy challenge, which the Centre for Mental Health Research at the ANU Research School of Population Health is focused on tackling. The Centre takes a research and education approach that embraces the complexity of suicide, working with mental health consumers, policymakers and service providers to conduct research and translate it into service improvements for our community. In 2019, ANU research delivered evidence-based suicide prevention programs in Australian schools and workplaces.

Awards for mental health research impact

Several prestigious awards in 2019 recognised the impact of ANU research on public policy to improve the mental health of Australians. Professor Luis Salvador-Carulla accepted the Research, Evaluation and Quality Improvement Award during ACT Mental Health Month, acknowledging the significant contribution the Centre for Mental Health Research makes to understanding, promoting and supporting people living with a mental health illness. Dr Amelia Gulliver received the 2019 ACT Young Tall Poppy Science Award, celebrating her work on the use of online programs to improve community mental health and reduce barriers to seeking help. Dr Michelle Banfield was awarded the prestigious John James Foundation Tony Ayers Prize for Excellence in Research in Translational Medicine, recognising her contribution in transforming science breakthroughs into clinical application; and the inaugural Consumer Engagement Award by the NHMRC for her work as a consumer researcher.

Pioneering research connects climate change & monetary policy

Connections between climate change mitigation efforts and monetary policy have long been unappreciated. These connections are now being clarified thanks to new research from the Centre for Applied Macroeconomic Analysis. The centre's research has prompted a rapid rethink of how to manage monetary policy in a world impacted by climate change. It has sparked new thinking about how climate policy should be designed given a particular monetary framework, and a rethink of how monetary policy should be made in a world of climate change shocks and climate change policies. In 2019, this new work was presented at a series of conferences around the world, and its value publicly recognised by Reserve Bank of Australia Deputy Governor Guy Debelle and United States Federal Reserve Governor Lael Brainard.

Tax policy for the twenty-first century

The Tax and Transfer Policy Institute has launched an energetic effort to promote tax reform in Australia. In 2019, the Institute ran 16 seminars on research on the tax and transfer system at four government departments, on topics ranging from gender equality, new models for policy evaluation, and new methods for statistical evaluation, among others. The seminars were attended by about 420 public servants. The Institute also oversaw an unparalleled secondment program in 2019, supporting five public servants from three departments to conduct research at the Institute. The Institute has also launched new research projects on taxpayer behaviour, savings taxation and corporate taxation.

ACT Climate Change Strategy targets

The ambitious ACT Climate Change Strategy, unveiled in September 2019, offers a plan for reducing the ACT's overall emissions by 50–60 per cent below 1990 levels by 2025, and achieving net zero emissions by 2045. The targets were proposed based on advice from the ACT Climate Change Council, an advisory body to the ACT Environment Minister. The advice was prepared by Crawford School's Professor Frank Jotzo, and the ANU Climate Change Institute's Honorary Professor Penny Sackett and Emeritus Professor Will Steffen, all members of the ACT Climate Change Council.

Toward a brighter future for Australia & Japan

The Australia-Japan Research Centre broke new ground with a series of collaborative research projects and high-profile public events in both countries in 2019. The centre generated new ideas and engaged with policymakers on trade policy in Asia for Japan's G20 presidency, on immigration policy as Japan looks abroad to arrest its population decline, on how to navigate global trade and financial risks as these become more acute, and on how to manage the growing entanglement of economic and national security policy. The centre has also continued to invest in 'Japan-literacy' in Australia and to work with the governments of both countries to strengthen the bilateral relationship.

Excellence in research & innovation

The National Institutes Grant enables ANU to maintain and enhance distinctive concentrations of excellence in research and education, particularly in areas of national importance to Australia.

ANU Grand Challenges Scheme

The ANU Grand Challenges Scheme is a \$50 million program investment in partnerships that conduct transformative research on global intractable problems, which should also attract external investment. The intent of the Scheme is to focus on addressing global challenges through collaboration between disciplines and with stakeholders, breaking through disciplinary boundaries to address major challenges confronting society.

After a competitive process, the selected 2019 Grand Challenge is Indigenous Health and Wellbeing. Ongoing programs in the ANU Grand Challenges Scheme are Our Health in Our Hands, announced November 2017, and Zero-Carbon Energy for the Asia-Pacific, announced in September 2018.

