# Making SPACE for Australia

Thursday 7th November, 2019
Government House, Sydney

On 7th November 2019, the Royal Society of New South Wales again joins with four Learned Academies of Australia to celebrate our annual Forum, held in Government House, Sydney, under the gracious Vice Regal Patronage of Her Excellency the Honourable Margaret Beazley AO, QC, Governor of New South Wales. This year, the Forum will be devoted to the challenges that await Australia and Australians in the study, exploration, and custodianship of Space.

The wonders of Space have always exercised the human imagination. Nowhere is this more so than in Australia, where richly embedded Aboriginal conceptions of the constellations and the cosmos continue to excite our imagination and to command our attention and respect. Today, an increased understanding of Space has deepened our understanding of Earth and is transforming our lives. Just as global satellites have revolutionised communication, agriculture and mining, and enhanced the role of environmental and geo-political surveillance, so a generation of 'space industries' is beginning to emerge, encouraging private and public investment across a wide range of sectors.

As political, military and commercial interests increase and intersect, so will arise a need for international order to devise norms and conventions to keep Space safe for human endeavour and peaceful conservation. Space is no longer the 'Last Frontier' - it is an immediate presence, and nations will be called upon to preserve its heritage and secure its potential.

Led by scholars and scientists, this Forum will reflect on Australia's long interest in reading the Heavens, and the place of humanity in the cosmos. We will ask how Australians have helped advance exploration, understanding and cooperation, and how we can further its constructive mission by way of scientific discovery, technological development, and humane consideration for the rights of all. We will be asking questions and testing assumptions that the world at large will confront in the great adventure that lies before us.

**The Royal Society of NSW acknowledges the generous support from Her Excellency the Honourable Margaret Beazley AO, QC, Governor of New South Wales, the NSW Government Office of the Chief Scientist and Engineer, and the New South Wales Smart Sensing Network.**

PROGRAMME

# Thursday 7th November 2019

| START | FINISH | |
|---|---|---|
| 08:30 | 08:50 | Registration |
| 08:50 | 08:55 | Guests are seated |
| 08:55 | 09:15 | Governor is announced into the Ballroom |
| | | Welcome and Acknowledgement of Country<br>**Ian Sloan AO, FAA FRSN** President, Royal Society of NSW |
| | | Official Opening<br>**Her Excellency the Honourable Margaret Beazley AO, QC**<br>Governor of New South Wales |

## KEYNOTE ADDRESS

| | | |
|---|---|---|
| 9.20 | 09.40 | MODERATOR: **Anne Green FTSE**<br>Chair, NSW Division, The Academy of Technology and Engineering |
| | | **Lisa Kewley FAA — Australia's Strengths in Space Science**<br>Professor and Australian Research Council Laureate Fellow, Australian National University |

## SESSION I — AUSTRALIA IN THE SPACE AGE

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|---|---|---|
| 09:40 | 11.00 | MODERATOR: **Jane Hall FASSA**<br>President, The Academy of Social Sciences in Australia |
| | | **Kerrie Dougherty — Sixty Years of Australia in Space**<br>Lecturer in Space History and Cultural Studies, International Space University |
| | | **Megan Clark AC, FTSE — The Australian Space Agency**<br>Head, The Australian Space Agency |
| | | **Kimberley Clayfield — Our Roadmap for Space**<br>CSIRO Space Technology Future Science Platform Leader |
| | | **Adam Lewis — Seeing and Sensing Australia from Space**<br>Head of National Earth and Marine Observation, Geoscience Australia; Co-chair, Land Surface Imaging Virtual Constellation, Committee for Earth Observation Satellites |

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| 11.00 | 11.30 | MORNING TEA — Served on verandah |

## SESSION II — SPACE LAW, SECURITY AND ETHICS

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| 11.30 | 12.30 | MODERATOR: **Donna Lawler**<br>Principal, Azimuth Advisory |
| | | **Steven Freeland — The Limits of Law: Challenges to the Global Governance of Space Activities**<br>Professor of International Law, Western Sydney University |
| | | **Ben Piggott — Military and Geopolitical Challenges in Space**<br>Visiting Fellow, University of NSW Canberra Space |
| | | **Nikki Coleman — Ethical Challenges in Space: Norms and Conventions for Peaceful Spacefaring**<br>Adjunct Lecturer, University of NSW Canberra Space |

