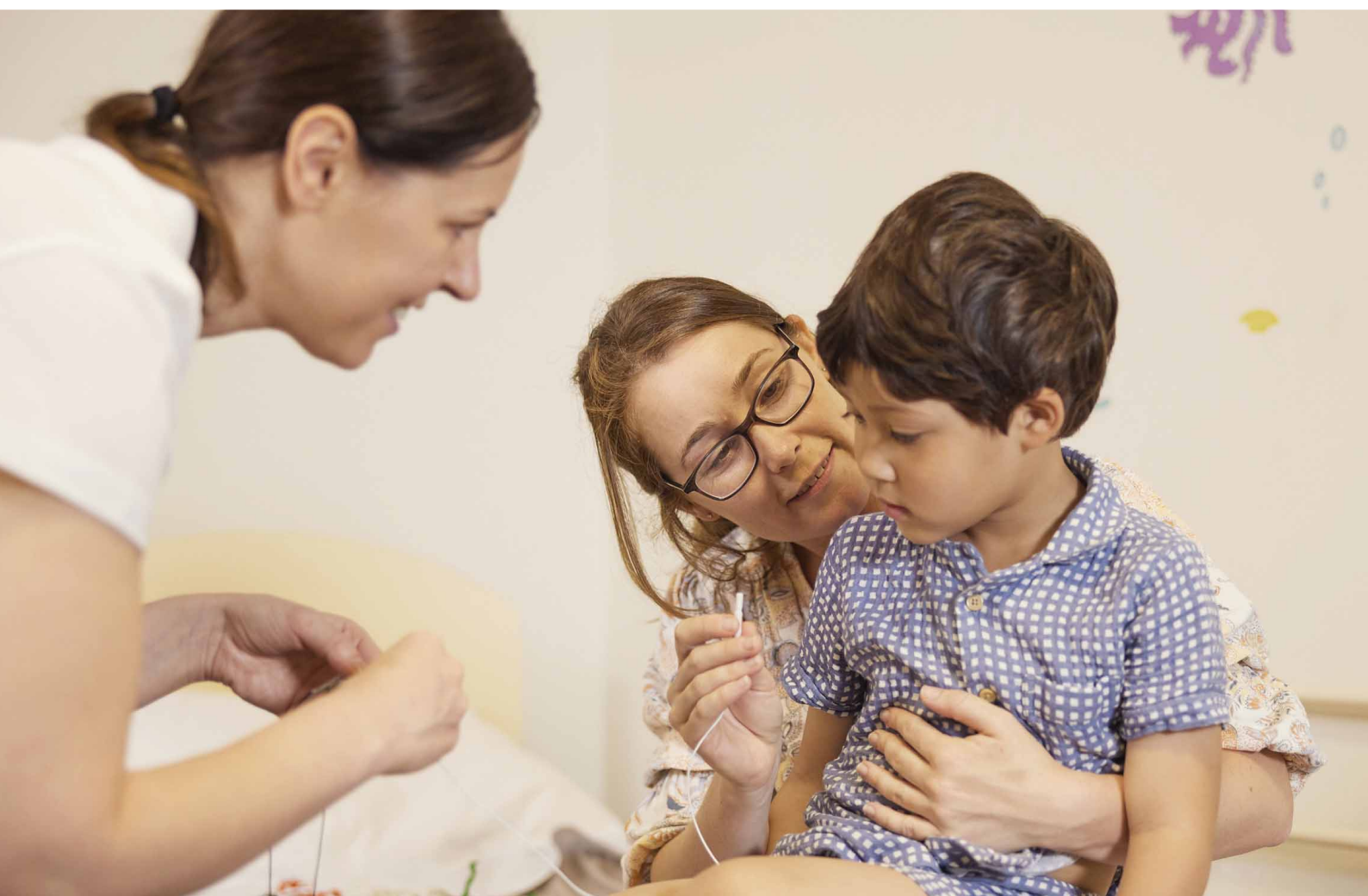


Woolcock Institute of Medical Research

BIENNIAL REPORT

2020-2021



Our work makes a difference to people's lives

www.woolcock.org.au

WOOLCOCK
LEADERS IN BREATHING & SLEEP RESEARCH



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Professor Ann Woolcock (1937-2001)

ABOUT US

WHO WE ARE

The Woolcock Institute of Medical Research aims to improve the quality of life for people affected by sleep and breathing disorders.

The Woolcock is the leading respiratory and sleep research organisation in Australia. We have been ranked by the influential Times Higher Education as the top specialist sleep and respiratory health research centre in the world.

We are determined that our work creates a better life for people living with respiratory conditions and sleep disorders.

Our dedication to wellbeing is at the very heart of what we do.

WOOLCOCK RESEARCH

Our team of more than 200 medical researchers is committed to investigating the causes of disease, finding better treatments and translating discoveries into new clinical practice. Our main areas of research are:

- Respiratory disease including asthma, emphysema, cystic fibrosis, allergies, pneumonia, and tuberculosis
- Sleep disorders such as obstructive sleep apnea, narcolepsy and insomnia, and other sleep-related issues such as ageing, shift work and obesity
- Lung cancer

THE WOOLCOCK CLINIC

We also have a clinic in Sydney, known as the Woolcock Clinic, which offers specialised treatment and healthcare support for people with sleep and respiratory disorders.

Our expert clinical team provides patients with the best possible care and treatment plans. Patients benefit from our world-leading research discoveries.

The clinic also runs comprehensive respiratory tests and sleep studies.

THE WOOLCOCK IN VIETNAM

The Woolcock Institute of Medical Research also leads

a team of researchers who are working in Vietnam to tackle important health challenges including tuberculosis, COPD, asthma, tobacco control and antimicrobial resistance.

Since 2010, the Woolcock in Vietnam has implemented a series of multi-centre clinical trials together with leading Vietnamese public healthcare and tertiary institutions. This work has an impact not only upon the people of Vietnam, but also much more broadly through the evidence generated from our trials.

The Vietnam centre contributes to the Woolcock's vision to have a global impact upon lung health.

OUR HISTORY

The late Professor Ann Woolcock (1937 – 2001) established the institute in Sydney in 1981 to become Australia's centre of excellence for respiratory research.

Originally called the Institute of Respiratory Medicine, the institute was renamed in 2002 in honour of its founder.

The Woolcock outgrew its first home at The Royal Prince Alfred Hospital, Camperdown and in 2008 relocated to the purpose-built laboratory and clinical complex in nearby Glebe where it remains today. The move was made possible with the generous support of the State and Federal governments.

These days, the Woolcock is structured as a not-for-profit company with strong campus partnerships throughout Sydney and throughout NSW, and has a branch office in Vietnam.

In 2021 we celebrated our 40-year anniversary.

OUR VISION

Improved quality of life for individuals and families affected by sleep, breathing and lung disorders.

OUR ASPIRATION

The Woolcock Institute of Medical Research aspires to maintain our world-leading research impact by the translation of sleep, respiratory and lung cancer research into better clinical outcomes globally.

OUR VALUES

RESPECT

We support open, respectful discussion, effective communication, transparent decision-making and productive internal governance practices.

In particular, we show respect at all times for staff, patients, families and carers as well as referring clinicians.

EXCELLENCE

We strive for excellence and innovation in research, research translation, clinical care and patient outcomes.

PARTNERSHIP

We actively seek mutually-beneficial internal and external partnerships.

We strive to obtain the best possible outcomes with our multidisciplinary and multifaceted approach to addressing respiratory and sleep disorders.

SUPPORT

We support and, where possible, resource individuals and teams to achieve their goals and potential.

OPPORTUNITY

We explore creative ways of providing quality career and learning opportunities for researchers, students, associates and staff.

OUR PARTNERSHIPS AND AFFILIATIONS

Our researchers work side-by-side with doctors, academics and researchers from some of Australia's most esteemed universities and hospitals.

We have strong partnerships with both The University of Sydney and Sydney Local Health District, University of Technology Sydney, University of NSW and Macquarie University, and collaborative agreements with the Hunter Area Health Service, the University of Newcastle, and Liverpool, Concord and Royal North Shore Hospitals.

The Woolcock is a member of Sydney Research, a cooperative alliance between 11 leading medical research institutes, Sydney Local Health District and

The University of Sydney. We are also a member of the advanced health research and translational centre, Sydney Health Partners.



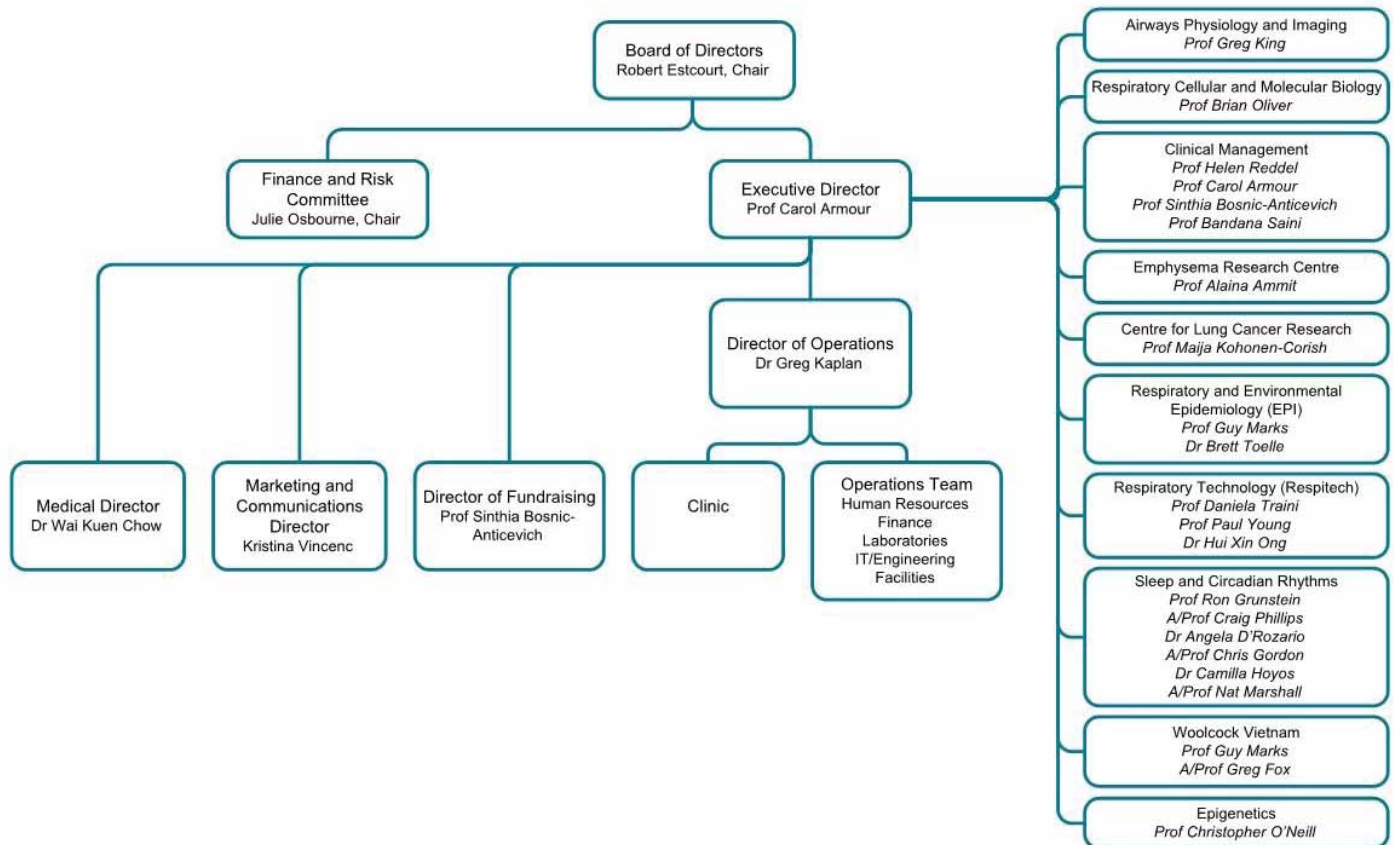
The Woolcock has strong affiliations with the National Lung Hospital in Hanoi, Vietnam and several other major health districts, healthcare provider networks, professional bodies, commercial companies and research-funding organisations.

In addition, the Woolcock's scientists and clinicians collaborate with colleagues across Australia, Asia, Europe and North America.

KEY PRIORITIES

- Strengthening our world-class position by broadening and deepening our range of research into sleep and respiratory disorders
- Building on progress with lung cancer and emphysema initiatives to change the life of patients
- Expanding the work of the clinics and improve the patient voice
- Establishing a new physical home for the Woolcock
- Developing a program for recruitment of PhD students
- Increasing the contribution of philanthropy to the Woolcock's sustainability and success
- Improving our profile by increasing our media and social media presence
- Establishing new clinical research networks in NSW, nationally and internationally
- Exploring ways to build our impact in Asia, particularly in Vietnam

OUR ORGANISATION



CHAIRMAN'S REPORT

ROBERT ESTCOURT, AM



My report on the work and progress of the Woolcock in 2020 and 2021 has to start by commenting on how well the Woolcock coped with the impact of the COVID-19 pandemic during this time. It was magnificent the way those working at the Woolcock responded to the initial crisis and then

coped with the ongoing pressure and disruption the pandemic caused.

At the beginning of the pandemic there was some discussion as to whether we could stay open. This was occurring at a time when universities were making their own major changes to campus life and there was little knowledge of the full impact of the virus. However, after careful consideration of the alternatives, we decided to remain open and have been operating throughout 2020 and 2021.

Deciding to stay open and true to the Woolcock's vision was the easy part; achieving this in the middle of a pandemic was a very different matter. The Executive Director, Professor Carol Armour and her staff had to re-engineer and re-organise virtually every aspect of the Woolcock's operations to ensure they continued in a safe environment. This had to be done at breakneck speed, frequently in the face of contradictory advice and under an avalanche of communications from the Federal and State health authorities. It is to the credit of all at the Woolcock that a safe working environment was created for researchers, clinicians and patients.

Like so many others, researchers moved to a home-based work environment. Eventually, under NSW Health direction, they were able to return to the laboratory and face-to-face contact with their colleagues at the Woolcock. This has meant that the Woolcock has had to ensure there was a supportive workplace culture as well as good IT advice and support.

The manner in which sleep studies were handled was altered to ensure that the best COVID-safe practices were in place. While demand did fall off, the Woolcock

continued to welcome patients. Similarly, there was a change in the way clinic patients were handled and processed. A major change was the increase in telephone consulting which approached 80 percent of clinic activity during the NSW lockdown. These changes put increased pressure on all the staff involved and they came through magnificently.

In recent months, there has been a slow return to more normal operating and work conditions. Demand for sleep and clinical appointments is recovering and the laboratories are once again humming with activity.

The extraordinary efforts of Carol, her management team and all at the Woolcock have ensured that through this terrible time the Woolcock was able to remain true to its vision.

Moving on from the pandemic, I can confirm that the Woolcock remains globally-recognised as a leader in our fields. We have continued to improve facilities and equipment when opportunities arise. Our research work has hardly missed a beat and our work has proven important in combating the scourge of COVID.

Unfortunately, despite our continuing research success and success as a translator of that research, we still cannot shake off our major constraint – finance. We have finished the two years in better financial shape than we have ever been, but this is a very low bar to cross. The fact is, despite being a globally recognised Medical Research Institute, and bringing great standing to those universities we have a relationship with, we are underfunded and lead a hand-to-mouth existence. Bearing in mind the pressure on both public and private funding after the COVID disruption, this is not a problem I expect to ease in the foreseeable future. We must find new sources of financial support. We need ideas and support to help us place the Woolcock and its activities on a truly sound long-term footing. We need to work towards a position where we can face the future with great confidence. Consequently, it is important that the Board and Management pursue every avenue that might provide a sounder basis for our long-term operations.

In this regard, we are fortunate in the friends and supporters we already have. They include the Federal

and State governments, The University of Sydney, University of Technology Sydney, UNSW, Macquarie University, the Sydney Local Health District, other Area Health Boards, Perpetual and, of course, all our wonderful donors. Without our donors, we would not exist. I offer my heartfelt thanks to all concerned.

I must also extend my thanks to my colleagues on the Board. In difficult circumstances, their enormous amount of exceptional voluntary service has been

very important and valuable to the Woolcock. All have shown exceptional dedication to the job required.

Lastly and most important of all, as already mentioned, my thanks go to Professor Carol Armour, her management team, and all those who work at the Woolcock. It is a privilege to be associated with them. I, the Board and the whole community, cannot thank them enough for their dedication and work.



EXECUTIVE DIRECTOR'S REPORT

PROFESSOR CAROL ARMOUR, AM



2021 marked our 40th anniversary. In that time our researchers have published more than 6,000 papers, we have been ranked as the leading specialist sleep and respiratory medical research institute in the world and we have developed a reputation for mentoring young researchers and providing

world-class clinical care for our patients.

2020 and 2021 were undoubtedly very difficult years globally due to COVID-19. This impact was felt across the medical research field, with the pandemic pausing most active research studies. Our research groups focused on other activities such as manuscript and grant writing, adapting research protocols to online/telehealth formats where feasible and safe to do so. The Woolcock learned to adapt to online and telehealth initiatives, to continue our work with patients, colleagues and networks in Australia and overseas.

Here are some of our achievements and the impact we have had in respiratory and sleep health:

Respiratory and Environmental Epidemiology Group

Investigation into the health effects of unflued gas heaters on NSW primary school children prompted a \$400 million government-funded replacement project.

Respiratory Cellular and Molecular Biology Group

Improved the understanding of why respiratory viral infections, including SARS-CoV-2 (COVID), can lead to the development of lung diseases, and why the same infections can cause lung diseases such as asthma to exacerbate.

Clinical Management Group

Created gold standards for inhaler use in the management of asthma, chronic obstructive pulmonary disease (COPD) and allergic rhinitis, which are now embedded within disease management guidelines around the world.

Woolcock Centre for Lung Cancer Research

Together with the Lung Cancer Research Network, developed biomarker testing for predicting patient response to cancer therapy.

Respiratory Technology Group

Translated research discoveries into a clinic setting in the form of better drug treatments and devices.

Woolcock Emphysema Centre

Australia's only research centre dedicated to the fight against COPD. Discoveries move seamlessly from the laboratory to the clinic and enable our patients to get leading-edge treatment and care.

Sleep and Circadian Research Group

Responsible for the first trials of continuous positive airway pressure (CPAP), now the 'gold standard' for the treatment of obstructive sleep apnea. The group runs multiple clinical trials to test new treatments and strategies for sleep health. There is also a growing interest in narcolepsy and the role of sleep in dementia.

Woolcock Vietnam

Conducted major trials involving more than 100,000 people that increased the detection of tuberculosis, which in turn led to a dramatically-reduced disease prevalence and resulted in new World Health Organisation screening guidelines. This has led to a major reduction in tuberculosis in children.

Airway Physiology and Imaging Group

Pioneered the use of telemonitoring technology to monitor lung function in asthma and chronic obstructive pulmonary disease in Australia. This strategy is now being tested for implementation worldwide.

Please read more about our research and clinical work within this report.

I would like to extend my thanks to my management team – to those who have left (Joanne Elliot, Chief Operating Officer, and Kerstin Baas, Chief Commercial Officer) and to those who we welcomed (Greg Kaplan, Director of Operations, and Dr Wai Kuen Chow, Medical Director). I would also like to thank Sinthia Bosnic-Anticevich, Director of Fundraising, and Kristina Vincenc, Marketing and Communications Director. The management team are essential to the success of the Woolcock.

Thank you to our Board. We are so lucky to have the support of this extraordinary group of people. Finally, a huge thank you to our Board Chair, Robert Estcourt, who has constantly supported and encouraged the Woolcock over these many years.