Our Health in Our Hands is furthering more precise diagnosis and personalised intervention for people affected by chronic disease, particularly diabetes and multiple sclerosis. The Our Health in Our Hands Research Committee harnesses the expertise of academics and clinicians from diverse backgrounds, and people living with Multiple Sclerosis and Type 1 Diabetes through health experience teams to ensure their experiences and preferences are embedded in the research.

Zero-Carbon Energy for the Asia-Pacific, launched in September 2019, recognises that Australia is a renewable energy powerhouse and resource-rich nation, whose immediate neighbours in the Indo-Pacific will account for two-thirds of the world's energy demand growth in the coming decades. The initiative is using research and engagement to help transform the way Australia trades with the world by developing zero-carbon export industries, creating new paradigms in benefit sharing, and developing technologies, policies and approaches that can be applied in the Asia-Pacific and beyond.

Excellence in research & innovation – health & medicine

Progress in personalised medicine

A revolutionary approach to immune disorders has cut through the long and painful process of diagnosis and treatment for many patients. Patients with conditions such as rheumatoid arthritis, multiple sclerosis and Type 1 Diabetes can present with vastly different and vague symptoms. Once a diagnosis is made, the right treatment can be equally hard to find, if at all. Professor Carola Vinuesa and her team at the Centre for Personalised Immunology have taken a huge conceptual step in identifying the right treatment rather than following the trial and error therapies used until now. The team starts with a specific patient, rather than surrogate mice. They sequence the patient's genome using Australia's largest supercomputer, and look at the patient's many mutations to see which one is causing the disease. They use Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) array technology to edit the DNA to generate a precise mouse model that replicates the patient's specific mutations. Treatments can then be trialled on the real disease in the mouse. When an effective treatment is identified it can be applied to the specific matching patient, and to all patients with the same molecular markers. The centre is attracting cases from the 5–10 per cent of the world's population with auto-immune diseases. Professor Vinuesa, co-Director of the Centre for Personalised Immunology, is the first female ANU academic to be recognised on the list of highly cited researchers awarded by the Web of Science.

Transforming communication in healthcare

Communication is the cornerstone of quality healthcare practice and patient safety. In its short life, the Institute for Communication in Healthcare has already found research and training success in tackling ineffective communication at and between all levels of the healthcare system. The institute translates cutting-edge communication research by healthcare professionals, linguists, communication experts, computer scientists, engineers and health policy experts, into best practice for safe and compassionate healthcare for health providers, clinicians, nurses, patients and their families. For example, the training course in communication at nursing handovers is already showing substantial impact. St Vincent's Hospital reports a sharp decline in the rate of falls, which it attributes directly to the institute's training. The institute is collaborating with research centres and hospitals across the globe to improve healthcare communication. It co-convened the 2nd International Symposium on Communication in Health Care with Nanyang Technological University in Singapore in February 2019 and has been the driving force behind the creation of an international consortium with Nanyang, Hong Kong, Lancaster and Harvard universities, and University College London.

Collaborating in end-of-life care

A nationally coordinated approach to end-of-life care in Australia is closer thanks to the collaborative approach of ANU Medical School. The school was a key partner in the ACT End of Life and Palliative Care Research Collaborative follow-up workshop in October 2019 along with ACT Health, and other universities and associations. The workshop identified synergies and a range of potential research projects. The school's collaborative approach also includes consumers and providers of end-of-life care. One focus is on the doctors who have had end-of-life care conversations with patients and their families. Research is finding that by embracing the experience, doctors can reduce their own anxiety, and give more compassionate support to the family. Linguists from the ANU Institute for Communication in Healthcare are studying the structure of these conversations to give them a framework and inform authentic teaching modules. The modules can be shared locally and nationally, allowing many to benefit from end-of-life communications.

Excellence in research & innovation – environment & resources

Integrated research on disaster risk science

Recent Australian natural disasters confirm that the new Disaster Risk Science Institute, launched in November 2019, is needed more than ever. Its focus will be on reducing the physical, economic and human impacts of large-scale natural disasters in Australia and its neighbouring Asia-Pacific region. It is charged with building societal resilience and effective responses to natural disasters. The institute brings together science and social science in earthquake, tsunami, volcanic eruptions, cyclones and storms, fires, floods and droughts. The results of empirical research will be placed in the hands of policymakers, practitioners and disaster affected communities. Specialist in disaster risk, resilience, response and recovery, Professor Helen James, is the Interim Director of the institute.