# Making SPACE for Australia

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| 12.30 | 13.30 | LUNCH — Served on verandah |

## SESSION III — SPACE AND PEOPLE

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| 13.30 | 14.30 | MODERATOR: **Annie Handmer**<br>School of History and Philosophy of Science, The University of Sydney |
| | | **Jonathan Webb — The Promise and Peril of Space: Viewing Space through the Media**<br>Science Editor, Australian Broadcasting Commission |
| | | **Alice Gorman — Space Heritage: Artefacts and Archaeology**<br>Senior Lecturer, College of Humanities, Arts and Social Sciences, Flinders University |
| | | **Ceridwen Dovey — On Human Visions and Visitors in Space**<br>Freelance writer (*WIRED* & *The New Yorker*) |

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| 14.30 | 15.00 | AFTERNOON TEA — Served on verandah |

## SESSION IV — AUSTRALIA'S SPACE ECONOMY: PROSPECTS FOR THE FUTURE

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| 15.00 | 16.00 | MODERATOR: **Susan Pond AM, FTSE FRSN**<br>Chair, New South Wales Smart Sensing Network |
| | | **William E Barrett — The Role of NSW in Australia's Space Industry**<br>Senior Vice President, Asia Pacific Aerospace Consultants |
| | | **Paul Scully-Power AM — Space 2.0: Small Smart Satellites**<br>Astronaut, Advisor to NSW and Federal Government |
| | | **Jason Lind — Defence Space Situational Awareness: Opportunities for Australian Industry**<br>Group Captain & Director of Intelligence, Surveillance, Reconnaissance and Electronic Warfare, Royal Australian Air Force HQ |

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|---|---|---|
| 16:00 | 16:20 | RAPPORTEUR: **Brett Biddington AM**<br>Principal, Biddington Research Pty Ltd |
| 16:20 | 16:30 | CLOSE: **Ian Sloan AO, FAA FRSN**<br>President, Royal Society of NSW |

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| 16.30 | 18.00 | REFRESHMENTS — Served on verandah |

ATSE Australian Academy of Technology & Engineering

Australian Academy of Science

ACADEMY OF THE SOCIAL SCIENCES IN AUSTRALIA

# ABSTRACTS & BIOGRAPHIES

## OPENING SESSION
**09:00 - 09:40**

### WELCOME from Royal Society of NSW and Four Academies

**Emeritus Professor Ian Sloan**
AO, FAA FRSN

Professor Ian Sloan, President of the Royal Society of New South Wales, has physics and mathematics degrees from the University of Melbourne, a Master's degree in mathematical physics from the University of Adelaide, a PhD in theoretical atomic physics from the University of London, and an Honorary Doctorate of the University from the University of New South Wales. In a 50-year career at the University of NSW, he has published extensively on theoretical physics and computational mathematics, and won numerous awards, including the Lyle Medal of the Australian Academy of Science and the George Szekeres Medal of the Australian Mathematical Society.

### Welcome to Government House

**Her Excellency the Honourable Margaret Beazley** AO, QC

Her Excellency the Honourable Margaret Beazley AO QC is the 39th Governor of New South Wales, commencing her five-year tenure on 2 May 2019. Prior to her appointment as Governor, Her Excellency enjoyed a long and distinguished law career spanning 43 years, during which time she served as a role model for women in law at both the State and National level. Appointed Queen's Counsel in 1989, in 1993 she was made a judge of the Federal Court of Australia, the first woman to sit exclusively in that Court. In 1996, she achieved the distinction of being the first woman appointed to the New South Wales Court of Appeal and, subsequently, the first woman to be appointed as its President.

### Keynote Address
### Moderator

**Emeritus Professor Anne Green** AO, FTSE

Emeritus Professor Anne Green is known for her research on the structure and ecology of the Milky Way Galaxy. Graduating from Melbourne and Sydney Universities, she was an Alexander von Humboldt Fellow. At the University of Sydney, Anne was Director of the Molonglo Telescope, first female Head of the School of Physics and is now President of the Physics Foundation. She was President of the Astronomical Society of Australia, Chair of Astronomy Australia Ltd and inaugural co-Chair of the Women in Astronomy Working Group of the International Astronomical Union. The Astronomical Society of Australia recently established the Anne Green Prize for mid-career scientific achievement.