RESEARCH LEADERS



PROFESSOR ALAINA AMMIT

Professor Alaina Ammit is the Director of the Woolcock Emphysema Centre. The Centre is Australia's only research centre dedicated to the fight against chronic obstructive pulmonary disease (COPD). It leads the way with research to better understand, treat and prevent this disease. Professor Ammit's research focus is the elucidation of the mechanistic basis of inflammation in chronic respiratory diseases. Her research goal is to discover new targets for drug discovery. She has earned an international reputation for her research, demonstrated by more than 110 publications with citations of more than 4,000, a h-index of 34, and a career total of more than \$6 million from a range of funding bodies (including NHMRC, ARC, and philanthropy). She has demonstrated research leadership through national and international research contributions and high-level engagement with the research community and the peak societies. Her current appointments include: Member of the Medical Research Advisory Committee of the ARC; NHMRC Grant Review Panel Member; Elected Member of the ATS Nominating Committee; Associate Dean (Research Excellence) and Professor of Respiratory Pharmacology in the Faculty of Science at the University of Technology Sydney.



PROFESSOR CAROL ARMOUR AM

Professor Carol Armour has worked in asthma research at a basic scientific and clinical level. Her investigations span the breadth of asthma research from the cellular mechanisms to the translation of new ways to treat asthma within the health system. She is on the Australian Respiratory Council, The National Asthma Council and has chaired the National Asthma Monitoring Advisory Committee, worked on the National Therapeutic Guidelines and the Australian Medicines Handbook. From 2003 to 2006 she was a member of the NHMRC Research Committee and was the Chair of the Training Awards Committee. She was Pro Vice Chancellor, Research, at The University of Sydney, from 2006 to 2009. In 2005, she was made a Fellow of the Pharmaceutical Society for her services to the profession and awarded the Australasian Pharmaceutical Science Association (APSA) medal for research in 2007. She was made a Payne-Scott Professor by The University of Sydney in 2018. She is the Executive Director of the Woolcock Institute of Medical Research. She was made a Member of the Order of Australia for significant services to medical education in the 2019 Honours list. In 2020, she was awarded the prestigious Eureka Prize for Outstanding Mentor of Young Researchers, in recognition of her lifelong passion for mentoring and career development of staff and students.



PROFESSOR SINTHIA BOSNIC-ANTICEVICH

Professor Synthia Bosnic-Anticevich is an internationally-recognised leader in clinical pharmacy research in the field of respiratory medicine, in particular the quality use of respiratory medicines. She leads national and international research groups focusing on the use of respiratory medicines in different patient populations. She works across the continuum of healthcare settings, with a multi-dimensional and inter-professional approach to better understand and improve health outcomes for patients. She is the author of over 80 research publications and has attracted over \$11 million of research funding. She is actively involved in the mentoring and supervision of research students and early career researchers. Professor Bosnic-Anticevich is on the executive committee of Allergic Rhinitis in Asthma (ARIA), the body responsible for creating guidelines for the management of allergic rhinitis and Chair of the Pharmacy ARIA group. She is a member of the executive committee of the Respiratory Effectiveness Group, an investigator-led, not-for-profit research initiative that has been set up in recognition of the potential value of real-life research and the need to harness real-life evidence to inform meaningful practice guidelines, drug licensing and prescribing decisions. In this capacity, she provides international leadership in setting research standards and evaluating mechanisms for integrating real-life research into clinical guidelines and practice.



DR ANGELA D'ROZARIO

Dr D'Rozario, BSc (Hons) PhD RPSGT is a Senior Research Fellow, School of Psychology, University of Sydney. She established and heads the Facility for High-density Electroencephalography (EEG) Sleep Investigation and the Sleep Neurobiology Research Theme at the Woolcock Institute of Medical Research. She is a Chief Investigator on the NHMRC Centre of Research Excellence to Optimise Sleep in Brain Ageing and Neurodegeneration (CogSleep CRE, 2019-23) where she leads the EEG Biomarker Discovery Program. She was awarded an NHMRC-ARC Dementia Research Development Fellowship (2016-20) to investigate links between abnormal brain activity during sleep and cognitive decline in older adults. She trained as a sleep technologist at St Thomas' Hospital (London, UK), and later commenced her PhD in Sleep Medicine at The University of Sydney. She was a recipient of the prestigious NHMRC Dora Lush Priority PhD Scholarship to examine novel brain biomarkers of cognitive dysfunction and sleepiness in obstructive sleep apnea. In 2017, she received the Helen Bearpark Memorial Scholarship from the Australasian Sleep Association (ASA), the peak national body for sleep health and sleep medicine. She is an active member of the ASA Research Committee and The University of Sydney Human Research Ethics Committee.



PROFESSOR GREG FOX

Professor Greg Fox is a Pulmonologist and Epidemiologist from the Woolcock Institute of Medical Research and The University of Sydney. His research primarily focuses upon active case-finding for tuberculosis (TB), control of drug-resistant TB and the use of technology to enhance TB control. He lived in Vietnam for four years, during which time he helped to establish a multi-centre, randomised, controlled trial of contact investigation for TB. He subsequently completed a post-doctoral fellowship at McGill University in Canada. Professor Fox collaborates closely with the Vietnam National TB Program to undertake multi-centre studies focused upon strengthening global TB control policies. He leads the V-QUIN MDR-Trial, a clinical trial evaluating the effectiveness of levofloxacin to treat latent TB infection among contacts of patients with MDR-TB, in partnership with the Vietnam National TB Program.



ASSOCIATE PROFESSOR CHRISTOPHER GORDON

Associate Professor Christopher Gordon is a Research Leader of Insomnia, Chronobiology and Industry Collaboration at the Woolcock Institute of Medical Research and a nurse academic in the Faculty of Medicine and Health at The University of Sydney. He leads a multidisciplinary insomnia research program focusing on understanding the pathophysiology of insomnia and developing and conducting randomised controlled trials of new digital insomnia therapies and non-pharmacological chronotherapies for treatment of circadian rhythm disruptions. Associate Professor Gordon worked as clinical nurse specialist for 11 years in Intensive Care at Royal Prince Alfred Hospital. He completed his PhD in 2010 examining thermal and cardiovascular mechanistic physiology. He has developed the largest insomnia database in Australia with the most comprehensive collection of clinical, psychophysiological and treatment measures. As well, he has extensive experience in fostering and developing industry-academic partnerships across a range of research areas.



PROFESSOR RON GRUNSTEIN AM

Professor Ron Grunstein has been a consultant physician in sleep disorders for more than 30 years and a pioneer in improving patient care in sleep medicine in Australia and internationally. He currently holds an Investigator Leadership Level 3 award from the National Health and Medical Research Council (NHMRC's highest level research appointment). Ron is a Senior Staff Specialist at Royal Prince Alfred Hospital and Professor of Sleep Medicine at the University of Sydney. He heads the Sleep and Circadian Research Group at the Woolcock Institute and was Chief Investigator A on three successive NHMRC Centres of Research Excellence (2004-2018). Professor Grunstein served as President of the World Sleep Federation (2007-2011), the roof body for sleep researchers and clinicians internationally organising successful world congresses in Cairns and Kyoto. He was awarded the Australasian Sleep Association Distinguished Achievement Award in 2010; the Kleitman Award, the premier award of the American Academy of Sleep Medicine in 2011; and the Royal Prince Alfred Foundation Medal for Excellence in Medical Research in 2012. In 2014, he received the Distinguished Professor Award from the Sydney Medical School. Professor Grunstein was named a Fellow of the Australian Academy of Health and Medical Sciences in October 2021, and Fellow of the Thoracic Society of Australia and New Zealand in April 2022. Professor Grunstein is the most published sleep researcher in Australia with more than 414 publications (including book chapters). He has a Bachelor of Medicine and Surgery and MD degrees from The University of Sydney and a PhD from the University of Gothenburg in Sweden. He was made a Member of the Order of Australia for significant services to medical research and education in the 2019 Honours list.



DR CAMILLA HOYOS

Dr Camilla Hoyos graduated with a PhD from The University of Sydney and is a researcher at the Woolcock Institute of Medical Research and School of Psychology, the Brain and Mind Centre and the Charles Perkins Centre at The University of Sydney. She currently holds a National Heart Foundation Future Leader Fellowship. Dr Hoyos has a research interest in whether reversing sleep problems with various therapies leads to reduced risk and impact of diabetes, heart disease and dementia. Dr Hoyos' expertise includes clinical research in the area of sleep medicine, particularly the design, conduct and reporting of randomised controlled trials. She maintains active participation in the activities of the American Thoracic Society as Chair of the Sleep, Respiratory and Neurobiology Assembly Program Committee for the 2020-21 conferences and as a member of the Australasian Sleep Association Research Committee.



PROFESSOR GREG KING

Professor Greg King is a medical graduate of Otago University and a clinician-researcher at the Woolcock Institute of Medical Research, The University of Sydney and Royal North Shore Hospital. He is Conjoint Professor of Respiratory Medicine, the Sydney Medical School, The University of Sydney and Medical Director of the Respiratory Investigation Unit. He has a research interest in the mechanics of airways disease in relation to clinical aspects of disease. His expertise includes complex measurements of airway and lung function, including the forced oscillation technique, multiple breath nitrogen washout and three-dimensional ventilation imaging and CT imaging. He currently supervises six PhD students (five as primary supervisor) and postdoctoral fellows from science and medical backgrounds. He has a clinical and research interest in asthma, COPD and bronchiolitis in haemopoietic stem cell transplant recipients. Professor King maintains active participation in the activities of the TSANZ, APSR and ATS in terms of teaching, professional development and executive committee function.



PROFESSOR MAIJA KOHONEN-CORISH

Professor Maija Kohonen-Corish is a molecular geneticist with a long track record of discovery in translational research. She completed a BSc and an MSc at the University of Helsinki, Finland. This was followed by a PhD in human genetics at John Curtin School of Medical Research in Canberra, where she also established one of the first laboratories in Australia to identify the inherited gene mutations in Lynch Syndrome families (1991-2000). She obtained certification in molecular genetics from the Human Genetics Society of Australasia in 2005. She was head of lung and colon cancer research at the Garvan Institute of Medical Research 2002-2017 and was awarded the Cancer Institute NSW Fellowship for the maximum three terms (2005-2014). During this time she discovered new biomarkers of lung and colon tumours and developed a new mouse model of proximal colon cancer which resembles the mesenchymal subtype in humans. Her laboratory described two novel tumour suppressor functions for the MCC gene in DNA repair and cell-cell adhesion. They also established a MCC-knockout mouse that has provided a new model for colitis-associated cancer. She was appointed Director of the Woolcock Centre for Lung Cancer Research in 2019 to investigate the role of the microbiome in lung cancer and its links to the efficacy of immunotherapy. She continues to study the cancer risk in inflammatory bowel disease and test possible new cancer therapies by exploiting the DNA repair defect caused by MCC silencing. She is an invited member of the Variant Interpretation Committee of the International Society for Gastrointestinal Hereditary Tumours that produces international guidelines on how to interpret the pathogenicity of the inherited gene defects in Lynch Syndrome.



PROFESSOR GUY MARKS

Professor Guy Marks is a respiratory physician and environmental epidemiologist. His main research interests are in chronic respiratory disease (asthma and COPD), tuberculosis control and the adverse health effects of exposure to air pollution. He is Professor of Respiratory Medicine at UNSW, South Western Sydney Clinical School. He is currently an NHMRC Senior Principal Research Fellow (NHMRC's highest level research appointment). He is head of the Respiratory and Environmental Epidemiology group at the Woolcock Institute of Medical Research and an Honorary Professor at The University of Sydney (Sydney Medical School). His other major roles include Editor-in-Chief (lung diseases) of the International Journal of Tuberculosis and Lung Disease, Vice President of the International Union Against Tuberculosis and Lung Disease, Director of the Australian Centre for Airways Monitoring, Chair of the NSW TB Advisory Committee, and Chair of the NSW Chief Health Officer's Expert Advisory Committee on Air Pollution. In 2019, he was appointed President of the International Union Against Tuberculosis and Lung Disease. He also received an Achievement Award by the NHMRC in 2014 for being the top-ranked applicant for a Research Fellowship in that year.



ASSOCIATE PROFESSOR NATHANIEL MARSHALL

Associate Professor Nathaniel Marshall is a clinical triallist and epidemiologist specialising in sleep and sleep disorders at the Woolcock Institute of Medical Research and the Sydney Nursing School. He uses a wide variety of epidemiological research methods and designs, including randomised controlled trials and population-based cohorts, including the Busselton Health Study. With his colleagues, he is attempting to measure the impact of disease, the effectiveness of a variety of treatments, and investigate health system activity related to sleep. He provides high-quality evidence-based information of direct and immediate utility to both practising clinicians and policy-makers. Associate Professor Marshall has over 15 years' practical experience in designing, running, analysing, reporting and reviewing both pharmacological and non-pharmacological studies in sleep medicine. He has undergraduate degrees in psychology and accounting and a postgraduate diploma in health sciences from the University of Otago. His PhD in public health focused on clinical trials and related methodology (Massey University, New Zealand).



PROFESSOR BRIAN OLIVER

Professor Brian Oliver is a translational researcher supported by an NHMRC Career Development Fellowship level 2 (Industry) – the aim of which is to identify and develop new ways of treating respiratory diseases. He is also a Professor at the University of Technology Sydney (UTS). His scientific training began at the National Heart and Lung Institute, UK, with Professor Peter Barnes. He then had further training in both molecular biology and then virology at Professor Sebastian Johnston's laboratory at Imperial College London, UK before commencing his PhD (awarded in 2005) at The University of Sydney (supervised by Professor Judith Black). He leads a productive team of researchers investigating the pathophysiology of respiratory diseases, with an emphasis on understanding mechanisms leading to disease exacerbations and progression. He is head of the Respiratory Cellular and Molecular Biology Group, at the Woolcock Institute of Medical Research, the co-director of the Environmental Respiratory Group of SPHERE, the treasurer of LAM Australia, and the industry liaison officer of the TSANZ NSW.



PROFESSOR CHRIS O'NEILL

Professor Chris O'Neill is a physiologist by training. He received his PhD from the University of Newcastle (NSW). After undertaking brief post-doctoral training posts in the School of Veterinary Science, The University of Sydney and the Institute of Zoology, London, he took on the direction of the Human Reproduction Unit at Royal North Shore Hospital. There, he pioneered many of the current techniques in assisted reproductive technologies and developed one of the world's leading treatment centres for infertility. He was until recently the Professor for Reproductive and Developmental Medicine at The University of Sydney, and Head of the Centre for Regenerative and Developmental Medicine within the Kolling Institute for Medical Research. He is Professor of Epigenetics in the School of Life Sciences at the University of Technology Sydney and a member of the Charles Perkins Centre. His current research focusses on the impacts that the intrauterine environment has on an individual's whole-of-life health trajectory. In particular, he studies how these events change the pattern of expression of genes that influence the predisposition of individuals to developing chronic diseases, including respiratory, cardiac, and metabolic diseases. Chris has held generous continuous competitive research funding throughout his career, and has a record of extensive collaboration with industry, philanthropic and advocacy groups. He has held many consultative and advisory posts with government agencies and industry and is a Fellow of the Society for Reproductive Biology.



DR HUI XIN ONG

Dr Hui Xin Ong holds a Bachelor of Pharmacy (Hons) and a PhD in Pharmaceutical Science from The University of Sydney. Her research is focused on developing pharmaceutical and medical device technologies that can be used for the treatment of respiratory and infectious diseases, and methodological platforms that can help promote the translation of new discoveries to clinical practice. Dr Ong's expertise lies in the study of the dynamic interactions between the different biological barriers in the respiratory tract and aerosol particles in a representative manner that captures the true nature of aerosol interactions in the lung. Her research is currently a blend of basic, applied and clinical disciplines. Dr Ong's work with diverse renowned experts from academia and industry partners has led to the development of various state-of-the-art pharmaceutical formulations and an outstanding publication record in leading journals in the field. In 2014, she was awarded the prestigious European Respiratory Society-European Lung Foundation Fellow to work at the University of Southampton (UK). As an emerging leader in the field, she has secured approximately \$3 million for research projects, infrastructure and education with competitive national and international grants since 2015. Dr Ong's well-rounded experience in industry-focused research and education, applied and clinical research aims to translate her research into commercial outcomes that will benefit the healthcare sector and community.



ASSOCIATE PROFESSOR CRAIG PHILLIPS

Associate Professor Craig Phillips (Macquarie University - Faculty of Medicine, Health and Human Sciences, Macquarie Medical School) is an NHMRC Research Fellow at the Woolcock Institute of Medical Research. Most of his research has focussed on understanding how obstructive sleep apnea (OSA) treatment impacts cardio-metabolic health using rigorously-designed randomised controlled trials. New clinical trial work is focussing on weight loss as an alternative treatment for OSA and whether CPAP treatment reduces the risk for Type 2 diabetes. Other mechanistic studies are exploring how OSA impacts brain vascular function and cognition. A new NHMRC-funded study is also exploring how OSA might inhibit the clearance of toxic waste products from the brain that cause dementia.



PROFESSOR HELEN REDDEL

Professor Helen Reddel is a respiratory physician working to improve treatment for asthma and COPD. She is a Research Leader in the Clinical Management Group at the Woolcock Institute of Medical Research, Chair of the Science Committee of the Global Initiative for Asthma (GINA), Clinical Adviser for the Australian Centre for Airways Disease Monitoring (ACAM), and a member of the Australian Asthma Handbook Guidelines Committee. Professor Reddel's current research focusses on strategies to improve the management of asthma and COPD, with interest in improving the quality, prescribing and use of respiratory medications in primary care, and in population level monitoring of asthma and COPD through ACAM. She is co-chairing a multinational longitudinal study of 15,000 patients with asthma and/or COPD that aims to identify underlying disease mechanisms so that targeted treatments can be developed. Professor Reddel has a strong focus on improving communication between patients and healthcare professionals, and on making guidelines not only evidence-based, but also practical and practice-centred.



PROFESSOR BANDANA SAINI

Professor Bandana Saini's expertise lies in the implementation of clinical practice models focussed on respiratory and sleep health within Australian primary care. She has led and collaborated in implementing and evaluating several successful community pharmacy-based service trials in projects involving: screening/case detection (sleep disorders, chronic obstructive pulmonary disease, tuberculosis (Cambodia); patient self-management support (allergic rhinitis, sleep disorders, asthma); clinical audits (insomnia medications, insomnia-related practice, smoking cessation); pharmacovigilance (insomnia medications); pharmacy education (problem-based learning, peer assessment); as well as community health education program research (asthma, smoking cessation in high schools). Her skills include trial design and implementation, stakeholder engagement, pedagogical inquiry, and qualitative methodologies. Her research has been implemented in pharmacy settings overseas, for example, in Indonesia. Her research provides a link between public health and health economic concepts as well as clinical aspects of community pharmacy roles in chronic respiratory/sleep disorders. She has received funding from several sources including the Department of Health, NHMRC, Pharmacy Council of NSW and Asthma Australia, as well as a recent award of an NHMRC Translating Research into Practice Fellowship (TRIP Fellowship 2017-19). She is currently the Chair of the Medicines Committee of the Australasian Sleep Association (ASA), a member of the ASA's Clinical Committee as well as being on the Pharmacists Advisory Group (National Asthma Council) and the Primary Care Advisory Committee (Lung Health Foundation).



ASSOCIATE PROFESSOR BRETT TOELLE

Associate Professor Dr Brett Toelle is a Senior Research Fellow working within the Respiratory and Environmental Epidemiology Group. For over 27 years he has been involved in population studies of lung disease which have included studies of pre-school children, schoolchildren, twins, community-based adults and occupational work groups. His recent work has focussed on asthma as the participants in the Childhood Asthma Prevention Study (CAPS) transition through puberty and on COPD as part of the Australian Burden of Lung Disease (BOLD) project of adults aged 40+ years from six sites around the country. He is also a psychologist and undertook a PhD investigating “Factors associated with non-adherence to prescribed asthma medication”. During his psychology internship, he worked with psychologists in the sleep research group and clinicians at the Royal Prince Alfred Insomnia Clinic.