Adaptation & mitigation of future climate impacts

The collaborative community of climate change researchers and teachers being built across ANU by the Climate Change Institute is creating new and innovative approaches to tackling critical climate change. The institute also generates strategies to improve the uptake of research across government and industry, advises on policy, and works to increase climate change understanding and awareness across a wider audience. The institute engages with audiences locally, nationally and internationally through briefings, representation on boards and committees, short courses, seminars and public events. Climate change is already affecting all parts of Australia and all nations in the region. It has been identified as the biggest global health threat for the twenty-first century. The need is increasingly pressing to move beyond incremental change to existing systems and develop transformational approaches. The institute draws together more than 300 researchers from fields including climate science, policy, economics, law and psychology to develop long-term, interdisciplinary approaches. A strong focus is interactions between climate change and health. Researchers from across the University are also leading research that will: investigate feasible, scalable technologies that will remove CO₂ from the atmosphere over the coming decades; generate profitable new industries in the process such as developing new, recyclable materials that can lock up carbon as part of the circular economy; draw down carbon at a landscape level; and help build society's capacity to adapt to the climate changes that have already been locked in.

A new way to develop drought resistant crops

A simple test could be a game changer for growing productive wheat crops during drought. Lead researchers, Dr Arun Yadav, Dr Adam Carroll and Professor Barry Pogson, say their work could be instrumental in maximising and ensuring the reliability of food production in the face of increasingly severe drought, and pressures on farming from climate change, population growth and land-use. The test measures the relative abundance of four amino acids in wheat plants to predict their ability to maintain yield under drought much more accurately than current methods. It can be done precisely in greenhouses all year round, at a fraction of the cost of traditional field-based methods. The next challenge is to scale up the technique beyond the varieties tested to date. The breakthrough is built on the long-term capability in applying new technologies to plant sciences enabled by National Institutes Grant, and is the work of ANU scientists from the ARC Centre of Excellence in Plant Energy Biology (including Deputy Director Barry Pogson, 2019 Eureka Prize winner) and CSIRO Agriculture and Food.

Climate change impacts on breeding habits

The Superb Fairy-wren is one of Australia's most recognised and well-loved birds. In 1991, Professor Andrew Cockburn established a long-term study, now co-led by Professor Loeske Kruuk, in the National Botanic Gardens in Canberra. Each year they monitor the breeding and survival of every fairy-wren in the gardens, and a massive dataset documents the complete life history of many generations. This information is now used to study everything from the genetic basis of reproductive success and plumage colouration, to the environmental factors that affect survival. The project has been especially powerful because of the insights gained on how climate change affects bird populations. For example, the data shows that warmer days and milder nights in early spring are contributing to birds breeding earlier each year. Similarly, a link is becoming apparent between extreme high temperature events and the stopping of breeding activity, leading to a decline in population size. This wealth of data is allowing Australian researchers to determine whether the effects of climate change on wild animal populations reported in milder temperate zones in Europe and North America can be applied to Australia where the climate is naturally hotter and drier.

Biodiversity

The conservation and management of Australia's distinctive biodiversity succeeds only with deep knowledge gained through long-term environmental research and monitoring. National Institutes Grant investment supports that ongoing work, and allows the Fenner School of Environment and Society to work consistently for the public good that biodiversity provides. The school currently has 20 PhD scholars and seven postdoctoral researchers in biodiversity, and its eight professional officers are particularly important in community engagement. The school maintains, often with external partnerships, more than 100 long-term field sites and engages the broader community through volunteer participation, crowd-funding programs, social media communications and press coverage. Five of the most significant programs continue to demonstrate ground-breaking science and impact: Victorian Central Highland Forests, a globally significant study with 35 years of data, which is helping the Victorian Government to reshape forest management policy; Jervis Bay Fire Study, which is re-establishing populations of locally extinct species; Nanangroe Long Term Forest Fragmentation Study, which is examining how past land clearing for grazing and cropping interacts with new plantation landscapes, and the consequences for biodiversity conservation; Mulligans Flat–Goorooyaroo Woodlands, which is facilitating broad-scale reintroduction of locally extinct mammals; and Eastern Tasmania bird survey (monitoring more than 1,300 sites), which is informing policy development for critically endangered bird species.