### Keynote Speaker

**Professor Lisa Kewley** FAA

Professor Lisa Kewley, Professor and Australian Research Council (ARC) Laureate Fellow at the Australian National University (ANU), obtained her PhD on the connection between star-formation and supermassive black holes in infrared galaxies. She is a world leader in galaxy formation and evolution working on galaxy collisions, supermassive black holes, star formation and oxygen content in galaxies across cosmic time. As Director of the ARC Centre of Excellence for All-Sky Astrophysics in 3D (ASTRO 3D), Lisa leads an international network of scientists aiming to understand the origins of the stars and galaxies around us, from shortly after the Big Bang to the Milky Way today.

### Australia's Strengths in Space Science

Australia has made a major contribution to space science over the past few decades, in the development of space instrumentation,

the use of many space telescopes, and now the development and testing of exciting new cube satellites. In this address, I will provide an overview of Australia's exciting history and current activities in Space Science, including the development of dedicated UV and optical detectors for space spectroscopy for NASA and other missions. I will describe the ground breaking new science that Australian astronomers have conducted using space telescopes, including the Hubble Space Telescope, the GAIA mission, and the Chandra X-ray telescope. I will finish with a look to the future, with Australia's latest developments in cube satellites for space science, as well as the discoveries that we expect to make with the upcoming James Webb Space Telescope.

## SESSION I
## 09.40 - 11.00
## AUSTRALIA IN THE SPACE AGE

### Moderator

**Distinguished Professor Jane Hall**
FASSA, FAHMS

Distinguished Professor Jane Hall is President of the Academy of the Social Sciences in Australia and Fellow of the Australian Academy of Health and Medical Sciences. Professor Hall received the National Health and Medical Research Council Outstanding Contribution Award in 2017 and was named as one of the *Australian Financial Review / Westpac 100 Women of Influence* in 2016. Jane is Director, Strategy in the Centre for Health Economics, Research and Evaluation at the University of Technology Sydney. She is one of the most high-profile health economists in Australia, with an international reputation built on both research contribution and policy analysis.

**Kerrie Dougherty**

Kerrie Dougherty, an international expert in the history of Australian space activities, is a lecturer in space history and cultural studies at the International Space University. She has a BA (Hons) degree from the University of Sydney, a Graduate Diploma in Information Management (specialising in Archives Administration) from UNSW, and a Graduate Certificate in Public History from UTS. She was Curator of Space Technology at the Powerhouse Museum in Sydney from 1988 - 2014. An elected Member of the International Academy of Astronautics, Kerrie serves on its History of Astronautics Committee. She is the author of *Australia in Space* (Hindmarsh, ATF Press), and numerous other publications on Australia's space history.

### Looking Back: Sixty Years of Australia in Space

Australia's involvement in space activities commenced in 1957, the beginning of the Space Age, with space tracking and sounding rocket launches at Woomera. By 1960, Australia was considered one of the leading space-active nations and in 1967 became one of the earliest countries to launch its own satellite. Yet by 1980, Australia's space prominence had dwindled, with the country lacking both a national space agency and a coherent national space policy. This presentation will examine the often-contradictory history of Australian space activities from 1957 to the announcement of the Australian Space Agency in 2017, providing background for the day's proceedings.

**Dr Megan Clark** AC, FTSE

Dr Megan Clark is Head of the Australian Space Agency, Director of Rio Tinto, CSL Limited and CARE Australia, and a member of the Australian advisory board of the Bank of America Merrill Lynch. She was CEO of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) from 2009 to 2014 and previously Director at NM Rothschild and Sons (Australia) and Vice President Technology, then Vice President Health, Safety and Environment at BHP Billiton. Dr Clark holds a BSc from the University of Western Australia and a PhD from Queen's University, Canada. She is a Fellow of the AusIMM and of the Australian Institute of Company Directors.