ASSOCIATE PROFESSOR CINDY THAMRIN

Associate Professor Cindy Thamrin is a Research Leader and NHMRC Career Development Fellow in the Airway Physiology and Imaging Group at the Woolcock Institute of Medical Research, and a Senior Research Fellow at The University of Sydney. She has a dual background in respiratory physiology and electronic engineering from the University of Western Australia. Her PhD in 2006 at the Telethon Institute for Child Health Research, Perth, extended a lung function test known as the forced oscillation technique to track changes in airway mechanics with lung volume. Her postdoctoral research at the University Hospital of Bern, Switzerland focussed on assessing future risk in asthma using novel variability analyses of lung function. Her current research interests are clinical application of new lung function tests, and advanced respiratory data analytics, especially applied to home telemonitoring of asthma and COPD.



PROFESSOR DANIELA TRAINI

Professor Daniela Traini is a Professor in Respiratory Science and Research Advisor for Health and Medical Research at Faculty of Medicine and Health, The University of Sydney and was an ARC Future Fellow. She is an international leader in pulmonary drug delivery and her research portfolio covers all areas of respiratory research, from bench to bedside. Professor Traini leads the Respiratory Technology group at the Woolcock Institute of Medical Research and works in collaboration with Professor Young. Over the last 13 years since joining The University of Sydney, and before, during her five years in industry, she developed a leading research program on aerosol drug delivery, from powder engineering, aerosol generation and characterisation, to in vitro and in vivo lung deposition with clinical outcomes. Professor Traini has extensive experience in both academic and industrial pharmaceuticals, and still retains a strong link with the pharmaceutical industry. Since 2005, she has published over 200 full peer-reviewed manuscripts, has six patents and has attracted more than \$12M in competitive funding.



PROFESSOR PAUL YOUNG

Professor Paul Young is a Professor in Respiratory Technology at the Sydney Medical School (Discipline of Pharmacology), Head of Respiratory Technology at the Woolcock Institute of Medical Research and was an ARC Future Fellow. Professor Young has 20 years' experience in inhalation drug development with a focus on medical device engineering and industry engagement. He is an internationally-recognised expert in the field of inhalation technology and has published >170 peer-reviewed journal articles since 2002 (>3000 citations), 6 patents, 16 book chapters and more than 150 conference proceedings. He has an H-index of 32 and 5-year i10 index of 97. Professor Young has received > \$15M in projects and infrastructure support since 2005 and has a proven track record in securing Category 1 ARC and NHMRC funding. His research team of around 20 personnel are considered world leaders in the field of aerosol science.

DISTINGUISHED ALUMNI



PROFESSOR SANDRA ANDERSON AM

Professor Sandra Anderson is a world-renowned respiratory scientist. Her research passions lie in the areas of exercise-induced asthma, mucociliary clearance and innovative therapies. The culmination of Professor Anderson's passion for science has led to a diagnostic product and formulations for the treatment of Cystic Fibrosis (CF) and non-CF bronchiectasis. In honour of Professor Anderson's commitment to the field, she has received numerous awards. Her commitment to science, mentorship, collaboration and engaging people to undertake robust and translational science is a key driver for people at the Woolcock Institute of Medical Research and we are proud to have her as a Woolcock Distinguished Alumna.



PROFESSOR MARIE BASHIR AD

Professor Marie Bashir has invested time and energy in the Woolcock Institute of Medical Research over many years. As a medical practitioner herself, she supports the Woolcock model of care for respiratory and sleep patients as well as investigation of their disease in order to improve their lives. Professor Bashir has supported our international visitors, attended all our alumni events and donated her time to support the Woolcock. In 2013, the Woolcock leaders and supporters enjoyed her hospitality at Government House. On every occasion, when asked for help, she has been willing to give of herself. She is a warm and generous supporter and we thank her for all she has done.



EMERITUS PROFESSOR NORBERT BEREND AM

Professor Norbert Berend retired from his Chair of Thoracic Medicine and as Director of the Woolcock Institute of Medical Research on 30 June 2012. Professor Berend led the Woolcock through a time of great change, had oversight of the negotiations to house the Woolcock in one building, sought funding and achieved the dream. At the time he became Director, the Woolcock had fewer than 20 employees in temporary homes on the University and RPA Hospital grounds. In 2012, the Woolcock had more than 150 employees and associate staff and 55 postgraduate students working in a state-of-the-art research institute. During this period, he also led the development of respiratory research within the Asia-Pacific. Professor Berend made us what we are today.



PROFESSOR EMERITA JUDY BLACK AO

Professor Judy Black's leadership and research achievements in the field of airway smooth muscle, her role in the career development of the next generation of research leaders and her outstanding service have been a model for all of us. Professor Black has changed the thinking around the role of the airway smooth muscle in asthma. Leading by example and generously helping others to achieve success in their careers, Professor Black has been instrumental in fostering a unique environment within the Woolcock Institute of Medical Research. She has encouraged a culture of giving back and helping others to succeed. She has created a legacy that will foster success within the biomedical research community for years to come. Professor Black is unique and very special to us here at the Woolcock.



PROFESSOR RUTHVEN BLACKBURN AO

Professor Ruthven Blackburn had the vision to see that Sydney needed a clinical research institute - preferably associated with The University of Sydney. At the time there was very little research being undertaken in respiratory medicine. A group of like-minded individuals led by him and Professor Ann Woolcock started the Institute of Respiratory Medicine. From there, the Woolcock Institute of Medical Research started to nurture national and international stars and his vision and leadership has led to its existence today. The Woolcock remains extremely grateful to Professor Blackburn and his passing is mourned by the many in the Woolcock who knew him.



PROFESSOR JEFFREY DRAZEN

Professor Drazen, M.D. is a senior physician at the Brigham and Women's Hospital, Distinguished Parker B. Francis Professor of Medicine at Harvard Medical School, Professor of Physiology at the Harvard School of Public Health, and Adjunct Professor of Medicine at the Boston University School of Medicine. Professor Drazen has been the editor-in-chief of the New England Journal of Medicine since July of 2000. A specialist in pulmonology, Professor Drazen maintains an active research program and has published hundreds of articles on topics such as lung physiology and the mechanisms involved in asthma. His research has had a profound influence on the treatment of asthma. Professor Drazen has been a powerful supporter of the Woolcock Institute of Medical Research. On previous visits to Australia, he has worked with our Board to talk to senior politicians at the State and Federal level – the result of which was infrastructure funding for us which has given us our world-class edge. At every visit, he is happy to talk about the way respiratory research from the Woolcock is featured at the New England Journal. We welcome Professor Drazen as a member of our distinguished alumni and thank him for his ongoing contribution to respiratory research.



PROFESSOR CHRISTINE JENKINS AM

Professor Christine Jenkins worked tirelessly with the other research leaders as a team and led them as they considered their strategy at a time of great change. Professor Jenkins ran the education program for the Woolcock Institute of Medical Research especially the Think Tank program which has considerably enriched our research and scientific interchange, as well as the professional development program for healthcare practitioners. Internationally-renowned speakers were invited to the Woolcock and the facilitation of interaction with research leaders has been highly productive. Her guidance has led to new research directions, collaborations and grants.



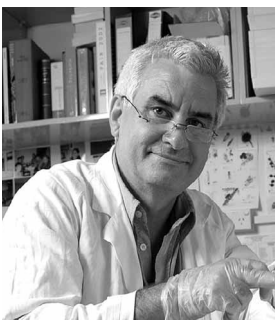
PROFESSOR CHERYL SALOME

Professor Cheryl Salome has had more than 25 years' experience in respiratory research, particularly in the causes and mechanisms of asthma. Professor Salome worked very closely with Professor Ann Woolcock during her career and was responsible for leading and facilitating epidemiology, cell biology and lung physiology. Professor Salome nurtured the lung physiology group, recruited PhD students, had oversight of all projects, made sure the research experience was a valuable one and then mentored these rising stars until they became independent research leaders. Her students have gone on to lead the world in lung physiology. Meanwhile, never one to step into the limelight, Professor Salome worked at the Woolcock Institute of Medical Research facilitating the Friday research seminars, the Think Tank and continued to write manuscripts and successful grant applications which changed the way we think about airway disease. Professor Salome was and continues to be a star at the Woolcock.



PROFESSOR PAUL SEALE AM

Over the years Professor Paul Seale nurtured many of us, provided advice when asked, opened doors and facilitated pathways to success. He was involved in a multitude of clinical trials and fostered the next generation of medical and science students in terms of clinical pharmacology. At the Woolcock Institute of Medical Research, he was particularly valued as the leader of the clinical trials unit for 10 years. Professor Seale ensured that the unit was successful, safe and governed appropriately. Professor Seale served as our deputy director and in this role he provided sage advice for the management team on all matters of governance.



ASSOCIATE PROFESSOR EUAN TOVEY

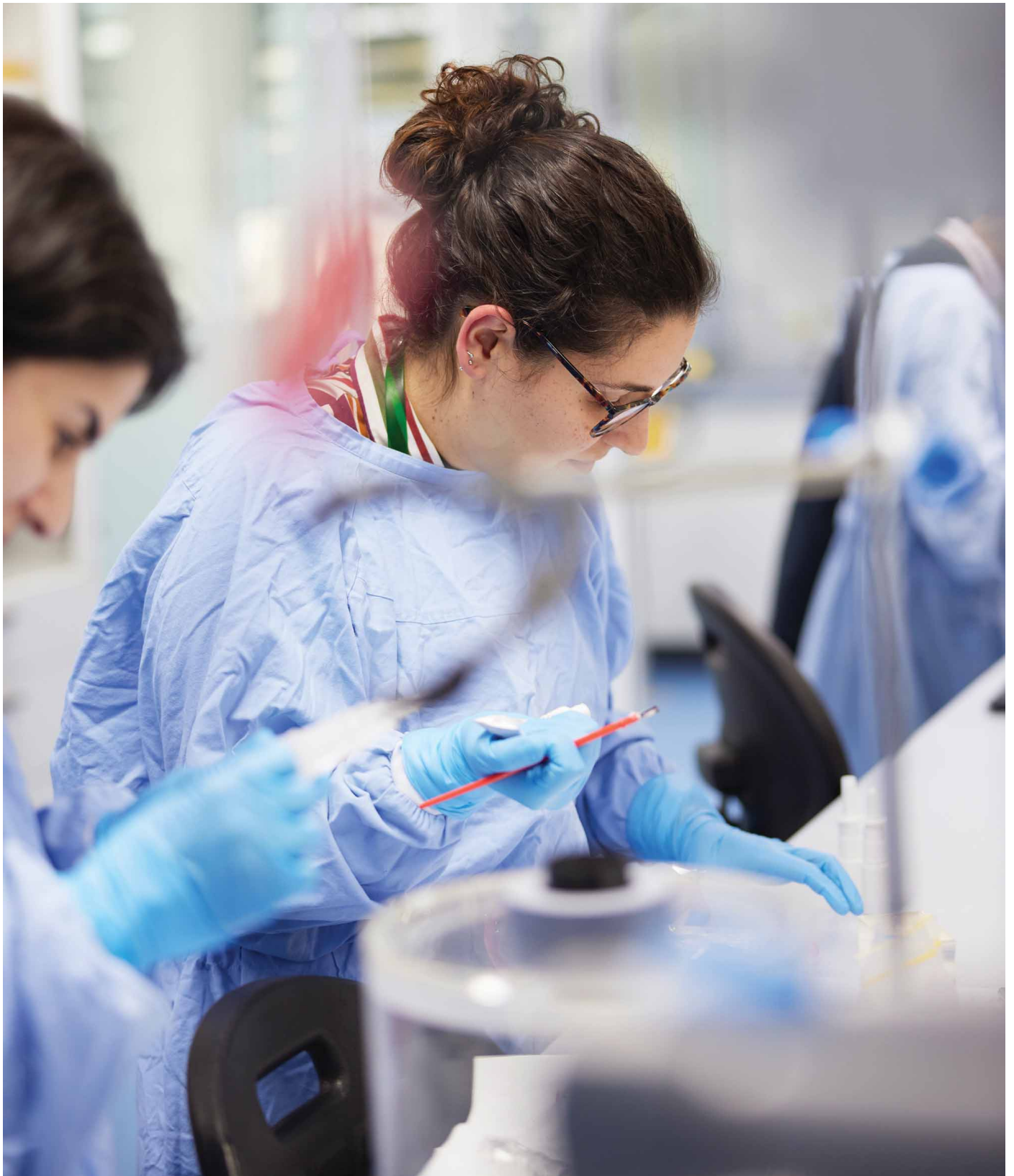
Over the many years of his scientific career, Associate Professor Euan Tovey focused on allergy research, particularly the house dust mite. He has worked on measurements of aeroallergens, investigated personal exposure to allergens and ways to minimise these. He has also investigated the role of viruses in asthma exacerbations and how these viruses are transmitted. He was a senior research fellow of the NHMRC. He has been inducted into the Asthma NSW Hall of Fame. His inquisitive and innovative mind is evident by his long list of patents. He invented many novel mechanisms and devices which he also followed through with development. The Woolcock Institute of Medical Research would like to thank Associate Professor Tovey for his passion and commitment to research and our institute.



CLINICAL PROFESSOR IVEN YOUNG AM

Professor Iven Young is a senior honorary physician in the Department of Respiratory and Sleep Medicine, Royal Prince Alfred Hospital, Sydney, after being Head of Department from 1991 to 2009. He has been in respiratory consultant practice since 1978 after he returned from a post-doctoral research fellowship at the University of California where he developed his interest in pulmonary gas exchange physiology. His major interests are the investigation and management of respiratory failure and all aspects of pulmonary function testing, occupational lung disease, asthma, chronic obstructive lung disease and interstitial lung diseases. In 2016, he was awarded the Society Medal of the Thoracic Society of Australia and New Zealand (TSANZ) and also appointed as a Member of the Order of Australia "For significant service to respiratory and sleep medicine as a clinician, administrator, researcher and mentor, and to professional societies". He serves on the Board of Directors of the Australian Respiratory Council and retired from the Board of Directors of the Woolcock Institute of Medical Research in 2017 after 20 years of service.

OUR RESEARCH GROUPS



AIRWAY PHYSIOLOGY AND IMAGING

GROUP LEADERS: Professor Greg King and Associate Professor Cindy Thamrin

The Airway Physiology and Imaging Group investigates what goes wrong with the function of the airways and lungs in diseases such as asthma, chronic obstructive pulmonary disease (COPD) including emphysema, as well as in cystic fibrosis, in bone marrow transplant patients, and in smokers. The knowledge gained from these studies informs clinicians of better ways to understand, assess and treat patients. It provides a bridge for translating research from the “bench to bedside”, in other words, making research benefit patients. The group is recognised for their expertise in clinical respiratory physiology, i.e. the science of determining how the lung goes wrong and how this causes patient symptoms. Its researchers are international leaders in complex lung function methods such as multiple breath nitrogen washout and forced oscillation technique. They also combine these measurements of function with three-dimensional lung imaging methods: high resolution computed tomography (HRCT), magnetic resonance imaging (MRI) and single photon emission

computed tomography (SPECT). They are a diverse, interdisciplinary team comprising clinicians, basic scientists and engineers.

GRANTS

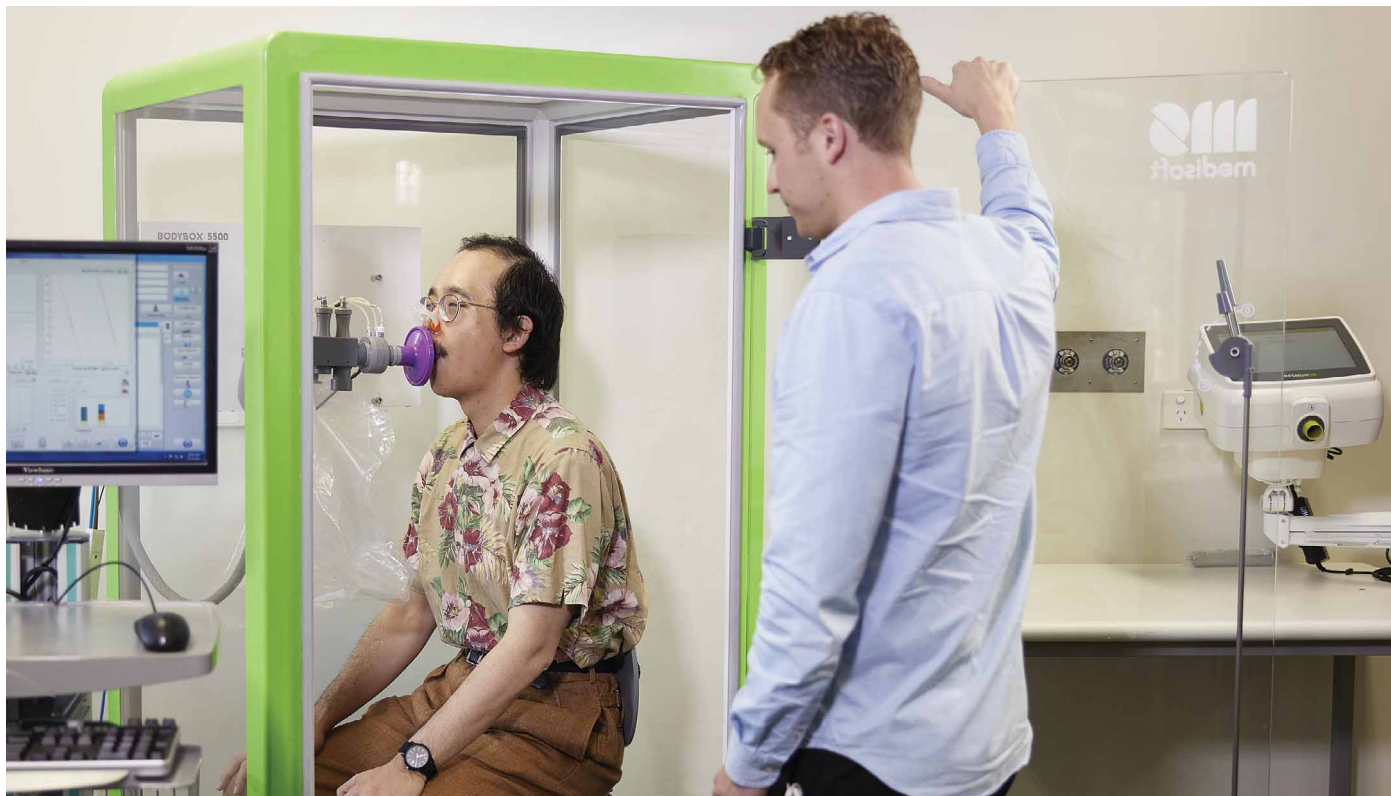
NHMRC Career Development Fellowship. *Telemonitoring of lung function variability in asthma and chronic obstructive pulmonary disease* – awarded 2016-2020. Associate Professor Cindy Thamrin. (\$419,180).

AstraZeneca. *Funds to employ a biomedical engineer to work on joint project led by Cindy Thamrin and Helen Reddel* – awarded 2021-2022. Associate Professor Cindy Thamrin and Professor Helen Reddel. (\$140,000).

Maridulu Budyari Gumal Sydney Partnership for Health, Education, Research and Enterprise (SPHERE), GlaxoSmithKline Australia Pty Ltd. *Grant to support a project focused on managing droplet dispersion during administration of respiratory devices during the COVID-19 pandemic* – awarded 2020. Dr David Chapman and Professor Greg King. (\$90,000).