PhD Candidate Belinda Wilson places cameras in front of Quoll dens in Mulligans Flat Nature Reserve, Canberra.

Antarctica-driven sea-level rise

The critical role of Antarctica in driving rapid sea-level rise has been revealed by a global study led from ANU. An examination of historical and new data from the last interglacial (the period of warmer global temperatures 125,000–118,000 years ago) revealed the sequence of events leading to sea levels 10 metres above current levels. Early Antarctic ice loss was caused by Southern Ocean warming at the onset of the interglacial. Meltwater emanating from Antarctica caused changes in global ocean circulation that resulted in northern polar warming and associated Greenland ice loss. Sea levels rose up to three metres per century due to natural climate instabilities that are far smaller and slower than current human-caused rates of warming. These rapid and large sea-level changes happened on timescales that would have profound effects on today's coastal and urban infrastructure. Current greenhouse gas-driven climate change is producing rapid atmospheric and oceanic warming in both polar regions that is greater and faster developing than the last interglacial; and with simultaneous ice-loss in Antarctica and Greenland.

Launch of Mercury Australia network

Research in Australasia on the historical and contemporary uses and impacts of mercury has been consolidated into a new network, Mercury Australia. Mercury Australia's co-convenors are Dr Larissa Schneider of ANU (recent winner of the ANU Vice-Chancellor's award for Impact and Engagement) and Dr Darren Sinclair, University of Canberra. In total, 20 researchers from eight universities in complementary disciplines, in particular chemists, environmental scientists and social scientists, are contributing research to Mercury Australia across a range of disciplines. These include regulation and governance of mercury emissions; tracking historical mercury contamination in lake sediments; sources, chemical evolution, and transport pathways of atmospheric mercury; and mercury bio-accumulation in freshwater ecosystems. The network also brings critical mass to present research findings as practical policy advice for governments, and to engage with industry and the public. It is translating its research results into publicly accessible information on its website. Mercury Australia also has the goal of helping Australia ratify the United Nations Minamata Convention on Mercury. The 128 countries that have ratified the convention, which came into force in 2017, include China, the United States and the countries in the European Union. Australia has signed the convention but is yet to ratify it. The network will be able to provide data and information needed to meet Australia's obligations under the convention.

Resolving a long-time challenge to global carbon markets

The rules for international carbon markets are still being developed around the 2015 Paris Agreement on efforts to combat climate change. For Paris to succeed, each country was allowed to determine its own ambitions and approach, but that makes accounting for carbon credits more complex. One point of contention is avoiding counting the same emission reduction more than once to achieve climate mitigation targets. The double counting can come from carbon credit trading, by countries and airlines. In 2019, ANU Professor Frank Jotzo and colleagues from a range of other countries published new work in *Science* that highlights why resolving double counting is critical. They suggested key ingredients for a robust outcome, irrespective of countries' mechanisms and targets, are a single set of international accounting rules, robust emissions accounting, and economy-wide targets in each country. Rules that guarantee environmental integrity and avoid double counting can ensure that carbon markets will work, and global ambition can be more readily raised. The issue remains central in the international climate change negotiations after the United Nations Climate Change Conference COP 25 in Madrid, in December 2019.

Excellence in research & innovation – society & culture

Australia & the world

Australian Studies Institute

The Australian Studies Institute was established to be a primary driver of the 'Australia and the World' program for global engagement at ANU. Part of the University's foundational mission was to study the great challenges facing the globe from an Australian perspective, with the Institute supporting this by connecting a global network of Australian study centres, institutes, associations and researchers. It continues to develop ways to facilitate global engagement, through social media, podcasts and e-bulletins promoting Australian research, conferences and workshops. The Institute has identified and contacted more than 500 centres, institutes, networks and programs around Australia and across the globe, and almost 1,500 other individual researchers. In 2019, the Institute hosted two distinguished visiting fellows from the United States as part of the Vice-Chancellor's Australia and the World Visiting Fellow program, and hosted 10 dinners, bringing together almost 450 visiting fellows and ANU community members. The flagship First Eight Prime Minister's lecture focusing on Andrew Fisher was delivered to a capacity crowd at Australia House, London, and initiated a new partnership between the Institute and the Britain-Australia Society for the remaining lectures in the project. Other notable events were the Australia and the World Annual Lecture featuring the Treasurer of Australia, the Hon Josh Frydenberg MP, and the Inspiring Women Reflect series hosted by the Hon Ros Kelly AO.