### Looking Forward: The Australian Space Agency

Australia has a long history in space and a vibrant space industry. Looking to the future, the Australian Space Agency has

set our Advancing Space: Australian Civil Space Strategy, 2019-2028 which builds on Australia's strengths and addresses our challenges. Through this, the Agency will transform and grow a respected Australian space industry, including tripling the size of the industry to $12 billon and creating up to 20,000 new jobs by 2030. In this presentation, Dr Clark will outline how the Agency plans to build our future while continuing to serve our nation and honour our past.

### Dr Kimberley Clayfield

Dr Kimberley Clayfield is Leader of the CSIRO Space Technology Future Science Platform. This program, established in Nov 2018 with an initial $16 million investment from CSIRO over 3.5 years, is building capability, identifying and developing innovative new space technologies and applications, and supporting the growth of Australia's space industry. Kimberley also oversees space technology activities within the CSIRO Centre for Earth Observation, including the acquisition of CSIRO's first CubeSat (CSIROSat-1). Kimberley is Past Chair of Engineers Australia's National Committee on Space Engineering, and the first Australian to have received the prestigious Lawrence Sperry Award from the American Institute of Aeronautics and Astronautics.

## Our Roadmap for Space

The CSIRO Space Technology Future Science Platform (Space FSP) was launched in November 2018 with an initial $16 million investment over 3.5 years to build world-leading capability and drive cutting-edge research within CSIRO. This is in support of the Australian Space Agency's goal of tripling the size of the Australian space industry by 2030. This presentation will provide a brief overview of CSIRO's space activities to date, new investments in future space science and technology capability through the Space FSP in the priority areas of space-derived services, space object tracking, and space exploration and utilisation, and will describe how CSIRO is working with the Australian space sector to grow the national space industry.

### Dr Adam Lewis

Dr Adam Lewis from Geoscience Australia is an international leader in Earth observation, or 'EO'. He led development of the Australian Geoscience Data Cube, allowing thousands of satellite images to be analysed as time-series, unlocking 'big data from space', and leading to government funding for Digital Earth Australia. Adam is active in the EO community. He co-chairs the Land Surface Imaging team of the international Committee on Earth Observation Satellites (CEOS) and is Co-Chair of CEOS Strategic Implementation Team. Previously, Adam worked in the Great Barrier Reef Marine Park Authority, James Cook University, the Australian National University, and for the Government of Victoria.

## Seeing and Sensing Australia from Space

Astronauts are moved and inspired when they look back, look down and look home. Australians excel in Earth observation (EO) and in developing the first remote sensing software, writing the textbooks, creating companies, patenting inventions, building instruments for satellites, and pioneering the use of remote sensing satellite data. In 2019, Earth Observation is entering a new era. Global operational observing systems, free and open data, time-series of observations, calibration and standardisation, the Open Data Cube analysis platform, and deep international collaborations are allowing EO to deliver critical information whilst empowering research and private sector innovation. Australia is at the forefront of this revolution.

## SESSION II
## SPACE LAW, SECURITY AND ETHICS

### Moderator

### Donna Lawler

Donna Lawler is co-founder and a Principal at Azimuth Advisory and member of the International Institute of Space Lawyers. An experienced commercial lawyer specialising in complex transactions in the space and telecommunications industries, she has had a key involvement in the build, launch and insurance programmes for six geo-stationary satellites on behalf of Optus and its parent company, SingTel. Prior to co-founding Azimuth Advisory, Donna was Assistant General Counsel for Optus Satellite. She has also practiced technology and telecommunications law at Baker & McKenzie in Hong Kong and at Minter Ellison in Sydney.

### Professor Steven Freeland

Professor Steven Freeland is Professor of International Law at Western Sydney University. He is also Visiting Professor at the University of Vienna, the University of Copenhagen, and Université Toulouse1 Capitole, a Member of Faculty at the London Institute of Space Policy and Law and the Centre for Research in Air and Space Law, McGill University, and Fellow of the Australian Academy of Law. He is a Director of the International Institute of Space Law, and a Member of the Space Law Committees of the ILA and IBA, and has been appointed by UN COPUOS to co-lead multilateral discussions among the Member States regarding the exploration, exploitation and utilisation of space resources.