Philanthropic grants from the John Notaras Family Trust to study home monitoring of asthma using





oscillometry, and from the Berg Family Foundation, to investigate the causes of irreversible airflow obstruction in asthma.

CycloPharma Australia to investigate the mechanisms of bronchodilator responsiveness in asthma and COPD.

AWARDS AND PRIZES

Dr Katrina Tonga, TSANZ Boehringer Ingelheim COPD Australia Travel Grant (2020).

Dr David Chapman and Associate Professor Cindy Thamrin, Medical Journal of Australia Christmas Competition Winner for the paper, Scientists in pyjamas: characterising the working arrangements and productivity of Australian medical researchers during the COVID-19 pandemic (2020).

HIGHLIGHTS 2020-2021

Associate Professor Cindy Thamrin, appointed Chair of the Program Committee of the Respiratory Structure and Function Assembly, American Thoracic Society (2020-2021).

Dr Katrina Tonga, appointed Chair of the Physiology and Sleep Special Interest Group, Thoracic Society of Australia and New Zealand (2021-present).

Dr David Chapman was part of the Working Group which developed the Thoracic Society of Australia and New Zealand's position on electronic cigarettes (published 2020).

We have the privilege of a number of new honorary affiliates joining us during this time: Professor Kim Prisk (University of California, San Diego), Dr David Chapman, Dr Katrina Tonga, Dr Geshani Jayasuriya, Dr Catherine Farrow and Dr Troy Cross.

Publication of Updated TSANZ Statement for Acute Oxygen Therapy in Adults and ERS Technical Standards Document for Respiratory Oscillometry. Both projects were chaired by Greg King.

PhDs AWARDED

Dr Sabine Zimmermann, "Temporal dynamics of airway mechanics: implementation in management of COPD", The University of Sydney. Supervisors: Professor Greg King, Associate Professor Cindy Thamrin, Dr Claude Farah, Dr Andrew Chan.

Dr Joseph Prinable, "Long-term monitoring of respiratory metrics using wearable devices", The University of Sydney. Supervisors: Professor Alistair McEwan, Associate Professor Cindy Thamrin, Dr Peter Jones, Dr David Boland.

CLINICAL MANAGEMENT

GROUP LEADERS: Professor Carol Armour, Professor Helen Reddel, Professor Sinthia Bosnic-Anticevich and Professor Bandana Saini.

The Clinical Management Group investigates the care of people with asthma and COPD in the community, clinic and hospital environment. We design models of care, perform clinical trials and work in practice to improve the daily care of these diseases by healthcare professionals. Our research is patient-centred, ensuring care involves the patient in decision-making about their health and in day-to-day management of their respiratory condition. The group collaborates with GPs, pharmacists, nurses, research psychologists, asthma educators, physiotherapists, speech pathologists and specialist respiratory physicians to provide better respiratory care for patients in the future. We also interact with professional organisations to make sure that our research is adopted in practice for better health care.

GRANTS

Perpetual, IMPACT Philanthropy. *Safer use of asthma reliever medications – a matter of better risk communication by health professionals* – awarded 2020-2021. Professor Bandana Saini. (\$96,000).

Commonwealth Department of Health, The Pharmacy Trial Program Tranche 2. *Getting Asthma Under Control using the skills of the Community Pharmacist* – awarded 2017-2020. Professor Carol Armour, Professor Sinthia Bosnic-Anticevich, Professor Bandana Saini and others. (\$2,281,510).

Perpetual, IMPACT Philanthropy. *Effect of cost on adherence in asthma: a pharmacy-based intervention* – awarded 2018-2022. Professor Helen Reddel. (\$84,000).

GlaxoSmithKline Australia Pty Ltd, Investigator-initiated Grant. *Addressing the burden of respiratory disease in General Practice: A real-life implementation study*



focusing on high risk asthma and COPD patients – awarded 2020-2022. Professor Sinthia Bosnic-Anticevich. (\$600,000).

GlaxoSmithKline Australia Pty Ltd, Investigator-initiated Grant. *Raising the rate of referral: A novel approach to screening and referring patients at risk of severe asthma in the community pharmacy* – awarded 2020-2022. Professor Sinthia Bosnic-Anticevich. (\$377,000).

AstraZeneca, Investigator-initiated Grant. *Using data science to build predictive models for the identification of high-risk respiratory patients in primary care* – awarded 2021. Professor Sinthia Bosnic-Anticevich. (\$50,000).

Mylan, Investigator-initiated Grant. *Implementation and evaluation of the AR Pharmacy Clinic – an implementation science approach to improving allergic rhinitis case in the community pharmacy* – awarded 2021. Professor Sinthia Bosnic-Anticevich. (\$100,000).

Viatrix, Industry sponsorship. *The Pharmacy AR Study: Implementation and elevation of a pragmatic AR management service (AR clinic) in community pharmacy* – awarded 2021-2022. Professor Sinthia Bosnic-Anticevich, Biljana Cvetkovski, Rachel Tan. (\$175,841).

AstraZeneca, Investigator-sponsored. *Telehealth Respiratory Service for Remote Asthma* – awarded 2021. Professor Sinthia Bosnic-Anticevich. (\$44,000).

GlaxoSmithKline Australia Pty Ltd, Investigator-initiated Grant. *ACAM – Funding Respiratory Monitoring in Australia* – awarded 2018-2020. Professor Helen Reddel, Professor Guy Marks. (\$300,000).

AstraZeneca, Sponsorship for investigator-initiated project. *Proposal for funding respiratory monitoring in Australia* – awarded 2019-2021. Professor Helen Reddel, Professor Guy Marks. (\$300,000).

AstraZeneca, Investigator-initiated sponsored clinical research. *ESCR-19-20122 NOVELTY sub-study* – awarded 2021. Professor Helen Reddel. (\$193,000).

Sydney Southeast Asia Centre, The University of Sydney. *Developing medication risk communication training for Indonesian pharmacists informed by an in-depth exploration of patient risk perceptions* – awarded 2021. Professor Bandana Saini. (\$20,000).

Teva Pty Ltd, Investigator-initiated Grant. *Methods*

for measuring medication adherence and addressing adherence in asthma and COPD care – awarded 2020-2022. Professor Sinthia Bosnic-Anticevich, on behalf of the REG Adherence Group. (\$113,800).

Boehringer Ingelheim, Investigator-initiated Grant. *Real-world observational study of peak inspiratory flow rate, inhalation technique and medication adherence (PIFotal COPD Study)* – awarded 2021-2022. Professor Sinthia Bosnic-Anticevich and others. (\$732,000).

Boehringer Ingelheim, Investigator Initiated Grant. *Assessing the Utility of Peak Inspiratory Flow as Predictor for COPD Exacerbations* – awarded 2020-2022. Professor Sinthia Bosnic-Anticevich and others. (\$405,000).

PhDs AWARDED

Dr Mariam Fathima (2021), Finding the right approach for screening and management of chronic respiratory diseases such as COPD in primary care through community pharmacy. Supervisors: Professor Carol Armour and Professor Bandana Saini.

Dr Fatema Tun Naher Sake (2021), Collaborative Approaches for Improving Insomnia Management in Australian Primary Care. Supervisor: Professor Bandana Saini.

Dr Reem Alzayer (2021), Asthma Management Experience Among Culturally and Linguistically Diverse (CALD) People in Australia. Supervisor: Professor Bandana Saini.

PRESENTATIONS

Professor Sinthia Bosnic-Anticevich, Respiratory Matters Workshop: Plenary Presentation. Asthma control: The importance of inhaler technique and compliance. Australia, July 2021.

Professor Sinthia Bosnic-Anticevich, ASPIRE National Nurses Conference: Symposium: Inhalers, Adherence and Cost effectiveness. Australia, July 2021.

Professor Sinthia Bosnic-Anticevich, PSA National Conference 2021 – Patient self-management in Allergic rhinitis, Australia.

Professor Sinthia Bosnic-Anticevich, PSA National Conference 2021 – Pharmacists guiding the right respiratory devices, Australia.

Professor Sinthia Bosnic-Anticevich, CNN Breaking Paradigms: COPD Treatment Symposium: Choosing the

right device for a successful treatment in COPD. Mexico (Virtual), June 2021.

Professor Sinthia Bosnic-Anticevich, Re-imagining inhaler use. Respiratory Reimagined Symposium. Sydney, January 2021.

Professor Sinthia Bosnic-Anticevich, Medication Adherence and Pharmacoeconomics. Device Academy, China (Virtual), July 2021.

Professor Sinthia Bosnic-Anticevich, Pharmaceutical Society of Australia, Mastering Respiratory Medicines Use, Sydney, Australia, March 2021.

Professor Sinthia Bosnic-Anticevich, TSANZ Symposium: Primary Care: Adolescent respiratory health and the role of primary care: Respiratory medicines use and young people: Identifying opportunities in the community pharmacy setting. Australia, May 2021.

Professor Sinthia Bosnic-Anticevich, Symposium: Drug Delivery to the Lungs (DDL) Scientific Conference "DIGITAL Inhalers - a panacea for respiratory patients? International (virtual) 9-11 Dec 2020.

Professor Sinthia Bosnic-Anticevich, Expert session:

"Connecting inhaler in the clinic: reviewing the evidence" European Respiratory Society annual congress (virtual), September 2020.

Professor Sinthia Bosnic-Anticevich, Expert session: "Inhalation matters in COPD: Making a patient-centred choice" European Respiratory Society annual congress (virtual), September 2020.

Professor Sinthia Bosnic-Anticevich, HealthEd Webinar. Inhaler Devices in clinical practice. Australia May 2020.

Professor Sinthia Bosnic-Anticevich, Respiratory Symposium. Putting Patients at the Centre of Care. Korea, July 2020.

Professor Sinthia Bosnic-Anticevich, Respiratory Summit: Inhalation therapy: personalised selection of inhaler devices. Taiwan (virtual), June 2020.

Professor Sinthia Bosnic-Anticevich, Respiratory Symposium: Acute Respiratory Care: Time of Change Symposium (virtual), Australia June 2020.

Professor Sinthia Bosnic-Anticevich, Respiratory Summit: Inhalation Matters: the importance of inhaler choice in COPD, Australia, April 2020.



RESPIRATORY AND ENVIRONMENTAL EPIDEMIOLOGY

GROUP LEADERS: Professor Guy Marks and Associate Professor Brett Toelle

The Respiratory and Environmental Epidemiology Group conducts research to investigate the prevalence of and risk factors for respiratory disease in different population groups. They also investigate community-based public health interventions to manage chronic respiratory diseases. Active areas of research include the impact of air quality and other environmental exposures such as wind turbine-generated infrasound, on health, characterising asthma, and COPD in the community. They also have an interest in the symptom of breathlessness in the Australian community. The group uses epidemiological and public health methods to answer research questions.

The group has three main areas of activity:

Respiratory and Environmental Epidemiology (R&EE) – this programme covers several areas including impact of air quality on respiratory health, ongoing analyses of data collected as part of a primary prevention of asthma study and a national research project to quantify COPD. They are also working in the areas of tuberculosis treatment and case finding.

Centre for Air pollution, energy and health Research (CAR) – a Centre of Research Excellence funded by the National Health and Medical Research Council. This group focusses on research into the impact of air pollution and energy transitions on human health and translates that research into contributions to policy that aims to mitigate that impact. CAR provides an opportunity to build the capacity for early career researchers by offering post-doctoral fellowships, travel grants, PhD top-ups, seed funding grants and research-specific training. CAR engages its partner organisations and the public through organising workshops, symposiums and public lectures.

Australian Centre for Airways disease Monitoring (ACAM) was initially established at the Woolcock Institute of Medical Research in 2002 as a collaborating unit with the Australian Institute of Health and Welfare, and since 2018 it has been an independent centre within the Woolcock. It aims to assist in reducing the burden of chronic airways disease, including asthma and COPD, in Australia by developing,

collating and interpreting data relevant to prevention, management and health policy for chronic airways disease. ACAM has recently conducted a repeat survey where they collected data from more than 10,000 Australians as part of the National Breathlessness Survey. An additional online survey was conducted to investigate difficult-to-treat asthma. A number of future surveys are planned.

GRANTS

NHMRC, Centre of Research Excellence. *Centre of Research Excellence in Tuberculosis Control on both sides of our border* – awarded 2018-2022. Professor Gregory Fox, Professor Guy Marks. (\$2,497,939).

NHMRC, Centre of Research Excellence. Energy transitions, air pollution and health in Australia – awarded 2016-2021. Professor Guy Marks. (\$2,491,229).

NHMRC, Project Grant. *Air pollution and mortality and morbidity in adult Australians (APMMA Study): a large population-based cohort study* – awarded 2018-2022. Professor Guy Marks and others. (\$1,055,989).

NHMRC, Research Fellowship. *A world that breathes more easily: research for improving global lung health* – awarded 2019-2023. Professor Guy Marks. (\$963,270).

NHMRC, NHMRC/ GACD Request for Applications. An integrated health-sector strategy to combat COPD and asthma in Vietnam: A pragmatic stepped intervention cluster randomised trial – awarded 2017-2022. Professor Greg Fox. (\$1,894,349).

NHMRC, Project Grant. *Prevention of multi-drug resistant tuberculosis in a high prevalence setting: Connecting the DOTS in Vietnam* – awarded 2017-2022. Professor Gregory Fox. (\$3,234,544).

Federal Department of Foreign Affairs and Trade (DFAT). *Health system interventions to combat the emergence and transmission of pandemic and drug-resistant respiratory infections in the Vietnamese healthcare system (V-RESIST Study)* – awarded 2018-2021. Professor Greg Fox. (\$2,480,000).

NHMRC NAFOSTED, Joint call for Collaborative Research Projects. *Harnessing new mHealth*

technologies to Strengthen the Management of Multidrug-Resistant Tuberculosis in Vietnam: The V-SMART Trial – awarded 2019-2024. Professor Greg Fox, Professor Guy Marks. (\$496,103).

Perpetual, IMPACT Philanthropy. *Emotional Wellbeing in adults who have COPD: Development, Implementation and Evaluation of a brief intervention to address this unmet need* – awarded 2019-2022. Associate Professor Brett Toelle. (\$84,000).

NHMRC, Targeted Research: Targeted Call for Research into Wind Farms and Human Health. *Multidimensional Assessment of the Health Impacts of Infrasonic: Two Randomised Controlled Trials* – awarded 2016-2020. Professor Guy Marks, Professor Ron Grunstein, Associate Professor Nathaniel Marshall, Associate Professor Craig Phillips, Associate Professor Brett Toelle, Associate Professor Delwyn Bartlett, Dr Christine Cowie and others. (\$1,943,934).

CAR Seed Funding Grant. *Ascertaining neighbourhood variation in wood heater emissions in Sydney: a case study* – awarded 2021. Dr Christine Cowie, Professor Guy Marks and others. (\$16,600).

AWARDS AND PRIZES

Professor Guy Marks was awarded:

- Fellowship of the Australian Academy of Health and Medical Sciences
- 2021 Lung Health Legend by the Australian Lung Foundation
- 2021 Mentorship Award by the Australasian Epidemiological Association

HIGHLIGHTS 2020-2021

The research team juggled the challenges of a global pandemic while significant research work proceeded on our three major research projects during 2020 and 2021; the Wind Farms and Health Home Study, the Air Pollution Morbidity and Mortality in Australian Adults (APMMA), and Test and Treat to End TB (ACT5).

CAR input into policy processes

In 2020, CAR provided seven submissions to government and attended two hearings.

Submissions:

- January 2020: Research Infrastructure Investment Plan Scoping Study: National Environmental Prediction System led by TERN

- March 2020: Health impacts of exposure to poor levels of air quality resulting from bushfires and drought. NSW Parliament Inquiry
- March 2020: NSW Independent bushfire enquiry led by NSW Premier
- April 2020: Royal Commission into bushfires
- April 2020: Inquiry into the 2019-20 Victorian Fire Season led by the Inspector General for Emergency Management
- June 2020: Closed part of the Inquiry-Bushfire Royal Commission Issues paper
- October 2020: State of the Environment Report 2021 led by Federal Department of Agriculture, Water and Environment

Hearings:

- 25 August 2020. By invitation, Dr Christine Cowie gave evidence on behalf of CAR at the NSW Inquiry into sustainability of energy supply and resources in NSW.
- 12 June 2020. By invitation, Professor Guy Marks gave evidence on behalf of CAR at the NSW Parliament Inquiry into Health impacts of exposure to poor levels of air quality resulting from bushfires and drought.

In 2021, CAR submitted eight submissions to government and attended two hearings.

Submissions:

- February 2021: Consultation on Light and Heavy Vehicle Emission Standards for Cleaner Air led by Federal Department of Infrastructure
- April 2021: Inquiry into air pollution in Victoria led by the Parliament of Victoria, Legal Council, Environment and Planning Committee
- April 2021: NSW Draft Clean Air Strategy led by the NSW Department of Planning, Infrastructure and Environment
- June 2021: Hunter Power Project (Kurri Kurri Power Station) led by the NSW Department of Planning, Infrastructure and Environment
- June 2021: NSW Clean Air Bill (2021) led by Parliament of New South Wales Portfolio Committee No.7 - Planning and Environment

- July 2021: Brisbane City Council proposed Health, Safety and Amenity Local Law 2021
- July 2021: Moreton Bay Regional Council Local Laws Review
- July 2021: Guideline for assessing and minimising air pollution led by EPA Victoria
- November 2021: Draft guideline for dust emissions led by WA Department of Water, Environment and Resources

Hearings:

- 21 June 2021: Professor Michael Abramson and Professor Fay Johnston attended the hearing into the Inquiry into the Health Impacts of Air Pollution in Victoria.
- 15 October 2021. By invitation Dr Christine Cowie gave evidence on behalf of CAR at the NSW Inquiry into Protection of the Environment Operations Amendment (Clean Air) Bill 2021. Parliament House (online appearance).

CAR workshops and training events

CAR undertook 18 online webinars in 2020 and 2021. These featured research from CAR members or research related to the themes of CAR.

CAR also hosted seven workshops:

- 23 March 2020. CAR's first online event for the year, Exposure assessment, data fusion and measurement error: with special guest speaker Professor Lianne Sheppard from the University of Washington. This workshop discussed how to design and implement exposure assessments that are fit for purpose.
- 3 September 2020. Health Impact Assessment (HIA) workshop. This workshop demonstrated how to calculate the health burden of air pollution.
- October 2020. "Landscape fire smoke: Protecting health in an era of escalating fire risk". This large online workshop discussed the health impacts of bushfire smoke. It was attended by around 200 people and very well received. A summary of panel discussions titled "Policy Implications for Protecting Health from the Hazards of Fire Smoke. A Panel Discussion Report from the Workshop Landscape Fire Smoke: Protecting Health in an Era of Escalating Fire Risk" was published following the event.
- 23-24 September 2021. In conjunction with PHAA, CAR hosted a symposium on: How do we improve public health messaging during periods of bushfire smoke and poor air quality?



- 8 December 2021. CAR hosted its second Health Impact Assessment Workshop.
- 16 September 2021. Invited Associate Professor Adrian Lowe UOM to present on the causal models and directed acyclic graph (DAG) theory.
- 2021. Members of CAR presented to industry partners at the Department of Planning and Environment on Bayesian spatiotemporal model blending.