Launch of smartvote tool

Before the federal election in May 2019, a team from the ANU School of Politics and International Relations developed 'smartvote Australia'. This innovative online tool let Australian voters compare their views with candidates and political parties in the lead up to the election. Candidates answered 35 questions posed by ANU researchers across a wide range of current policy issues. By answering the same questions, voters were matched to candidates and parties in a more sophisticated way. The tool, launched in partnership with Nine Entertainment, helped voters cut through the campaign rhetoric and make highly informed voting choices, based on the issues that mattered to them. It proved to be popular, with 540,000 'matchings' or 'recommendations' given during the campaign.

John Mitchell Economics of Poverty Lab

The ANU Research School of Economics has officially launched the new John Mitchell Economics of Poverty Lab. Established using financial support from the National Institutes Grant and a generous donation from ANU Alumnus John Mitchell, the lab will use economic field experiments to understand human capital formation and inform evidence-based policy development around the globe. Applied economist Professor John List and Professor Mike Price lead the lab's research teams, housed across ANU and at the University of Chicago. The professors are in discussions with key federal government bodies to understand pressing issues, design field experiments to explore the issues empirically and, ultimately, inform evidence-based policy responses to them. The lab is also nurturing and advancing the careers of some of the world's most promising junior experimental economists. Dr Eva Vivalt is studying the welfare effects of minimum wage requirements, Dr Sutanuka Roy the effect of early-childhood intervention on human capital formation, and Dr Evan Calford decision-making under extreme uncertainty. The lab will also equip policymakers with the tools to analyse and interpret data themselves. The first of its short courses and conferences – where attendees receive guidance from international subject matter experts – are planned. The lab promises to revolutionise how policymakers think about evidence-based policy, both in Australia and abroad.

Socio-environmental dynamics in our region

The Asia-Pacific region is on the cusp of major cultural, environmental and political change exacerbated by frontier disputes, migrations, diverging standards of living, rapidly changing communication networks, cultural conflicts and climate change. None of these developments can be understood without a deep knowledge of the historical and cultural factors that underpin them. The Research Hub for Socio-Environmental Dynamics has the goal of transforming Australia's understanding of the lifeways of people and populations in the region through the study of the dynamics of borders and connections. It brings together the scholarly excellence of the CHL, and other parts of the College of Asia and the Pacific, and College of Arts and Social Sciences. The focus is on Indigenous communities in Australia, and our nearest neighbours in the Pacific and Papua New Guinea, commensurate with the school's long-held research focus in the region and working closely with Indigenous communities. Two projects were successfully run in 2019: KARRADJAKDURRIRRI – we are all working together: building partnerships for shared research and teaching with Australian Indigenous communities; and the Innovation Flagship project – Indigenous People and the Regional Remix: a transdisciplinary humanities workshop.

World's oldest human bone tattooing kit

The world's oldest known tattooist's kit – dated to 2,700 years old and with intricate, multi-toothed tattooing tools – is shedding further light on the long-running debate about where Polynesian style tattooing first developed. The kit was found complete in 1963 on Tongatapu, Tonga's main island, but was feared destroyed during the 2003 Canberra bushfires. It has been rediscovered but without the ink pot. The tools themselves have changed very little since the time of the kit, with traditional tattooing equipment still used in the Pacific virtually identical to it. ANU researchers, who have minutely studied the kit, said the four tattooing tools are made from bone – two from a large seabird and two from large mammals, most likely humans. Tattooing is culturally very important in the Pacific. Were these tools introduced to the Pacific through migration, or were they developed in Polynesia and spread from there? This discovery pushes the date of Polynesian tattooing right back to the beginnings of Polynesian cultures. The oldest evidence for tattooed skin goes back more than 5,000 years, to the age of mummies in Egypt and the Italian iceman Otzi, but the tattooing tools used in these places are largely unknown.

The future of research

The National Institutes Grant enables ANU to maintain and further develop the University's strong focus on research and the educational philosophy that its students are part of a community of scholars.