### The Limits of Law: Challenges to the Global Governance of Space Activities

Space is vital in terms of the world economy, strategic thinking, terrestrial military strategy, geopolitics, human rights, commercial enterprise, technological innovation and the future of humankind. However, as the technology of space continues to evolve, this opens up possibilities for an even more expansive range of potential space activities, each of which pose significant challenges to the development of further international and national regulatory and policy frameworks. This presentation will touch on several of the major challenges and raise questions and some potential solutions in the way we conceive of law and the regulation of space in the future.

### Ben Piggott

Ben Piggott studies space policy, and particularly the application of space power to defence. Previously, he has worked on planning and execution of space-enabled naval operations, in operational headquarters, and at sea. He has contributed to several Space Generation Advisory Council reports to the UN Committee on Peaceful Uses of Outer Space, dealing with diverse aspects of space policy including ownership and risk for space commerce, and space technology applications. Ben chairs the Future Strategic Leaders Program at the Institute for Regional Security. He holds a BSc in chemistry, and a Master's of Space Operations from UNSW, where he is currently a Visiting Research Fellow.

### Military and Geopolitical Challenges in Space

Competition in the commons has always been a feature of human civilisation. Navies have been a feature of strategic competition since ancient Athens. Since the invention of flight, no noteworthy strategic power has been without an air force. In the 21st century, as barriers to access in space decline, this presentation will touch on what this might mean for Australia, how it might shape our interaction with other nations, and will ask how we can avoid tragedies of strategic competition in the commons.

### Nikki Coleman

Revd. Dr Nikki Coleman is a military ethicist and RAAF chaplain based in Canberra. She has taught military ethics at ADFA for ten years, as well as at the Australian National University, Case Western Reserve University and Yale University. Nikki is the leader of the UNSW Canberra Space Ethics research team and the International Space Ethics Collaborative Research Group. Her current space research areas include space bioethics, particularly in regard to astronauts and space tourists, and military space ethics, focusing on space terrorism, the proposed US Space Force and asks how commercial and military users can coexist in a congested space environment.

#### Ethical Challenges in Space: Norms and Conventions for Peaceful Spacefaring

Fifty years after humans first stepped on the moon, space is increasingly becoming congested, contested, and competitive. This presentation will give a brief overview of the ethical problems raised by the explosion in the number of commercial operators in space and how we balance this against our increasing reliance of satellites in our day to day lives, as well as our human need to explore, dream and reach for the stars.

## SESSION III
## SPACE AND PEOPLE

### Moderator

### Annie Handmer

Annie Handmer works in the field of international cooperation in space and strategic space diplomacy. She has undergraduate degrees in law and philosophy, completing an Honours thesis on the cooperation among French, American and Soviet scientists during the Cold War. She is currently undertaking a PhD at The University of Sydney where her research focuses on characterising space law as socially constructed, and in that context analysing how it is shaped by the individual interactions of people, groups and organisations. Annie is the creator and host of Space Junk Podcast, in which she interviews space experts on various topics.

### Dr Jonathan Webb

Dr Jonathan Webb is Science Editor at the ABC. He spent 10 years in the UK, where he earned a DPhil in neuroscience from Oxford. After leaving the lab to pursue science journalism,

Jonathan worked as a science reporter for BBC News, covering everything from brains to bosons. He has live-blogged a comet landing, conducted interviews inside a hadron collider, and broadcast live from under a tablecloth at a chemistry conference. In 2016 he returned to Australia to lead the ABC's science unit, working across radio, podcasts and the web. He is a passionate advocate of specialist science reporting and appears regularly on-air, including RN Breakfast with Fran Kelly.

#### The Promise and Peril of Space: Viewing Space through the Media

Space stories are a permanent fixture in space science news headlines and in factual science programs. What is the source of this enduring appeal, and how do these stories manifest in 2019? From the sense of danger and mystery space provides, to the thrill of exploration, to the process of making new discoveries and the pure wonder of contemplating our place in the heavens, I will explore a range of ideas using recent examples such as the Apollo 11 anniversary and ABC programs about asteroids, black holes, and flying telescopes.

### Dr Alice Gorman

Dr Alice Gorman is an internationally recognised leader in the field of space archaeology. Her research focuses on the archaeology and heritage of space exploration, including space junk, planetary landing sites, off-earth mining, rocket launch pads and antennas. She is a Senior Lecturer at Flinders University and a Director on the Board of the Space Industry Association of Australia. In 2017 Alice won the Bragg UNSW Press Prize for Science Writing. Her book *Dr Space Junk vs the Universe: Archaeology and the Future* was published in April 2019. She tweets as @drspacejunk and blogs at Space Age Archaeology.