Other CAR translation outputs

- In 2020 and 2021, CAR published 18 monthly or bimonthly newsletters and grew its subscriber base to around 600 subscribers.
- In 2020, CAR published a position paper entitled “Nationally consistent air quality reporting position paper” detailing the need for consistent air pollution reporting amongst state and territories.
- In 2020, CAR published a fact sheet entitled: “Waste- to-energy plants: can we safely burn waste?” which discussed the finding of a review of the health impacts of waste- to-energy electricity plants, funded through a CAR seed grant.
- In 2021 CAR published three position papers:
 - “There is no ‘safe’ level of air pollution. Implications for Australian policy”. This paper explains the need to reform the way that air pollution is regulated in Australia, away from standards based regulation and towards continuous emissions reductions.
 - “‘No level of air pollution is safe’: Commitment to continuous emissions reduction through an alternative model for the AAQ NEP” which is a sister document to the above position paper.
 - “Reducing the health impacts of wood heaters in Australia” which explains the disproportionate health burden that wood heater smoke represents and outlines a variety of policy options to reduce this burden.

In 2020 and 2021, CAR awarded 10 seeding grants totalling \$180,000. In 2021, there was a focus on three strategic themes:

1. no safe level of air pollution;
2. bushfire smoke; and
3. wood heaters.

The grant proposals were for work that was relevant to implementation or late-stage of translation of evidence into policy or practice.

CAR awarded one postdoctoral training grant to Dr Dinh Bui from the University of Melbourne to undertake two training courses:

- Group-Based Trajectory Modelling for the Medical and Social Sciences
- Latent Class/Cluster Analysis and Mixture Modelling

There were three new CAR PhD Top Up awards in 2021. The PhD Top ups of \$10,000 per year are awarded to those scholars who have already secured a PhD Scholarship, who are interested in a career in air pollution and energy transition and health research, and who are supervised or co-supervised by CAR investigator(s) at participating institutions.

CAR awarded three new postdoctoral fellowships in 2020-2021 these early career researchers from the Queensland University of Technology (QUT) and university of Melbourne (UOM).

ACAM conducted a second National Breathlessness Survey of 10,024 people in late 2020/early 2021. The survey structure and content was similar to the one conducted the previous year, but with some additional questions included about COVID-19 and mental health. A paper describing the methodology and results from the first National Breathlessness Survey was published in *Respirology* in May 2021. ACAM conducted an additional online survey among 5,457 people with asthma to investigate Difficult to Treat Asthma.

PRESENTATIONS

Cowie CT, Salimi F, Ezz W, Clifford S, Mazaheri M, Morawska L, Robinson PD, Toelle BG, Marks GB. UFP exposure and biomarkers of exposure/effect on small airways in school children. International Society for Environmental Epidemiology (ISEE), Washington DC, US (virtual conference), Aug 2020. Poster presentation. Published conference abstract. doi: 10.1289/isee.2020.virtual.p-0947.

Cowie CT, Yi Y, Toelle BG, Hanigan IC, Knibbs LD, Jegasothy E, Marks GB, Garden FL. Comparison of LUR, satellite LUR and Bayesian NO₂ exposure measures on effect estimates of respiratory and allergic disease in a children’s cohort. International Society

for Environmental Epidemiology (ISEE), Washington DC, US (virtual conf), Aug 2020. Poster presentation. Published conference abstract. doi: 10.1289/isee.2020.virtual.p-1222.

Invited Presentation:

Dr Christine Cowie. Ascertaining spatial variation in urban wood heater emissions. Health, Environment & Living Conference. Inaugural HEAL Conference (national on-line conference), 18 December 2021.

Dr Christine Cowie. COVID-19, air pollution and health, WIMR, 2021.

Dr Christine Cowie. COVID-19, air pollution and health, CASANZ Annual Conference, 19 May 2021.

Dr Christine Cowie. The APMMA Study-Studying long-term exposure to air pollution in a low-level setting: methods. Sleep Research Group at Woolcock Institute of Medical Research, 1 December 2020.

Invited Speaker at International Meeting:

“The Rocky Road to TB Elimination in Vietnam”. Vietnam Lung Association, 11 December 2021.

“Lung Health for All for Sustainable Development”. Amrita Oration. Amritacon conference, Kerala, India, 11 December 2021.

“Tuberculosis” Philippines College of Chest Physicians, State of the Art Pulmonary Disease update, 5 November 2011.

“Can we end TB by 2030”. Invited symposium talk. 52nd Union World Conference on Lung Health, 19 October 2021.

“Mass screening for TB: new tools and practices” Symposium at Union World Conference on Lung Health, 20 October 2021.

World Lung Day address to Haryana Health department (Rotary International event) on behalf of The Union, 25 September 2021.

“Environmental impact on health: airborne threats to lung health” Invited presentation, TSANZ New Zealand, 30 September 2021.

“Benefits and harms for individuals versus communities”, invited talk at the WHO workshop on innovative clinical trial designs for the evaluation of new TB preventive treatment, 15-17 September 2021.

“Extrapolation & decision analytic modelling” invited talk at WHO workshop on innovative clinical trial designs for the evaluation of new TB preventive treatment, 15–17 September 2021.

Indonesia High Level Meeting to launch Commit to Quit campaign. Welcome speech, 1 June 2021.

Asia-Pacific Summit of Mayors. Welcome speech on behalf of The Union, 17 December 2020.

Presentation about Lung Health at ALAT (Latin America) conference, 12 December 2020.

“Directing Discovery to Transform TB” at Tuberculosis eSymposia – Keystone Symposia – Virtual meeting, 5 December 2020.

“51st Union World Conference on lung health: Advancing prevention” – Virtual event, 20-24 October 2020.

George Comstock Lecture: “The Rocky Road to the Elimination of TB.” Keynote Speaker at 24th Annual Union – North America region (NAR) TB conference in Chicago, USA, 27-29 February 2020.

Invited Speaker at Major National Meeting:

“Request for expert advice” Advisory Committee on Medicines 22 Meeting. Australian Government Department of Health, Therapeutic Goods Administration (TGA), Canberra via webex, 6-7 August 2020.

Local and National Invited Presentation:

Talk on TB prevention for Rheumatologists. Rheumin8. Abbvie.com, 17 September 2021.

“Winners and Losers of the COVID-19 Pandemic.” Invited speaker, University NSW Sydney ASEAN Conference, Inspiring the Present, Envisioning the Future, (virtual), 17 October 2020.

“Tuberculosis (TB) and COVID in Vietnam.” Invited speaker Ingham Institute Clinical Academic Research Series, Ingham Institute for Applied Medical Research, Liverpool, 28 September 2020.

“COVID-19: Epidemiology and public health issues.” Invited speaker, Ground Rounds Webinar, UNSW South Western Sydney Clinical School (SWSCS) Liverpool Hospital, 2 April 2020.

RESPIRATORY CELLULAR AND MOLECULAR BIOLOGY

GROUP LEADER: Professor Brian Oliver

The group aims to uncover the molecular and cellular mechanisms underlying chronic respiratory diseases encompassing basic to clinical research.

Initially, the group's expertise was centred around asthma and COPD, focusing upon respiratory pharmacology and understanding important disease mechanisms such as virus-induced exacerbations. Over time, the group's expertise has expanded, and in 2016 their research evolved to develop novel models to address contemporary health issues, such as obese asthma, e-cigarettes and more recently, the health effects of air pollution.

In many of these areas, the research is world leading. For example, Scival rated the e-cigarette research to be in the top 0.1 percent of programs globally.

Air pollution research is the exciting new development in the group. Large epidemiological studies in 2020 and 2021, found that long-term exposure to low dose air pollution (i.e. levels which are considered safe) are associated with the development of COPD. This is of

particular importance in Australia as traffic-related air pollution (TRAP) is often overlooked, but exposure to TRAP is increasing as a result of increasing traffic flows and the propensity to build high-density housing along major traffic corridors. The group has invested in infrastructure to collect and analyse air pollution and is currently involved in experiments to understand the health effects and mechanisms involved.

GRANTS

NHMRC Project Grant. *Understanding why in-utero exposure to inhaled oxidants predispose people to develop asthma and COPD* – awarded 2019-2022. Professor Brian Oliver. (\$1,043,742).

NHMRC Equipment Grant. *Air pollution samplers*. Professor Brian Oliver. (\$25,000).

CSC, PhD Scholarship, Min Feng. (\$160,000).

CSC, PhD Scholarship, Xu Bia. (\$160,000).

AWARDS AND PRIZES

ERS Lung Science Conference 2021 Bursary





WIMR postgraduate Symposium 2021 (Best student presentation \$250)

UTS 3-minute thesis (Runner up \$250)

ECR Think tank (Best Presentation by a PhD Student \$500)

HIGHLIGHTS 2020-2021

Despite COVID-19 restricting a lot of what we do, and what we would like to do, 2020 and 2021 proved to be an exceptional period for publishing our work; we had 68 papers published.

Looking back, a lot of 2020 and 2021 was taken up with planning.

Our Silicosis Research Program is now established (Dr Anna Yeung and Andra Huang, PhD Student). Our Air Pollution Research in which we collect pollution from around Sydney was boosted by the arrival of ten field collection devices in late 2021 (led by Dr Dia Xenaki and Xu Bia, PhD Student). Our research into the Early

Life Causes of Asthma and COPD are very much coming towards some experimental answers (led by Dr Jeremy Chan and Min Feng, PhD student).

PhDs AWARDED

Razia Zakaria, PhD 2020, University of Technology Sydney

Jack Bozier, PhD 2021, University of Technology Sydney

Roy Woldhuis, PhD 2021, University of Technology Sydney

Baoming Wang, PhD 2021, University of Technology Sydney

PRESENTATIONS

Collectively over 50 national and international presentations were made over 2020-2021; including presentations at the two premier respiratory conferences, the American Thoracic Society Conference and The European Respiratory Society Annual Congress.

RESPIRATORY TECHNOLOGY

GROUP LEADERS: Professor Daniela Traini, Professor Paul Young and Dr Hui Xin Ong

The Respiratory Technology Group was established in 2012 to bridge the gap between fundamental respiratory science (molecular pharmacology and cell biology) and clinical research (physiology, epidemiology and clinical management). The Group is a leader in the areas of aerosols drug formulation and delivery, device development, and physiologically relevant in vitro models to enhance in vitro-in vivo correlations.

GRANTS

COVID-19 TechVoucher Program Application TV00184. *The nasal delivery of a nanoparticle elaborated siRNA for the prevention and treatment of COVID-19 infections from the SARS-CoV-2 virus* – awarded 2022. Professor Daniela Traini and others. (\$100,000).

Macquarie University, Research Acceleration Scheme. *Artificial Respiratory Models to Study the Mechanisms of Airborne Hazards Exposure and Toxicity* – awarded 2022. Dr Hui Xin Ong, Professor Daniela Traini, Professor Paul Young and other. (\$50,000).

Macquarie University, Research Acceleration Scheme. *Breathing Probiotics: Formulation and Characterisation of stable inhaled Probiotics for improved lung microbiome in respiratory infections* – awarded 2022. Professor Paul Young, Professor Brian Oliver and other. (\$49,635).

NSW RNA Production and Research Network – awarded 2021-2024. Professor Daniela Traini, Dr Hui Xin Ong and Trisha Juhura Almazi. (\$278,368).

Project ID: MOSTI.D (S) 600-4/12/1. Design and development of pulmonary N-methylated peptide liganded chitosan- 5 fluorouracil-folate nanoparticles for lung cancer treatment – awarded 2020-2022. Professor Daniela Traini and other. (RM420,358).

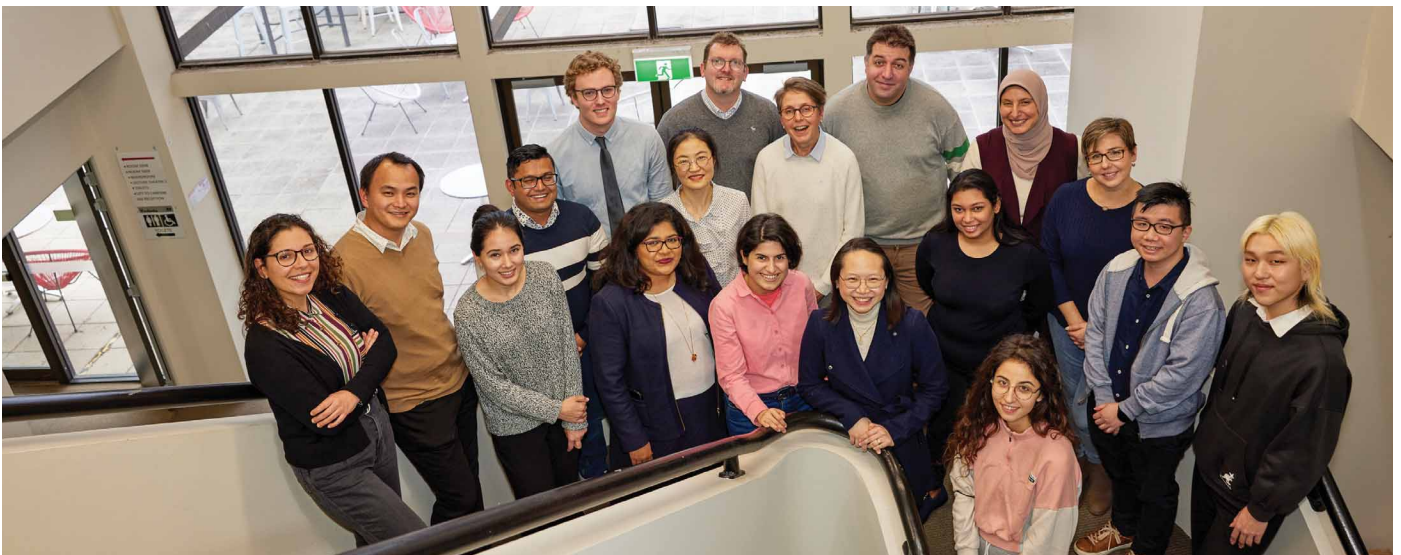
Macquarie University, COVID Recovery Fellowship. *Development of integrated real-time sensors for high-throughput monitoring of drug response* – awarded 2021-2022. Dr Hanieh Gholizadeh. (\$98,000).

ARC Linkage Project. *Plant plasters: Efficient spray micro-coatings for plant delivery to retention 2021-2023*. Professor Paul Young and other. (\$410,000).

ARC Linkage Project. *Enabling precise droplet control in hydrofluorocarbon free sprays* – awarded 2021-2024. Professor Paul Young and others. (\$690,000).

NSW Government Innovation Districts Challenge. *VBreathe anti-viral air filtration personal device* – awarded 2021. Professor Paul Young and other. (\$100,000).

NHMRC, Investigator Grant. *Breathing in a Cure: using the lung as a delivery portal for repurposed drugs* – awarded 2020-2024. Professor Daniela Traini. (\$2,880,078).



ARC, Linkage Project. *Smart hybrid system for the formulation and design of dry powder inhalers* – awarded 2018-2020. Professor Daniela Traini. (\$769,200).

ARC, Discovery Project. *Cause and effect: new mechanisms of particles formation in thunderstorms* – awarded 2019-2021. Professor Daniela Traini, Dr Hui Xin Ong. (\$550,000).

NHMRC, Development Grant. *Next generation hand-held nebulisers for aerosol drug delivery: using microfluidics to tune particle size* – awarded 2020. Professor Daniela Traini, Dr Hui Xin Ong. (\$726,160).

Defence Innovation Network, Pilot Project. *Unravelling the mechanisms of aerosolised toxins* – awarded 2020. Dr Hui Xin Ong, Professor Daniela Traini and others. (\$555,000).

ARC, Linkage Project. *Improving respiratory drug delivery through targeted nozzle design* – awarded 2017-2020. Professor Paul Young and others. (\$105,000).

ARC, Discovery Project. *Engineering better sprays for leaf coating: from drop impact to retention* – awarded 2019-2021. Professor Paul Young and other. (\$465,000).

AWARDS AND PRIZES

Drug Delivery to the Lung: Emerging Scientist Award (2021) - Dr Hui Xin Ong.

Respiratory Drug Delivery: Peter Byron Graduate Student Award (2020) - Emelie Landh.

Drug Delivery to the Lung Finalist Pat Burnell Award (2021) - Zara Sheikh and Ye Zhang.

HIGHLIGHTS 2020-2021

Established spin-off pharmaceutical company - Ab Initio Pharma with Professor Paul Young, Professor Daniela Traini and Dr Hui Xin Ong.

Ab Initio Pharma is a pharmaceutical formulation R&D and GMP manufacturing company based in Sydney, Australia. Established as a spin-off from The University of Sydney in partnership with Sydney Local Health District and the peak industry body, ARCS. The company provides innovators across Australia and globally, with a flexible platform to rapidly translate bench-top discoveries to clinical trial products and

fully-fledged commercial pharmaceuticals. The company is headquartered in Camperdown and currently has 15 personnel.

PhDs AWARDED

2021: Dr Zara Sheikh, Doctor of Philosophy (The University of Sydney). Unlocking the mechanisms of interactions between anti-inflammatories and antibiotics for optimal cystic fibrosis treatment. Lead Supervisor: Professor Daniela Traini. Supervisors: Professor Paul Young, Dr Hui Xin Ong.

2021: Dr Hanieh Gholizadeh, Doctor of Philosophy (Macquarie University). Optimization of Nasal Drug Delivery from Aerosols to Real-Time Drug Testing on-a-Chip. Lead Supervisor: Associate Professor Shaakoon Cheng. Supervisor: Dr Hui Xin Ong.

2021: Dr Emelie Landh, Doctor of Philosophy (The University of Sydney). Treating lymphangioliomyomatosis via nanoparticle inhalation. Lead supervisor: Dr Hui Xin Ong. Supervisors: Professor Daniela Traini and Professor Paul Young.

2021: Dr Jesse Xu, Doctor of Philosophy (The University of Sydney). Development of 3D printed, Drug-Eluting Airway Stents for the Personalised and Local Treatment of Central Airway Pathologies. Lead supervisor: Dr Hui Xin Ong. Supervisors: Professor Daniela Traini and Professor Paul Young.

2021: Dr Hong Jun Choi, Master of Philosophy (The University of Sydney). Exploring the influence of drug-excipient interaction on batch-to-batch variability in Seretide. Lead Supervisor: Professor Daniela Traini. Supervisor: Dr Rania Salama.

PRESENTATIONS

Professor Daniela Traini, Respiratory technology: how to bridge fundamental respiratory science with clinical research, GSK- UK Virtual Seminar, February 2021.

Dr Hui Xin Ong, Application of microfluidic technologies to accelerate respiratory drug delivery research and development. Invited speaker at Materials, Mimics, and Microfluidics: Engineering Tools for Mechanobiology (MBI 3M), National University of Singapore, Virtual Hybrid Scientific Meeting, July 2021.

Dr Hui Xin Ong, Advanced Integrated Respiratory Models for Rapid Translation of Inhaled Therapies. Emerging Scientist Award Presentation at the Drug Delivery to the Lung, December 2021.

SLEEP AND CIRCADIAN RESEARCH GROUP

GROUP LEADER: Professor Ron Grunstein

2020 and 2021 were undoubtedly very difficult years globally due to COVID-19 with the impact felt acutely across the medical research field. For the Sleep and Circadian Research Group, the pandemic led to the pausing of most active research studies. While this provided more time for some other activities such as manuscript and grant writing, the group also took the opportunity to reflect on study design and adapt research protocols to online/telehealth formats where feasible and safe to do so. This helped to ensure that the group's level of productivity remained high. The group continue to cross-collaborate amongst our component groups and with others in Australia and overseas.

Despite its challenges, 2020 and 2021 provided several outstanding accomplishments. Professor Ron Grunstein, Dr Angela D'Rozario and Dr Rick Wassing received NHMRC personal funding awards and Dr Camilla Hoyos received a Future Leader award from the National Heart Foundation. Of note was the commencement of four members of the Sleep and Circadian Research Group as Woolcock Research Leaders; Dr Camilla Hoyos, Dr Angela D'Rozario, Associate Professor Christopher Gordon and Associate Professor Nathaniel Marshall have joined the Woolcock Research Leadership team in addition to current members Professor Ron Grunstein and Associate Professor Craig Phillips. This is testament to their outstanding academic records, personal leadership skills and dedication to the Woolcock Institute of Medical Research over many years. In addition, Professor Brendon Yee was appointed both Head, Discipline of Sleep Medicine at The University of Sydney and convenor of the Sleep Health Clinical Academic Group within Sydney Health Partners.