Co-Lab for national security

A collaboration between the ANU Research School of Computer Science, ANU Mathematical Sciences Institute and the Australian Signals Directorate (ASD), ASD-ANU Co-Lab, is bringing together leading ANU academics with ASD analysts and technologists to collaborate on Australia's national security. This centre of excellence for ground-breaking research is building capacity and nurturing talent for securing national interests. As an incubator for joint research and knowledge transfer, it will identify and nurture talented students for careers with ASD and in other STEM related fields. One aim is to increase the number of domestic students and higher degree graduates in STEM with a particular focus on areas such as cryptography, secure communications, computing, cybersecurity and vulnerability research. Short courses and masterclasses for domestic Australian students, academics and ASD experts will help transfer knowledge and accelerate learning opportunities in related fields. Co-location of the partners in one building is allowing joint research projects to incubate, with lead investigators from both ANU and ASD in the areas of data science, cryptosystems and cybersecurity, and with joint supervision of PhD students. Joint projects are also open to other ANU staff and schools.

ANU & Australian intelligence agencies

A new close partnership of the ANU Research School of Computer Science with two Australian Government intelligence agencies was launched in 2019. It is taking leading-edge ideas from computer science and developing them into practical tools and techniques. The ASD (which collects and communicates signals intelligence and prevents and disrupts offshore cyber-enabled crime) and the Australian Transaction Reports and Analysis Centre (AUSTRAC) (which uses financial intelligence and regulation to disrupt money laundering, terrorism financing and other serious crime) can use the tools and techniques to protect the people of Australia and their assets while building the skills of researchers and operators in their use. Engagement with agencies has begun in research, education, workforce recruitment and generic STEM outreach activities, with National Institutes Grant funds targeting joint research. Five proposals were funded in the first year of the partnership.

Self-repairing hydrogel skin replacement

ANU scientists have invented a new hydrogel that mimics biological matter such as skin, ligaments and bone, and which is very strong, self-healing and able to change shape. The hydrogel (a gel with high water content used in products such as contact lenses) has dynamic chemical bonds that give it features unlike other materials previously reported. It can repair itself after it has been broken, like human skin. Hydrogels are usually weak, but this material is so strong it could easily lift very heavy objects. It can also change its shape, like human muscles. This makes the hydrogel an ideal material for wearable technology and various other biomedical devices. It would also be suitable for artificial muscles in soft robotics, and could enable a new class of medical implants or artificial muscles for next-generation robots that could one day swim. The team can make the hydrogel with simple and scalable chemistry. They will develop a 3D printable ink based on the hydrogel.

A cleaner, greener fertiliser

A novel (sustainable/environmentally benign/green) bioprocess, developed by ANU researchers in collaboration with CSIRO, converts waste and CO₂ into a new (green/natural) fertiliser. In commercial quantities, it could replace widely used chemical fertilisers, such as urea, produced through unsustainable, fossil-fuel reliant industrial processes. The method uses two pervasive pollutants, ammonia and CO₂, as renewable feedstock to generate citrulline, a natural substance that is rich in the essential plant nutrient, nitrogen. The sustainable production method employs enzymes – nature’s own catalysts – in water with little energy input and without toxic by-products. Ammonia is found in many wastewater streams, therefore waste from common household sewerage to heavily polluted industrial waste could be used as a source of raw materials, rather than being pollutants. It also means the process could be carried out almost anywhere, removing the carbon footprint and cost of fertiliser importation and transport.

Nature’s endless renewable fuel supplies

Scientists from ANU and the Max Planck Institute for Chemical Energy Conversion in Germany have cracked a key step in nature’s water-splitting recipe, which powers all plant life on Earth. It could be harnessed to make a limitless supply of cheap renewable fuel. During photosynthesis, plants split water and make complex carbohydrates with carbon dioxide – the food for plants to grow and thrive. This process also produces oxygen for animals, including humans, to breathe. Copying this process from nature would lead to an endless supply of cheap hydrogen fuel for transportation, without the carbon emissions that contribute to human-caused climate change.