## Space Heritage: Artefacts and Archaeology

In over 60 years of space exploration, humanity has left objects and traces strewn from Earth orbit to interstellar space. These form an archaeological record that we can interrogate for what it tells us about human engagement with space beyond Earth. Spacecraft and places – such as the Apollo 11 landing site on the Moon – are also our cultural heritage. Taking a heritage perspective means seeing this record as far more than just discarded junk. Rather, this speaks directly to how we can make sense of our place in the solar system.

### Ceridwen Dovey

Ceridwen Dovey is a fiction writer and freelance journalist who contributes regularly to WIRED magazine and *newyorker.com*. She studied anthropology at Harvard and New York University before returning to Sydney. Her interest in social justice in outer space was sparked when she profiled the space archaeologist, Alice Gorman, for *The New Yorker*. Since then, she has written about gender inequality in terms of who has the power to imagine our space futures, the potential pitfalls – both geopolitically and environmentally – of a space "resource race" led by private companies, and the magic and mysteries of moon dust, among other topics.

## On Human Visions and Visitors in Space

On the horizon, there is a difficult reckoning with our future in outer space, beyond the bounds of our home planet: Who do we as a species want to be in space? It is time for all people on Earth to have a say in the answer. In space circles, much attention is given to new technologies, but what space also gives us is an opportunity to revolutionize human relations – to build new types of communities from scratch, drawing on all we've learned from our mistakes on Earth. For once in human history, we can – and should – plan an inclusive, equitable, ethical approach to a precious global commons.

## SESSION IV
## AUSTRALIA'S SPACE ECONOMY: PROSPECTS FOR THE FUTURE

### Moderator

**Dr Susan Pond** AM, FTSE FRSN

Susan Pond is an experienced leader in business and academia, recognised for her national & international contributions in science, technology and medicine. Currently, she is Chair of the New South Wales Smart Sensing Network, Governor in Council Member of the Queensland University of Technology, and director of several companies, including the Trusted Autonomous Systems for Defence Cooperative Research Centre. Most recently, Susan was Director of Sydney Nano, a multidisciplinary initiative at The University of Sydney. She is an Adjunct Professor in the Faculty of Engineering & Information Technologies at The University of Sydney.

### William E Barrett

William (Bill) Barrett has extensive experience in Space and Telecommunications across all major sectors including satellite manufacture and communications, ground stations, launch services, and space insurance, policy and strategy for many companies. He has been an expert advisor to the Federal Government on commercial space and Australian Space Activities legislation, and co-authored major reports on Australian space capabilities and economic impact for the Australian Government that triggered the Expert Review and establishment of the Australian Space Agency. He is co-founder and long-term Deputy Chairman of the Space Industry Association of Australia (SIAA) and serves on several of its committees.

## The Role of NSW in Australia's Space Industry

Since the advent of the 21st century, global space activities have undergone a tremendous transformation. Industry has supplanted government as the driving force with the

dramatic growth of commercial space activities. Space services are becoming an essential element of the modern economy and are increasingly recognised as critical infrastructure underpinning our modern society. The Australian space economy mirrors these global trends and is larger and more capable than generally recognised. NSW is the largest contributor to the Australian space economy in terms of jobs and revenue, and is critical for the future growth of Australian space activities.

### **Dr Paul Scully-Power** AM

Dr Paul Scully-Power is Australia's first astronaut. He has a unique international background in industry, government, defence, space and academia in the US, UK, Australia, and NZ. He is currently engaged in development of artificial intelligence (national iAward for innovation), UAVs, microsatellites, smart sensors, nanotechnology and big data analytics. He has held Board and Executive roles in the corporate sector, and served with the Royal Australian Navy, Royal Navy, US Navy, and NASA, the Pentagon, US Military Intelligence and White House. He is co-founder of The Ripper Group (drones saving lives), and is the NSW Premier's Ambassador for the Space Industry.