Co-operative Research Centre (CRC) for Alertness, Safety and Productivity

Research Leaders: Professor Ron Grunstein and Associate Professor Christopher Gordon

The Alertness CRC commenced in 2014 with seven years funding of \$70 million in cash and in-kind resources from three universities (The University of Sydney, Monash University, Flinders University)

and 28 industry, government, and non-government organisations (NGO) including the Woolcock Institute of Medical Research. Reaching completion in 2020, the CRC worked to address the challenge of reversing the impaired productivity and safety implications of insufficient sleep and shift work.

Some of the key achievements of the CRC in relation to sleep health include:

- Development of the SleepFix insomnia therapy mobile application and the Philips SmartSleep Analyzer tool
- Validation of a phenotyping approach for obstructive sleep apnea
- Development of a program of driver sleepiness prevention
- Lighting solutions to maximise workplace alertness
- Roadside testing for sleepiness.

Insomnia Physiology, Health Psychology and Circadian Science

Research Leader: Associate Professor

Christopher Gordon

Health Psychology Lead: Associate Professor

Delwyn Bartlett

Insomnia is the most prevalent sleep disorders affecting up to 30 percent of adults. Our insomnia physiology theme of research aims to develop our understanding of the pathophysiological mechanisms of the disorder which have long remained elusive, severely limiting treatment options for patients. Through a range of research studies both in-lab and online, the team are discovering new knowledge about the changes that occur during sleep and wake periods in insomnia patients. They are also testing cutting-edge digital treatment options such as our sleep app, SleepFix in various population groups who have co-morbid insomnia (e.g. patients with back pain). In the five-year period to June 2022, this theme of research has been additionally supported by generous donor funds. In addition, they support the cross-group, CleverLights study (funded by Perpetual) to assess the effect of light exposure on night-time sleep and daytime activity and alertness in older Australians with sleep problems.



Neurobiology

Research Leader: Doctor Angela D’Rozario

The research undertaken by the Sleep Neurobiology Research Team provides neurophysiology and neuroimaging insights into cognitive deficits and daytime sleepiness in people with sleep disorders, severe mental illness and neurodegenerative disease. Their work encompasses a broad program of research undertaken as part of the NHMRC Centre of Research Excellence to Optimise Sleep in Brain Ageing and Neurodegeneration (CogSleep CRE) and includes several large trials funded by NHMRC project grants. Technological advances in measuring brain wave activity using our high-density electroencephalography (HD-EEG) systems (funded in part by the NHMRC), together with neuroimaging expertise provide a powerful platform for our growing research program. The team uses these tools to discover new biomarkers for identifying patients at greater risk of cognitive impairment, both in terms of next day functioning, (i.e. vigilance failure and motor vehicle accidents) but also over the longer term (i.e. accelerated cognitive decline with ageing). They examine the mechanisms

of how altered brain wave activity during sleep impairs learning and memory processes and leads to poor brain health. The team also evaluates innovative novel treatment approaches to restore normal sleeping patterns and improve cognition and clinical outcomes. In 2020, they were awarded an NHMRC and University of Sydney Equipment Grant which, with other supporting funds, allowed for the expansion of the HD-EEG equipment suite to include an additional system.

Epidemiology

Theme Leader: Associate Professor Nathaniel Marshall

The Sleep Epidemiology Team aims to investigate the prevalence, causes, risk factors and consequences of sleep disorders as well as rigorously test the effectiveness of established and emerging treatments in sleep health. They design clinical trials and statistically analyse clinical trials in conjunction with other research teams. They regularly conduct systematic reviews and meta-analyses on pressing clinical questions where they gather all high-quality data from around the world into single documents to better help doctors and patients make evidence-based decisions about their care. The group recently

completed a Government requested NHMRC-funded laboratory-based experiment into whether inaudible infrasound generated by wind turbines affects human physiological systems.

Clinical Trials

Research Leader: Doctor Camilla Hoyos

The Clinical Trials Team has expanded during 2020-2021 despite COVID-19 restraints. There is now a well-established clinical trials program assessing the effectiveness of various formulations of cannabinoids for insomnia and sleep disturbance through rigorous randomised controlled trials (RCT) rather than anecdotal reports. NHMRC success has seen the team embark on a large Australia-wide multi-site feasibility RCT which will look at sleep apnea treatments for the prevention of dementia. In addition, the group has undertaken several global-sponsored research studies including Avadel's Rest-On study of long-acting sodium oxybate for narcolepsy patients. The team's track record and reputation of excellence in clinical trials has resulted in many enquiries from industry for future partnership on multi-national studies. Several of these are currently being pursued including new treatments for sleep apnea, narcolepsy, delayed sleep phase syndrome and restless legs syndrome.

Cardiometabolic

Research Leader: Associate Professor Craig Phillips

The Sleep Cardiometabolic Research Program aims to understand the role of sleep in maintaining cardiovascular and metabolic health and how sleep and circadian disturbance such as occurs with obstructive sleep apnoea (OSA) and shift work, increases risk for diabetes and heart disease. Although obesity is the main driver of OSA and associated cardiometabolic conditions, evidence suggests that OSA, independent of obesity, promotes cardiometabolic disease and weight gain and hinders weight loss. The program includes studies assessing whether CPAP treatment for OSA in the presence of weight loss provides additional benefit in reducing diabetic risk and blood pressure and whether exercise during weight loss in OSA patients prevents loss of healthy muscle tissue. The team are also beginning to explore how neurovascular dysfunction in OSA might promote cognitive decline and dementia and obtained an NHMRC Ideas Grant (9.9 percent success rate) to explore how the brain's toxin clearance system works during sleep and how this relates to vascular function.

Respiratory Failure

Theme Leaders: Associate Professor Brendon Yee and Associate Professor Amanda Piper

Respiratory disorders that increase the effort to breathe or are associated with weakness of the respiratory muscles affect the pattern and depth of breathing. Sleep exaggerates any abnormalities in breathing and, over time, can lead to inadequate breathing identified by high levels of carbon dioxide and low levels of oxygen both at night and during the day. If left untreated or treated inappropriately, inadequate breathing can lead to reduced quality of life, unnecessary hospitalisations and even premature mortality. Breathing during sleep can be markedly improved by applying positive airway pressure to assist inspiratory efforts. Understanding who is at risk, when best to start therapy and what ventilation strategy works best are important issues to ensure people with chronic respiratory disorders receive the best evidence-based care. One aim of current research is to explore the role of CPAP modalities in obesity hypoventilation syndrome and chronic lung disease.

GRANTS

AusIndustry, Co-operative Research Centre. *CRC for Safety Productivity and Alertness* – awarded 2014-2021. Professor Ron Grunstein and colleagues. (\$14,700,000).

Department of Industry, Innovation, Science, Research and Tertiary Education, CRC for Alertness and Productivity. *SmartSleep Analyzer Validation in Older Age Group with Sleep Disorders* – awarded 2021. Associate Professor Christopher Gordon and Professor Ron Grunstein. (\$50,208).

Department of Industry, Innovation, Science, Research and Tertiary Education, CRC for Alertness and Productivity. *Mobile App-delivered Sleep Retraining Therapy (SleepFix) to Improve Sleep in Older Individuals with Insomnia* – awarded 2021-2022. Associate Professor Christopher Gordon and Professor Ron Grunstein. (\$171,923).

Department of Industry, Innovation, Science, Research and Tertiary Education, CRC for Alertness and Productivity. *Mobile App-delivered Sleep Retraining Therapy (SleepFix) to Improve Sleep in Individuals with Back Pain* – awarded 2021-2022. Associate Professor Christopher Gordon and Professor Ron Grunstein. (\$133,806).

Heart Foundation Project Grant. *The effects of long-term, low-dose colchicine on cognition and brain health in patients with established coronary artery disease: a randomised controlled study* – awarded 2019-2020. Dr Camilla Hoyos and colleagues. (\$74,965).

Heart Foundation, Future Leader Fellowship. *Targeting the heart to optimise healthy brain ageing in different at-risk populations across adulthood* – awarded 2021-2025. Dr Camilla Hoyos. (\$529,000).

MRFF, Rapid Applied Research Translation (RART). *Oximetry screening to detect sleep-disordered breathing in severe mental illness* – awarded 2019-2020. Professor Ron Grunstein, Professor Brendon Yee, Dr Angela D’Rozario, Associate Professor Nathaniel Marshall and colleagues. (\$142,056).

MRFF, Rapid Applied Research Translation (RART). *Weight Loss for Sleep disordered breathing: translating sleep, lifestyle, energy, eating, exercise program into practice* – awarded 2019-2020. Dr Elizabeth Cayanan, Professor Brendon Yee, Associate Professor Keith Wong, Associate Professor Craig Phillips, Professor Ron Grunstein, Associate Professor Nathaniel Marshall. (\$197,944).

MRFF, Rapid Applied Research Translation (RART). *The effectiveness of a mobile application delivering behavioural therapy for insomnia in primary care* – awarded 2019-2020. Associate Professor Christopher Gordon, Associate Professor Delwyn Bartlett, Professor Ron Grunstein, Associate Professor Keith Wong and colleagues. (\$130,000).

NHMRC-ARC Dementia Research Development Fellowship. *Sleep, plasticity and neurodegeneration: Enhancing sleep to prevent cognitive decline in Mild Cognitive Impairment* – awarded 2016-2020. Dr Angela D’Rozario. (\$525,116).

NHMRC-ARC Dementia Research Development Fellowship. *Sleep-wake disturbances and cardiometabolic dysfunction in at risk dementia: a novel pathway in neurocognitive decline* – awarded 2016-2020. Dr Camilla Hoyos. (\$558,305).

NHMRC, Boosting Dementia Research Initiative. *REducing Sleep Apnoea for the PrEvention of Dementia (RESHAPED): a multi-site feasibility RCT* – awarded 2019-2023. Professor Ron Grunstein, Associate Professor Craig Phillips, Dr Camilla Hoyos, Associate

Professor Nathaniel Marshall and colleagues. (\$1,468,685).

NHMRC, Boosting Dementia Research Leadership Fellowship. *Improving Sleep to Reduce Dementia Risk* – awarded 2018-2021. Associate Professor Craig Phillips. (\$709,585).

NHMRC, Centre of Research Excellence. *National Centre for Sleep Health Services Research – Positioning Primary Care at the Centre of Sleep Health Management* – awarded 2017-2021. Professor Ron Grunstein and colleagues. (\$2,500,000).

NHMRC, Centre of Research Excellence. *The Centre of Research Excellence to Optimise Sleep in Brain Ageing and Neurodegeneration (COGSLEEP)* – awarded 2018-2022. Professor Ron Grunstein, Associate Professor Craig Phillips, Dr Angela D’Rozario, Dr Camilla Hoyos and colleagues. (\$2,499,557).

NHMRC, Centre of Excellence. *The Centre of Research Excellence to Optimise Sleep in Brain Ageing and Neurodegeneration (COGSLEEP) seed funding. Assessing sleep and cognitive health in older people through community pharmacies – a triage, patient education and capacity building opportunity in primary care* – awarded 2021. Associate Professor Christopher Gordon, Professor Bandana Saini and colleagues. (\$20,000).

NHMRC, Centre of Excellence. *The Centre of Research Excellence to Optimise Sleep in Brain Ageing and Neurodegeneration (COGSLEEP) seed funding. Sleep disturbance in MCI: a pilot study of a cognitive behavioural therapy digital intervention – SUCEED* – awarded 2021. Dr Camilla Hoyos, Associate Professor Christopher Gordon and colleagues. (\$30,000).

NHMRC, Centre of Excellence. *The Centre of Research Excellence to Optimise Sleep in Brain Ageing and Neurodegeneration (COGSLEEP) seed funding. E-Coach-supported Digital SLEEP Therapy for Older Adults with Cognitive Impairment – ExCEED Study* – awarded 2020. Associate Professor Christopher Gordon. (\$20,050).

NHMRC, Centre of Excellence. *The Centre of Research Excellence to Optimise Sleep in Brain Ageing and Neurodegeneration (COGSLEEP) Fellowship. Novel biomarkers to understand the links between sleep and neurodegeneration in at-risk populations* – awarded 2021. Dr Julia Chapman. (\$50,000).

NHMRC, Project Grant. *A new clinical tool to assess fitness-to-drive in obstructive sleep apnea* – awarded 2018-2020. Professor Ron Grunstein, Associate Professor Keith Wong, Dr Angela D’Rozario and colleagues. (\$727,962).

NHMRC, Project Grant. *“Local Sleep” in the Awake Brain: An underlying cause of neurobehavioural deficits in obstructive sleep apnea?* – awarded 2018-2020. Professor Ron Grunstein, Dr Angela D’Rozario, Dr Craig Phillips, Associate Professor Keith Wong, Dr Camilla Hoyos and colleagues. (\$582,331).

NHMRC, Investigator Grant. *Innovative Neuroscience to Improve Treatment of Sleep Disturbances for Prevention of Depression and Anxiety* – awarded 2021-2025. Dr Rick Wassing. (\$645,205).

NHMRC, Investigator Grant. *Targeting Challenges in Sleep Health* – awarded 2021-2025. Professor Ron Grunstein. (\$2,414,215).

NHMRC, Investigator Grant. *Investigating sleep biomarkers of cognitive impairment and improving cognitive outcomes through targeted sleep interventions in adults at risk for dementia* – awarded 2021 for 2022-2024. Dr Angela D’Rozario. (\$1,570,120).

NHMRC, Senior Principal Research Fellowship (SPRF). *Addressing Therapeutic Challenges in Sleep Disorders* – awarded 2016-2020. Professor Ron Grunstein. (\$851,980).

NHMRC, Targeted Research Grant. *Multidimensional Assessment of the Health Impacts of Infrasound: Two Randomised Controlled Trials* – awarded 2016-2020. Professor Guy Marks, Professor Ron Grunstein, Associate Professor Nathaniel Marshall, Associate Professor Craig Phillips, Dr Brett Toelle, Associate Professor Delwyn Bartlett, Dr Christine Cowie and colleagues. (\$1,943,934).

NHMRC and University of Sydney Equipment Grant. *High-density electroencephalography (EEG) technology for sleep research* – awarded 2020. Professor Ron Grunstein, Dr Angela D’Rozario and colleague. (\$31,757).

NHMRC, Boosting Dementia Research. *Sleep, plasticity and neurodegeneration: enhancing sleep to prevent cognitive decline in mild cognitive impairment* – awarded 2016-2020. Dr Angela D’Rozario. (\$525,116).

Royal Australasian College of Physicians, Australasian Faculty of Rehabilitation Medicine Research Establishment Fellowship. *The use of quantitative electroencephalography in sleep to measure the neurological recovery following severe traumatic brain injury in post-traumatic amnesia*. Dr Pearl Chung. (\$50,000).

Royal Australasian College of Physician, Specialist Training Program. *Clinical Sleep Fellow Training Position*. Professor Ron Grunstein and Professor Brendon Yee. (\$130,000 per annum).

The University of Sydney BMC Development Grant. *Digital sleep therapy to enhance psychological outcomes in older adults with subjective cognitive impairment and insomnia disorder*. Dr Camilla Hoyos. (\$20,000).

The University of Sydney, Faculty of Science Visiting Scholar Scheme for Women – awarded 2020. Dr Angela D’Rozario. (\$5,000).

The University of Sydney Lambert Initiative, Research Grant. *Cannabinoid therapies in management of sleep disorders: a randomised placebo-controlled trial to examine cannabinal (CBN) for treatment of insomnia disorder* – awarded 2021-2022. Dr Camilla Hoyos. (\$205,000).

The University of Sydney Lambert Initiative, Research Grant. *Cannabinoids and sleep: a randomised placebo-controlled crossover pilot study of 20:1 CBD:THC for insomnia* – awarded 2021-2022. Professor Ron Grunstein, Dr Camilla Hoyos. (\$255,712).

The University of Sydney Lambert Initiative, Research Grant. *A randomised, double-blind, crossover trial investigating the dose-dependent effects of purified oral cannabidiol (CBD) on driving performance in healthy volunteers* – awarded 2019-2021. Professor Grunstein, Dr Camilla Hoyos. (\$217,974).

AWARDS AND PRIZES

Best Clinical Presentation (2nd Prize), Sydney Postgraduate Psychology Conference (2021), Anastasia Suraev

Emerging Sleep Hero Award, Sleep Health Foundation (2021), Anastasia Suraev

HDR CogSleep Publication Award for his article ‘Altered heart rate variability during sleep in mild cognitive impairment’, The University of Sydney (2021), Shawn (Dexiao) Kong



Leslie Rich Scholarship for Dementia Research (2020),
Zoe Schrire

Lambert Initiative of Cannabinoids Therapeutics PhD
Scholarship (2021-23), Isobel Lavender

Paulette Isabel Jones PhD Completion Scholarship, The
University of Sydney (2021), Anastasia Suraev

School of Psychology Publication Prize, The University
of Sydney (2020), Anastasia Suraev

‘Visualise Your Thesis’ Competition (Winner), The
University of Sydney (2021), Anastasia Suraev

HIGHLIGHTS 2020-2021

Completed RCT of cannabinoids in chronic insomnia
disorder (CANSLEEP) in October 2021.

Brendon Yee promoted to Professor, named Head of
the Discipline of Sleep Medicine at the University and
Chair of the Sleep Health Clinical Academic Group,
Sydney Health Partners.

Professor Ron Grunstein named a 2021 Fellow of the
Australian Academy of Health and Medical Sciences.

Dr Camilla Hoyos, Associate Professor Christopher
Gordon, Associate Professor Nathaniel Marshall,
Doctor Angela D’Rozario commenced as Woolcock
Research Leaders.

PhDs AWARDED

Melissa Aji (The University of Sydney)

MASTERS THESES PASSED

MPHIL Awarded – Madelaine Pankhurst (The University
of Sydney)

PRESENTATIONS

Dr Angela D’Rozario, High-density EEG investigations
in sleep disorders and ageing, CogSleep Symposium,
September 2020.

Dr Angela D’Rozario, Enhancing PSG data presentation
and analysis, Sleep DownUnder, October 2021.

Dr Angela D’Rozario, Sleep neurophysiology in older adults at risk for dementia: insights from high-density EEG, 3rd Congress of Asia Society of Sleep Medicine (virtual) Beijing, May 2021.

Dr Angela D’Rozario, Objective measurement of sleep in mild cognitive impairment: A systematic review and meta-analysis, Australia Dementia Forum, June 2021.

Dr Angela D’Rozario, The effects of continuous positive airway pressure (CPAP) therapy in moderate to severe obstructive sleep apnea (OSA): A high-density electroencephalography (EEG) study, Sleep DownUnder, October 2021.

Dr Angela D’Rozario, Using high-density EEG to evaluate device and drug-based interventions for improving sleep and cognitive outcomes, CogSleep Symposium, September 2021.

Associate Professor Christopher Gordon, Digital Sleep health – what is the state of play?, CogSleep Symposium, September 2020.

Associate Professor Christopher Gordon, Effectiveness of digital brief behavioural therapy for insomnia with wearable technology: pilot randomised controlled trial, Sleep DownUnder, October 2021.

Professor Ron Grunstein, New approaches to OSA therapy – relevance to the Elderly, CogSleep Symposium, September 2021.

Professor Ron Grunstein, Losing sleep over obesity – Can we fix the problem?, Australia and New Zealand Obesity Society Conference, July 2020.

Dr Camilla Hoyos, ECR Blitz Oral Presentation, Sydney Dementia Network Symposium, 2021.