Collaborating on the Giant Magellan Telescope

The Giant Magellan Telescope (GMT), being constructed in the mountains of Chile, sits at the forefront of the next generation of giant ground-based telescopes. The telescope’s resolving power will be 10 times greater than the Hubble Space Telescope and four times greater than its planned successor, the new James Webb Space Telescope to be launched next year. It will see fainter objects in greater detail than any telescope ever built, pushing our knowledge of the Universe further out in space and back in time. ANU is leading Australia’s involvement in the GMT and, with Astronomy Australia Limited, makes up 10 per cent of the international consortium of research and technology organisations designing and building the telescope, which will be completed in 2027. The Research School of Astronomy and Astrophysics is designing and building one of the telescope’s first instruments, the GMT Integral-Field Spectrograph. This near-infrared imager and integral-field spectrograph will be able to take the highest resolution images of distant galaxies and obtain spectra from across a continuous region of sky. The first phase of the instrument’s preliminary design study has been completed and passed review in March 2019. Completion of the second phase will increase Australia’s share of the GMT. Australian instrument scientists at ANU are also developing and building key elements of the crucial, and technically challenging, adaptive optics system. The research school is directly collaborating with other consortium members on various aspects of the telescope systems and instruments for the GMT, and its astronomers are serving on the GMT Science Advisory Committee.

Capabilities in transformative meta-optical systems

The long-term commitment of National Institutes Grant funding to fundamental physics research has culminated in the ARC Centre of Excellence for Transformative Meta-Optical Systems, launched in October 2019. Decades of research uncovered the deep physics that underpins this new centre – research that could have been sustained only with the support of the National Institutes Grant. The centre of excellence will drive research to develop smart and miniaturised optical devices that link the digital and physical worlds through light. It will lead to smaller, smarter, faster and cheaper wearable optical sensors to better monitor our health. The ARC Centre of Excellence for Transformative Meta-Optical Systems will be led by ANU, and partner with the University of Melbourne, University of Technology Sydney, RMIT University and University of Western Australia, as well as industry and universities across six other countries.



Professor Dragomir Neshev and Professor Chennupati Jagadish AC from the ARC Centre of Excellence for Transformative Meta-Optical Systems, ANU Research School of Physics.

Fostering the next generation

ANU has a proud history as a high-quality training ground for future research and academic leaders, supporting the next generation to realise nationally significant outcomes in their academic careers. Here are just three of them.

Lithin Louis

At the John Curtin School of Medical Research, Lithin Louis is focusing his PhD research on the interactions between a protein found in heart cells, SERCA (sarco/endoplasmic reticulum calcium ATPase) and RNA (ribonucleic acid), the genetic biomolecule that manifests the information present in DNA. SERCA moves the calcium ions within heart muscle cells, allowing them to contract to cause the heartbeat. When SERCA fails to move the calcium, the heart stops beating. ANU researchers discovered that SERCA interacts with RNA, which could regulate the function of SERCA. Mr Louis's research is about trying to understand which RNA interacts with SERCA, and its functional relevance. The research has widespread importance for humans across the globe: understanding these biomolecular interactions could unlock secrets for treating heart disease. Mr Louise's presentation won silver at the 2019 Asia-Pacific Three Minute Thesis competition.

Veronica Koman

Veronica Koman, who graduated with a Master of Laws from ANU in July 2019, is an Indonesian human rights lawyer. She has exposed human rights abuses in West Papua, an Indonesian territory for which she is advocating self-determination. Verified information from West Papua is scarce, and press restrictions and internet blackouts are common. Ms Koman has been charged under Indonesia's electronic and transactions law for sharing eyewitness accounts, photos and videos of protests from West Papua on social media. For her advocacy, Ms Koman was awarded the 2019 Sir Ronald Wilson Human Rights Award for an individual or organisation who has made an outstanding contribution to advancing human rights. The Australian Council for International Development makes the award. She credits her studies at ANU College of Law for giving her the knowledge and skills to work with international institutions and their legal frameworks.

Karlie Alinta Noon

Karlie Alinta Noon, who is studying her Master of Astronomy and Astrophysics at ANU, has an interest in the connections between astronomy and her Indigenous heritage. Her research explores the sophisticated astronomic knowledge deeply embedded within Indigenous culture. Ms Noon's Masters is focused on gas clouds outside the Milky Way and how to determine their distance from Earth. She is also examining moon haloes – rings around the moon formed by ice crystals, which are part of Indigenous traditional weather prediction – and exploring how they correlate to physical systems in the lower atmosphere. In 2019, Ms Noon was a finalist in the 3M Eureka Prize for Emerging Leader in Science and made the honour roll for Australian of the Year. She works to open the doors to STEM for people from minorities and inspire children, particularly girls, to engage in STEM.