### Space 2.0: Small Smart Satellites

No longer is space up there, it is down here. Over 80% of dollars spent on space are coming from the private sector. Within five years there will be tens of thousands of small satellites in low earth orbit all involved with things down here. This is not far-fetched. Elon Musk has certification to launch over 11,000 satellites in the next twelve months. This will change the face of agriculture, mining, and the way we live. It is like having a cloud of smartphones surrounding the earth. They will be connected into a mesh network communicating by light rather than radio waves, and will be at least 100 times more powerful than the Internet.

### **Group Captain Jason Lind**

Group Captain Lind joined the RAAF in 1986. A graduate of the Australian Defence Force Academy, he has Bachelor of Engineering and Master of Management degrees. He is a qualified Navigator with nearly 4000 hours flying PC-3 and AP-3C Orion aircraft as a Navigator/Communicator and Tactical Coordinator. He has deployed to the Middle East and to Northern Australia. Jason is also a graduate of the Australian Command and Staff College, where he commanded the School of Air Warfare. His current responsibilities include P-8A Poseidon, MQ-4 Triton, MC-55A Peregrine, Armed Remotely Piloted Aircraft Systems, Intelligence Systems, and Space Situational Awareness.

### Defence Space Situational Awareness – Opportunities for Australian Industry

The Australian Government signalled its intentions in the 2016 White Paper and Integrated Investment Program to increase Australian Defence Force (ADF) investment in Space-related military activities. In the nearly four years since this intention was put, the Australian and global space technology sphere has advanced at a nearly unprecedented rate providing an increased array of affordable options. The ADF is offering opportunities for the Australian Space industry and is actively seeking innovation to support enhanced Space Situational Awareness, the ability to protect essential Space Services, and to respond to aggression in the Space Domain, when required.

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### **Dr Brett Biddington** AM

### Rapporteur

Brett Biddington founded a consulting company in 2010 that specialises in space and cybersecurity policy. Previously, he was a member of Cisco Systems' global space team, and before that an officer in the Royal Australian Air Force specialising in intelligence, security and capability development. He led the team that delivered the International Astronautical Congress in Adelaide in 2017. He chairs the Advisory Group of the Victorian Space Science

Education Centre and is a director of the Space Environment Research Cooperative Research Centre (SERC) and the Institute for Regional Security (IFRS). He holds an Adjunct Professorial appointment at Edith Cowan University in Perth.

### Emeritus Professor Roy MacLeod
FAHA, FASSA, FRSN

**Program Co-Chair**

Emeritus Professor of History at The University of Sydney, Roy MacLeod has published extensively in the social studies of science and technology. Educated at Harvard and Cambridge, he was a Fellow of Churchill College, Cambridge, a founding Fellow of the Science Policy Research Unit at Sussex University, and the first Professor of Science Education at the Institute of Education, London University. He has held appointments in government, and at Harvard, Oxford, Cambridge, Durham, Göttingen, Florence, Paris, and the Woodrow Wilson Center in Washington, DC. He has also held the Charles A. Lindbergh Chair at the U.S. National Air and Space Museum.

**The RSNSW expresses its gratitude to all members of the 2019 Annual Forum Planning Committee**

**Professor Ian Sloan**
AO, FAA FRSN, Chair

**Dr Susan Pond**
AM, FTSE FRSN
Program Co-Chair

**Emeritus Professor Roy MacLeod**
FAHA FASSA FRSN
Program Co-Chair

**Professor Trevor S Bird**
FTSE FRSN

**Emeritus Professor Robert Clancy**
AM, DSc FRACP FRSN

**Professor Maxwell J Crossley**
FAA, FRSN

**Dr Donald Hector**
FRSN

**Emeritus Professor Robin King**
FTSE FRSN

**Honorary Professor Bernard Pailthorpe**

**Dr Judith Wheeldon**
AM, FRSN

**PODCAST**

Podcasts of each presentation will be available on the RSNSW and other websites as soon as possible after the Forum.

**THANK YOU**
for your attendance

Royal Society of NSW and Four Academies Forum

# Making SPACE for Australia

**Thursday 7th November, 2019**
**Government House, Sydney**

The Royal Society of NSW acknowledges the generous support from Her Excellency the Honourable Margaret Beazley AO, QC, Governor of New South Wales, the NSW Government Office of the Chief Scientist and Engineer, and the New South Wales Smart Sensing Network.