Dr Camilla Hoyos, The effect of treating sleep apnea on cognition in older adults at risk of dementia, Brain and Mind Centre Annual Research Symposium, November 2020.

Dr Camilla Hoyos, Trials investigating the effect of Sleep Apnea treatment on cognition in Older Adults at risk for dementia, CogSleep Symposium, September 2021.

Dr Tancy Kao, Predicting subjective sleep quality using multi-day actigraphy data: A machine learning approach, Sleep DownUnder, October 2021.

Associate Professor Craig Phillips, Could OSA cause neurodegeneration and dementia- what are the

underlying mechanisms?, American Thoracic Society Virtual ASM, 2021.

Associate Professor Craig Phillips, The sleep/wake rhythm of brain detoxification, CogSleep Symposium, September 2020.

Associate Professor Craig Phillips, Sleep apnoea and dementia risk – could hypertension be the link?, CogSleep Symposium, September 2021.

Associate Professor Craig Phillips and Professor Bandana Saini, Clocking Up: What Time Should I Take This Medicine? ASA Webinar, May 2021.

Dr Sheila Sivam, Management of hypersomnolence disorders in Australia: Challenges for the clinician, ASA Hypersomnolence Masterclass, July 2021.

Dr Lachlan Stranks, Diagnostic case presentation, ASA Hypersomnolence Masterclass, July 2021.

Anastasia Suraev, Medicinal cannabis use patterns for sleep disorders in the Australian community: results from the CAMS20-21 Survey, Sydney Postgraduate Psychology Conference, 2021.

Anastasia Suraev, Cannabinoids, sleep and daytime function, ECR ThinkTank Symposium, June 2021.

Anastasia Suraev, Good-quality restful sleep: what does cannabis have to do with it?, Brain and Mind Symposium, November 2020.

Associate Professor David Wang, invited oral presentation, 3rd Congress Asian Society of Sleep Medicine Congress (virtual) Beijing, May 2021.

Dr Rick Wassing, REM Sleep and Emotional Memory, CogSleep Symposium, September 2020.

Dr Rick Wassing, Interindividual differences in MRS-GABA, sleep architecture and cognitive Performance, CogSleep Symposium, September 2021.

Professor Brendon Yee, Sleep Disorders in Prader-Willi Syndrome, International Prader-Willi Syndrome Echo Session, June 2021.

WOOLCOCK EMPHYSEMA CENTRE

DIRECTOR: Professor Alaina Ammit

The Woolcock Emphysema Centre is the 'go-to' hub for Australia's 300,000 sufferers and top researchers wanting to change the way this respiratory condition is treated. The Centre, run from our headquarters in Glebe, Sydney, works to improve the lives of patients by ensuring earlier diagnosis, better treatment options and ultimately a cure which will allow thousands of people to avoid these conditions altogether. By integrating clinical and basic research, the facility can innovate rapidly and revolutionise the way these respiratory diseases are studied and treated.

GRANTS

NHMRC, Project Grant. *Switching on tristetraprolin to turn off inflammation in COPD* – awarded 2018-2022. Professor Alaina Ammit. (\$525,390).

Maridulu Budyari Gumal, SPHERE PhD support grant provided by the RSEOH CAG. Patrick He (\$10,000).

HIGHLIGHTS 2020-2021

During this period, Woolcock Emphysema Centre members published 34 journal articles detailing cutting-edge research discoveries that help us increase our scientific understanding of emphysema and improve clinical treatment.

The highlight of this biennial period was the caring and generous way in which members of the Woolcock Emphysema Centre supported each other to continue to conduct our important respiratory research, in a safe manner. Despite the challenges, our research efforts were sustained and many of our researchers contributed to research and clinical efforts against COVID-19. Notable examples include advice and guidelines for conducting pulmonary rehabilitation to support recovery from COVID-19; produced for the NSW Agency for Clinical Innovation by Dr Renae McNamara (Clinical Research Fellow with the Centre and The University of Sydney and South Eastern Sydney LHD) and colleagues.

Alison J, McNamara R, Spencer L, McKeough Z, Dale M, Tsai LL, Santos M, Kulas H. NSW Agency for Clinical Innovation. Respiratory physiotherapy COVID-19 advice. Sydney, NSW: ACI; 2020. https://aci.health.nsw.gov.au/__data/assets/pdf_file/0010/582823/ACI-RespCOP-Respiratory-physiotherapy-COVID-19-advice_V5.pdf

Alison J, McNamara R, Spencer L, Wootton S, McKeough Z, Dale M, Tsai LL, Kulas H. NSW Agency for Clinical Innovation. Rehabilitation following COVID-19 in the pulmonary rehabilitation setting. Sydney, NSW: ACI; 2020. https://aci.health.nsw.gov.au/__data/assets/pdf_file/0005/605525/ACI-Respiratory-Rehab-Following-COVID-19.pdf

Alison J, McNamara R, Spencer L, Wootton S, McKeough Z, Dale M, Tsai LL, Kulas H. NSW Agency for Clinical Innovation. Delivering pulmonary rehabilitation via telehealth during COVID-19. Sydney, NSW: ACI; 2020. https://aci.health.nsw.gov.au/__data/assets/pdf_file/0004/589801/ACI-COP-Guide-for-Virtual-Models-of-Pulmonary-Rehabilitation.pdf

PRESENTATIONS

McNamara R, Tsai LL, Santos M, Alison J. Improving pulmonary rehabilitation completion with personalised exercise and education modules: the PuReMod trial. *European Respiratory Journal* 2020;56 (suppl 64) 895; DOI: 10.1183/13993003.congress-2020.895.

Cheng S, Alison J, Dennis S, Stamatakis E, McNamara R, Spencer L, McKeough Z. Can a six-week behaviour change intervention reduce sedentary behaviour in people with chronic obstructive pulmonary disease? A randomised controlled trial. *European Respiratory Journal* 2020;56 (suppl 64) 252; doi: 10.1183/13993003.congress-2020.252.

McNamara R, Tsai LL, Santos M, Alison J. Improved pulmonary rehabilitation completion with personalised exercise and education modules: the PuReMod trial. *Respirology* 2020;25;Issue S1:111-230.

WOOLCOCK INSTITUTE IN VIETNAM

GROUP LEADERS: Professor Guy Marks and Professor Greg Fox

The Woolcock offices in Vietnam were established in 2010 to support the implementation of NHMRC-funded research into tuberculosis and lung disease. Since then projects in Vietnam have been awarded \$20 million in research funding and have included 130,000 participants across multiple sites. The Woolcock has offices in Hanoi, Ho Chi Min City and Ca Mau and the implementation of projects across 11 Provinces is overseen by Country Director Dr Thu Anh Nguyen. The Woolcock Vietnam currently employs over 50 local researchers and, as activity within the projects increases, the number of employees continues to grow. Our research program in Vietnam is testing new strategies to reduce the burden of tuberculosis, improve care for chronic lung diseases, confront with COVID-19 outbreaks and reduce antibiotic resistance. The group is also using new cutting-edge technologies to improve patient care. Our studies in Vietnam have provided the evidence needed to improve the health of people affected by tuberculosis worldwide.

GRANTS

NHMRC, Centre of Research Excellence for Tuberculosis. *Seed Grant. The development of a TB consumer advisory and advocacy committee in Hanoi, Vietnam* – awarded 2019-2021. Professor Greg Fox, Dr Lisa Redwood. (\$15,000).

DFAT. *Combating the emergence and spread of antimicrobial resistant infectious diseases in Vietnam: The V-Resist Study* – awarded 2018-2022. Professor Greg Fox. (\$2,480,000).

DFAT. *Understanding community transmission of COVID-19 in Vietnam: The V-COVID Study* – awarded 2020-2022. Professor Greg Fox. (\$370,000).

Research Institute of McGill University Health Centre (Quebec). *Tackling the two greatest obstacles to Tuberculosis elimination: Treatment of latent infection and drug resistant disease* – awarded 2015-2024. Professor Greg Fox. (CAD \$7,400,000).

NHMRC, Project Grant. *Ending Tuberculosis. A cluster RCT of community-wide universal testing and*

treatment for latent TB infection in high prevalence settings – awarded 2019-2023. Professor Guy Marks, Professor Gregory Fox, Dr Hoa Nguyen, Associate Professor James Wood, Professor Stephen Graham. (\$6,458,052).

NHMRC, Investigator Grant – *Emerging Leadership. Is the excess mortality amongst tuberculosis survivors explained by Chronic Pulmonary Aspergillosis? Investigating burden, diagnosis, and therapy (V QUIN Substudy)* – awarded 2021-2025. Dr Justin Beardsley. (\$300,000).

Research Institute of McGill University Health Centre (Quebec). *2R2: Higher dose Rifampin for two months vs standard dose Rifampin for latent TB: a 3-arm randomized trial* – awarded 2015-2024. Professor Greg Fox. (\$145,138).

NHMRC and Global Alliance for Chronic Diseases (GACD) Grant. *An integrated health-sector strategy to combat COPD and asthma in Vietnam: A pragmatic stepped intervention cluster randomized trial* – awarded 2017-2022. Professor Greg Fox. (\$1,894,348).

NHMRC, Project Grant. *Harnessing new mHealth technologies to strengthen the management of Multi-drug Resistant Tuberculosis in Vietnam* – awarded 2019-2024. Professor Greg Fox. (\$496,103).

The University of Sydney. *The effectiveness of a self-stigma reduction intervention upon stigma measure for patients with tuberculosis and multi-drug resistant tuberculosis in Vietnam: a randomized controlled trial* – awarded 2019-2021. Professor Greg Fox. (\$33,150).

NHMRC Centre of Research Excellence for Tuberculosis, Seed Funding. *Saliva-based therapeutic drug monitoring of levofloxacin and linezolid in patients with MDR-TB: A feasibility study in Vietnam* – awarded 2020-2022. Professor Jan-Willem Alffenaar. (\$14,000).

AWARDS AND PRIZES

Royal Australasian College of Physicians Medal for International Health, 2021. Professor Greg Fox.

HIGHLIGHTS 2020-2021

From 2019-2022, Professor Guy Marks is serving as the President of the International Union of Tuberculosis

and Lung Diseases, the oldest international organisation responsible for lung health globally.

During the COVID-19 pandemic, the team of the Woolcock Institute of Medical Research has made a substantial contribution to the public health and research response in Vietnam. With the support of the Australian Department of Foreign Affairs and Trade, the Woolcock team has undertaken six research studies focusing upon the epidemiology and transmission of COVID-19. Outcomes include videos and reports to support the COVID-19 response and estimates of the impact of COVID-19 upon people with tuberculosis in Vietnam. This research has been presented as keynote addresses at Vietnam's leading lung society meetings. The Woolcock team supporting these projects was led by Professor Greg Fox, Professor Guy Marks and Dr Thu Anh Nguyen. This is implemented in close partnership with Vietnamese colleagues.

The findings of the ACT4 Clinical Trial was published in the Lancet Public Health in 2021. This five-country study showed that a health system intervention was able to increase screening for latent TB infection. This

has important implications for public health policy globally, where there are major gaps in treatment of latent TB infection. The project was led internationally by Professor Dick Menzies (McGill University), and in Vietnam by Professor Nguyen Viet Nhung (National TB Program Director) and Professor Greg Fox (Woolcock Institute).

PhDs AWARDED

Dr Eric Huang was awarded his PhD at the University of New South Wales for his research on chronic lung disease in Vietnam. He conducted his research within the VCAPS project, funded by the Global Alliance of Chronic Disease. Supervisors: Professor Guy Marks (primary supervisor) and Professor Greg Fox.

PRESENTATIONS

In 2021, Professor Greg Fox and Dr Kavi Velen (a post-doctoral researcher affiliated with the Woolcock) presented findings of a systematic review of screening for tuberculosis among household contacts to a WHO Guideline Development Group. The evidence review directly informed global TB control recommendations and built upon previous research in Vietnam.



WOOLCOCK CENTRE FOR LUNG CANCER RESEARCH & LUNG CANCER RESEARCH NETWORK

DIRECTOR: Professor Maija Kohonen-Corish

The revolutionary new Centre for Lung Cancer Research was built at the Woolcock Institute of Medical Research with the financial support of NSW Health and the Office of Health and Medical Research. This modern, purpose-built research centre is now well-established and is changing the way a deadly cancer is diagnosed, treated and studied both in Australia and globally. Our flagship projects include:

- Understanding how the human microbiome is altered in lung cancer and how it can be exploited in treatment
- Developing of microbiome-based tests to identify therapy resistance and interventions to reverse the resistance
- Establishing preclinical evidence for a new type of targeted therapy in lung cancer
- Developing innovative stents and surgical aids for patients undergoing surgery for lung cancer

This will lead to the development of new interventions to boost therapy responsiveness for all lung cancer

patients and provide early diagnosis for those at risk. Acting as a hub for researchers working in the area of lung cancer, the facility is collecting tissue, cellular material and patient-related information to a dedicated biobank and data centre. Several projects are running in the state-of-the-art laboratory in collaboration with local health districts and research institutes.

GRANTS

Lung Foundation Australia. *Lung Microbiome as a Biomarker of Therapeutic Response in Lung Cancer* – awarded 2021-2022. Dr Anna McLean. (\$10,000).

Cancer Council NSW, Project Grant. *Defining new molecular mechanisms and therapy targets in colorectal cancer* – awarded 2019-2021. Professor Maija Kohonen-Corish. (\$450,000).

The Ross Trust, Project Grant. *Understanding Cancer Development in Inflammatory Bowel Disease* – awarded 2020-2022. Professor Maija Kohonen-Corish. (\$300,000).

Perpetual, Impact Philanthropy. – awarded 2021-2022. Professor Maija Kohonen-Corish. (\$100,000).



THE ANN WOOLCOCK LECTURE

The Ann Woolcock lecture promotes medical research in respiratory health. It is an annual event that honours the contribution of Professor Ann Woolcock to the research community.

Invited researchers share their ideas with industry, policy makers, doctors, specialists and patients with a view to prompting new collaborations to improve respiratory health.

The program also facilitates the visit of eminent respiratory clinicians and scientists to the Woolcock for an exchange of ideas, skills and techniques with our researchers.

2020

The Ann Woolcock Lecture was cancelled due to COVID-19.

2021

The 2021 Lecture was delivered by Professor Grant Waterer, University of Western Australia.



Professor Grant Waterer, MBBS, PhD, MBA, FRACP, FCCP, is Professor of Medicine at Royal Perth Hospital Unit and The University of Western Australia as well as an adjunct Professor of Medicine at Northwestern University, Chicago and adjunct Professor of Medicine at Curtin University. He is a respiratory specialist seeing general respiratory diseases but with a particular interest in pulmonary infectious diseases.

For the Ann Woolcock Lecture 2021, Professor Grant Waterer looked back over the great plagues and pandemics of the past, how they shaped history, how they might put the COVID-19 pandemic into historical context, and what lessons we can draw from the past to deal with COVID-19 and future pandemics.

Emergency hospital during Spanish Flu epidemic, 1918. National Museum of Health and Medicine



OUR CLINIC

The Woolcock Clinic is a world-leading medical centre, specialising in the diagnosis and treatment of all sleep and breathing disorders.

Our unique, multidisciplinary approach provides our patients with access to over 45 specialties, including respiratory and sleep medicine, neurology, psychiatry, psychology, geriatrics, rehabilitation medicine, endocrinology, ENT and specialised dental services, allergy and immunology and exercise physiology - all under the one roof.

The COVID-19 pandemic presented numerous challenges during 2020 and 2021, which were reflected in a 27 percent decline in sleep studies relative to 2018-2019. However, in a period when NSW public health institutions and numerous private facilities had to suspend services, the Woolcock Clinic remained open, performing 4,200 sleep studies and fully compliant with NSW Health regulations. This service was much appreciated by our patients and colleagues.

Our dedicated clinicians and staff continued to provide high quality patient care by adapting our infrastructure to provide a range of telehealth services.

Numerous Woolcock clinicians are global and local health research leaders, who provide our adult,

adolescent and paediatric patients with access to diagnostic innovations and cutting-edge evidence-based medicine.

The Woolcock Clinic continues to offer a comprehensive suite of specialised services to treat patients with sleep and respiratory disorders. Our clinic in Glebe has modern testing facilities and comfortable patient accommodation for adult and paediatric sleep studies. Our world leading Woolcock NeuroSleep Clinic specialises in the diagnosis and treatment of neurodegenerative and/or mental health problems, in addition to sleep disorders.

The Woolcock Therapy Centre (WTC) supports our clinicians and their patients by providing a range of therapies for sleep-disordered breathing. Our high-quality service supports patients throughout their therapy journey, from the initial trialling of a CPAP device for as long as they need our assistance, which may be several years. Over 800 patients began their journey at the WTC during 2020 and 2021.

Although a global product recall of Philips Respironics devices in 2021 adversely impacted many, our WTC team assisted our patients in acquiring new and safe CPAP devices from various manufacturers.



IN THE MEDIA

Articles on research and studies at the Woolcock appeared regularly in medical and mainstream media during 2020-21. Our researchers were also asked for expert commentary on topical news and current affairs. In 2020, the after-effects of the summer bushfires and questions about the emerging COVID-19 pandemic were topics of interest to the media while in 2021 the focus shifted to insomnia, sleep issues and new treatments for asthma. The methodology for media mentions changed at the end of 2020.

2020

Number of media mentions: 238

Top stories:

- 8/01/2020: **Channel 10 News, Vicky Kritikos**, “Bushfire smoke haze is taking a toll on people’s health and many asthmatics underestimate the risks”
- 12/01/2020: **The Daily Telegraph, Helen Reddel**, “Woman, 19, dies of asthma attack sparked by toxic bushfire smoke”
- 31/01/2020: **Australian Doctor, Sayantonee Ghosh**, “Tuberculosis in Australia”
- 21/02/2020: **ABC Online, Dianne Richards**, “Does counting sheep get you to sleep?”
- 13/03/2020: **Channel 9 News, Ron Grunstein**, “Cannabis oil being tested to fight insomnia”
- 12/04/2020: **The Daily Telegraph, Brian Oliver**, “Future pandemic: COVID-19 can happen again”
- 1/05/2020: **Australian Journal of Pharmacy, Leanne Philpott**, “Allergic rhinitis: More than a sniffle and a sneeze”
- 18/05/2020: **The Medical Republic, Sinthia Bosnic-Anticevich**, “Teaching correct inhaler technique to your patients – Webcast”
- 19/05/2020: **Triple J The Hack, Chris Seton**, “Interview about the effects of sleep apnea”
- 23/05/2020: **SMH Good Weekend, Helen Reddel**, “AND ... BREATHE”
- 30/05/2020: **The Sydney Morning Herald, Delwyn Bartlett**, “Not-so-sweet dreams: why so many are losing sleep during COVID”
- 1/06/2020: **The Medical Republic, Helen Reddel**, “Combined inhaler now on PBS for mild asthma”
- 17/06/2020: **Cosmos Magazine, Brian Oliver**, “Possible COVID-19 drug breakthrough welcomed”
- 14/07/2020: **ABC Radio, Christine Cowie**, “Gas heaters and carbon monoxide risk”
- 7/8/2020: **2GB Radio, Nathaniel Marshall**, “Friday Health with Nat Marshall”
- 17/08/2020: **medicalrepublic.com.au, Euan Tovey**, “Stop cleaning for a minute and listen: COVID is mostly airborne”
- 19/09/2020: **Channel 9 News, Christopher Gordon**, “New study investigating a link between poor lighting and disrupted sleep”
- 21/09/2020: **Medical Journal of Australia, Guy Marks**, “Harms from bushfire smoke: ‘Yesterday was the time to talk about it’”
- 14/10/2020: **2GB, Helen Reddel**, “Use of combination inhaler and reliever inhaler could reduce flare-ups by 60%”
- 16/10/2020: **scimex.org, Brain Oliver**, “Expert Reaction: WHO COVID-19 trial finds remdesivir, hydroxychloroquine, lopinavir and interferon don’t save lives”
- 19/10/2020: **Medianet, Daniela Traini**, “Breathing new life into asthma treatment using the PALM of their hand”
- 24/10/2020: **Australian Journal of Pharmacy, Sinthia Bosnic-Anticevich**, “Changing Concepts: Allergic Rhinitis”
- 6/11/2020: **The Conversation, Christine Cowie**, “Can we safely burn waste to make fuel?”
- 25/11/2020: **Channel Nine News, Rick Wassing**, “Sleep apnea linked to cognitive problems, workplace and vehicle accidents”
- 26/11/2020: **2CH Radio, Rick Wassing**, “Woolcock researchers recruiting volunteers for sleep apnea brain fog study”
- 1/12/2020: **The Limbic, Carol Armour**, “Respiratory researcher wins Science Oscar”
- 8/12/2020: **Channel 9 News, Sinthia Bosnic-Anticevich**, “Study discovers many children with hay fever are not being diagnosed properly”
- 15/12/2020: **The Australian**, “Wearing PJs bad for WFH mental health”

- 17/12/2020: **The Medical Republic, Chris Seton**, “Clinical Takeaway: Sleep deprivation in teenagers”

2021

Number of media mentions: 158

Top stories:

- 16/01/2021: **New Scientist, David Chapman and Cindy Thamrin**, “Put your clothes on: Medical Journal of Australia’s golden stethoscope award”
- 1/02/2021: **National Law Institute Journal, Delwyn Bartlett**, “Losing sleep”
- 18/02/2021: **LabOnline, Slnthia Bosnic-Anticevich**, “GSK funding research into respiratory conditions”
- 28/02/2021: **Channel TEN News, Chris Seton**, “Sleep researchers have warned parents to be vigilant about their children’s bedtimes”
- 13/04/2021: **SBS Insight, Simon Lewis and Chris Seton**, “While you were sleeping”
- 23/04/2021: **Oncology Republic, Maija Kohonen-Corish**, “Lung Cancer is more red-crowned toadlet than koala”
- 11/05/2021: **ABC Central West NSW, Leanne Poulos**, “Breathlessness Survey Interview”
- 12/05/2021: **The Medical Republic, Helen Reddel**, “GINA releases 2021 asthma strategy”
- 20/05/2021: **SSEAC Stories podcast, Greg Fox**, “Keeping Lungs Healthy: A Discussion of Respiratory Health in Vietnam”
- 1/06/2021: **Seven News, Ron Grunstein**, “Rest assured help is on hand with melatonin available over the counter at chemists for over 50s”
- 4/06/2021: **The Australian, Euan Tovey**, “Debate on droplet spread up in the air”
- 5/06/2021: **Channel 9 News, Camilla Hoyos**, “Pills used for sleep, the focus of a new trial to boost memory and thinking”
- 11/06/2021: **The Medical Republic, Greg King**, “Telehealth no replacement for doctor-patient connection”
- 9/07/2021: **AAP FactCheck, Brian Oliver**, “Ginger treatment for lung conditions hasn’t crystallised”

- 9/08/2021: **The Medical Republic, Helen Reddel and Cindy Thamrin**, “Is your asthmatic patient chaotic?”
- 13/08/2021: **Australian Journal of Pharmacy, Bandana Saini**, “Reacting to allergy symptoms”
- 14/09/2021: **ABC Radio Regional, Christopher Gordon**, “Interview - A good night’s sleep during lockdown”
- 3/10/2021: **Your Life Choices Podcast, Wai Kuen Chow**, “Expert tips to improve sleep”
- 11/10/2021: **ABC Online, Euan Tovey**, “What are dust mites, why do they cause allergies and can we get rid of them?”
- 27/10/2021: **ABC iView, Thu Anh Nguyen**, “TB – When a doctor becomes a patient”
- 29/10/2021: **Cosmos Magazine, Hui Xin Ong**, “Fast-tracking new aerosol treatments”
- 10/11/2021: **The Medical Republic, Chris Blackwell**, “HealthEd: Sleep and Depression”
- 19/12/2021: **ABC Everyday, Rick Wassing**, “How the moon can affect sleep”
- 23/12/2021: **Research Australia Inspire Magazine, Carol Armour**, “Celebrating 40 years of helping Australians breathe and sleep better”

DIGITAL MEDIA

During the calendar year 2021, growth in digital engagement included:

- Website hits/traffic doubled 102 percent to over 700 pageviews per day
- Newsletter reach grew by 35 percent to nearly 3,500 opens per newsletter
- Newsletter engagement grew by 149 percent to around 1,000 clicks per newsletter
- Newsletter subscribers increased by 28 percent to just over 6,000 subscribers
- Facebook organic reach doubled to over 300 impressions per post
- Twitter engagement rate rose by one percentage point to nearly 4 percent
- LinkedIn reach increased by 71 percent to over 500 impressions per post

OUR COMMITTEES

Below is a list of the Board Committees that operated in 2020 and 2021 and their membership (listed by Chair, followed by member's surname in alphabetical order):

FINANCE AND RISK COMMITTEE

Members: Julie Osbourne (C), Carol Armour, Robert Estcourt, Cansy Ittimani, Greg Kaplan, Jayne Shaw, Ian White.

Below is a list of the Woolcock committees that operated in 2020 and 2021 and their membership:

WOOLCOCK EXECUTIVE COMMITTEE

Members: Carol Armour (C), Sinthia Bosnic-Anticevich, Wai Kuen Chow, Greg Kaplan, Brian Oliver, Brett Toelle, Daniela Traini, Kristina Vincenc, Paul Young.

NEXT GENERATION COMMITTEE

Members: Brian Oliver (C), Juhura Al-mazi, Yik Chan, Christine Cowie, Hanieh Mahvizani, Diren Reddy, Sarah Serhal, Kavindhran Velen, Rick Wassing, Mohamed Zawahir.

RESEARCH COMMITTEE

Members: Brett Toelle (C), Carol Armour, Akshay Bhumkar, Biljana Cvetkovski, Greg Kaplan, Greg King, Maija Kohonen-Corish, Nathaniel Marshall, Brian Oliver, Hui Xin Ong, Craig Phillips, Sandra Rutting, Bandana Saini.

RESEARCH LEADER COMMITTEE

Members: Daniela Traini (C), Alaina Ammit, Sinthia Bosnic-Anticevich, Angela D'Rozario, Greg Fox, Christopher Gordon, Ron Grunstein, Camilla Hoyos, Greg King, Maija Kohonen-Corish, Guy Marks, Nathaniel Marshall, Brian Oliver, Hui Xin Ong, Craig Phillips, Helen Reddel, Bandana Saini, Cindy Thamrin, Brett Toelle, Paul Young.

CLINICAL COMMITTEE

Members: Wai Kuen Chow (C), Delwyn Bartlett, Chris Blackwell, Magorzata Bronisz, Liz Cayanan, Michelle Donegan, Ron Grunstein, Greg Kaplan, Shweta Naik, Andrew Ng, Jeremy Sparkes, Aruvi Thiruvarudchel, Andrew Treptow, Kristina Vincenc.

DEVELOPMENT COMMITTEE

Members: Sinthia Bosnic-Anticevich (C), Alaina Ammit, Delwyn Bartlett, Emma Funnell, Rachel House, Maija Kohonen-Corish, Christopher Madden, Hui Xin Ong, Craig Phillips, Leanne Poulos, Cindy Thamrin, Kristina Vincenc, Anna Yeung.

WHS COMMITTEE

Members: Catherine Shread (C), Juhura Al-mazi, Akshay Bhumkar, Cindi Elstub, Ann-Marie Gregory, Greg Kaplan, Shweta Naik, Diren Reddy, John Reynolds, Jeremy Sparkes, Yana Suslik, Rick Wassing.

MANAGEMENT COMMITTEE (2020)

Members: Carol Armour (C), Kerstin Bass, Sinthia Bosnic-Anticevich, Joanne Elliott, Kristina Vincenc.

MANAGEMENT COMMITTEE (2021)

Members: Carol Armour (C), Kerstin Baas, Sinthia Bosnic-Anticevich, Ann-Marie Gregory, Greg Kaplan, Kristina Vincenc.

OPERATIONS COMMITTEE (2020 only)

Members: Joanne Elliot (C), Akshay Bhumkar, Cansy Ittimani, Kariss O'Connor-Kerr, Catherine Shread.

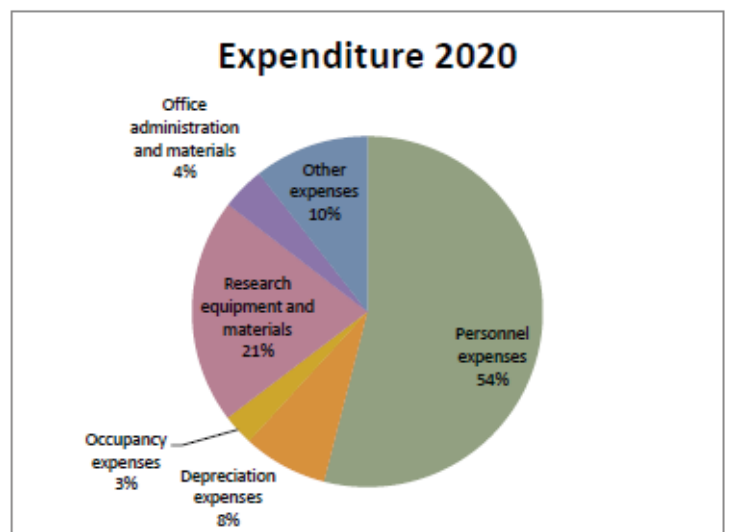
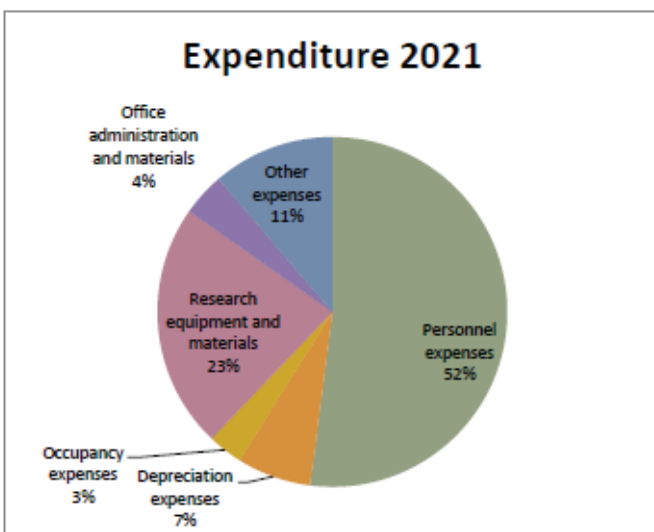
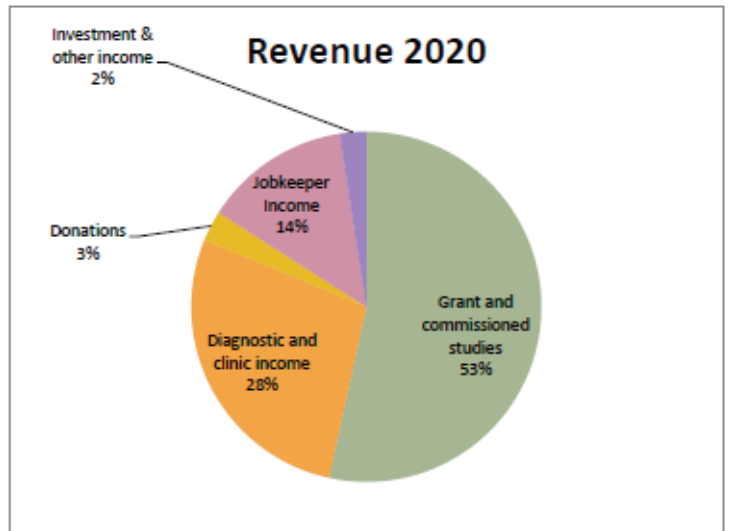
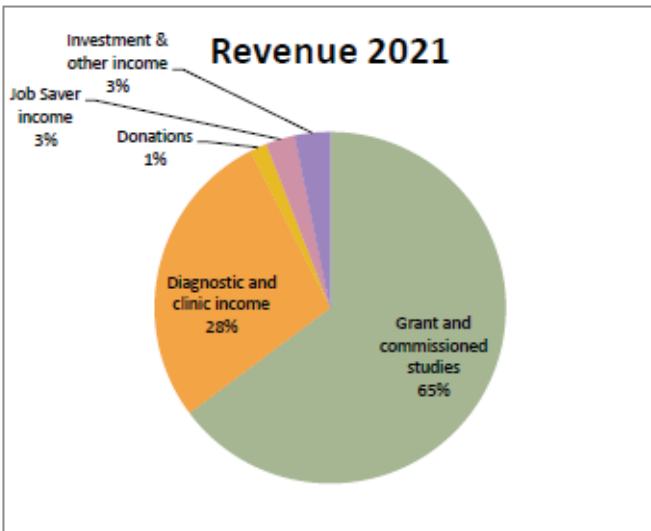
FINANCIAL PERFORMANCE

The economic environment in 2020 and 2021 continued to be challenging for many not-for-profit and for-profit organisations. Despite the industry-wide slowdown caused by the COVID-19 pandemic, research at the Woolcock Institute of Medical Research continued to be recognised in Australia and worldwide for its excellence, and individuals within the Woolcock continued their ground-breaking investigations.

Our research activity continues to be the main driver of activity at the Woolcock. Competition for research

grants in 2021 continued to increase across the research sector. However, Woolcock scientists still won a number of major research grants. The Sleep, Lung Cancer, Vietnam and Respiratory Technology groups were all awarded major grants. The Woolcock Clinic remained open and continued to provide services to the community.

The 2021 financial result for the Woolcock was a deficit of \$226,579 compared to a surplus of \$597,632 in 2020.



STATEMENT OF PROFIT OR LOSS

	\$	\$
	2021	2020
REVENUE		
Revenue	14,502,524	15,263,877
Total revenue	14,502,524	15,263,877
EXPENSES		
Personnel expenses	(7,665,458)	(7,920,176)
Depreciation expenses	(1,012,450)	(1,144,618)
Occupancy expenses	(472,972)	(421,173)
Research equipment and materials	(3,335,080)	(3,045,683)
Office administration and materials	(586,577)	(581,787)
Other expenses	(1,656,566)	(1,552,808)
Total expenditure	(14,729,103)	(14,666,245)
Surplus/(deficit) from operating activities	(226,579)	597,632

STATEMENT OF FINANCIAL POSITION

	\$	\$
	2021	2020
ASSETS		
Cash and cash equivalents	5,592,362	9,517,793
Trade and other receivables	741,337	3,218,999
Inventories	73,194	39,433
Other financial assets	13,587,731	7,895,539
Other assets	239,017	176,389
Total current assets	20,233,641	20,847,353
Property, plant and equipment	749,261	1,408,908
Right of use assets	1,391,331	44,067
Total non current assets	2,140,592	1,452,975
Total assets	22,374,233	22,300,328
LIABILITIES		
Trade and other payables	1,158,298	1,083,772
Provisions	725,644	631,573
Lease liabilities	573,539	35,483
Contract liabilities	11,675,403	12,796,921
Total current liabilities	14,132,884	14,547,749
Provisions	286,300	285,268
Lease liabilities	725,112	10,795
Total non current liabilities	1,011,412	296,063
Total liabilities	15,144,296	14,843,812
Net assets	7,229,937	7,456,516
EQUITY		
Retained earnings	7,229,937	7,456,516
Total equity	7,229,937	7,456,516

BOARD OF DIRECTORS



ROBERT ESTCOURT AM (CHAIRMAN OF THE BOARD)

Appointed 14 September 2005

Member of the Lung Foundation of Australia Investment Advisory Committee (2020-); Director Brookvine Pty Limited (2004-); Director and Chair of Finance and Risk Committee Radio 2RPH; Member Australasian Sleep Association Finance Committee; Investment Consultant to The Royal Australian & New Zealand College of Ophthalmologists (RANZCO) (2013-); Consultant AA Solutions (2012-); Director e Clipse Online (2010-2016); Director Innova Asset Management (2014-2015); Independent Investment Committee Member Charter Hall Opportunity Funds (2005-2014); Chairman Austock Asset Management (2007-2009), Director & Chief Executive Officer, Retail Cube Limited (2004-2006); Principal, Estcourt Associates (2003-); Director of AMP Portfolio Businesses (2002-2003); Director and Head of Cobalt RunOff Services Ltd (2000-2002); AMP Group GIO Task Force (1999-2000); Director, AMP Asset Management (1992-1999); Head of AMP Investments, New Zealand, 1990-1992; Head of Investment Strategy; Equity Research, AMP Investments (1986-1990); Assistant General Manager, Investment Division, UAL Merchant Bank (1974-1986). In 2021, Robert was awarded a Member of the Order of Australia for his significant service to the financial management sector.



PROFESSOR CAROL ARMOUR AM (EXECUTIVE DIRECTOR)

Appointed 10 April 2012

Appointed Executive Director 1 July 2012

Professor Armour has worked in the area of asthma research at a basic scientific and clinical level. Her investigations span the breadth of asthma research from the cellular mechanisms to the translation of new ways to treat asthma within the health system. She is on the Australian Respiratory Council, The National Asthma Council and has chaired the National Asthma Monitoring Advisory Committee, worked on the National Therapeutic Guidelines and the Australian Medicines Handbook. From 2003-2006 she was a member of the NHMRC Research Committee and was the Chair of the Training Awards Committee. She was Pro-Vice Chancellor, Research, at The University of Sydney, from 2006 to 2009. In 2005, she was made a Fellow of the Pharmaceutical Society for her services to the profession, and she was awarded the Australasian Pharmaceutical Science Association (APSA) medal for research in 2007. She was an Associate Dean in the Faculty of Medicine until 2018 and was made a Payne-Scott Professor by The University of Sydney in 2018. In 2019, she was awarded an AM for her significant service to medical education and asthma management. In 2020, she was awarded the prestigious Eureka Prize for Outstanding Mentor of Young Researchers, in recognition of her lifelong passion for mentoring and career development of staff and students.



IAN WHITE (COMPANY SECRETARY)

Appointed 1 May 2012

Ian White has over 40 years' experience within the financial services industry across various general management and company secretarial roles.



PROFESSOR BRUCE ROBINSON AC

Appointed 30 May 2006

Fellow in Medicine, Harvard Medical School (1986-1988); Instructor in Medicine, Harvard Medical School (1988-1989); Pioneered and Head, Molecular Genetics Unit (1989 - then transitioned to Co-Head, Cancer Genetics in 2010-), Co-Head of the Kolling Institute of Medical Research (1989-); Professor of Medicine (Endocrinology), The University of Sydney (1992); Head, Department of Medicine, The University of Sydney, Northern Clinical School (1996-2001); Chairman, Department of Medicine, The University of Sydney (1998-1999); Head, Division of Medicine, Royal North Shore Hospital (1998-2006); Chairman, Hoc Mai, Australia Vietnam Medical Foundation, The University of Sydney (2001-); Associate Dean (International) Faculty of Medicine, The University of Sydney (2003-2005); Dean, Faculty of Medicine, The University of Sydney (2006-2016); awarded Member of the Order of Australia AM in Queen’s Birthday Honours (2012); Chair, National Health and Medical Research Scientific Council (2015-); Chair, Medicare Benefits Schedule (MBS) Review Taskforce (2015-2020); Director, Cochlear Limited (2017-); Director, Mayne Pharma Group Limited (2014-); Director QBiotech Group Ltd (2018-), Companion (AC) in the General Division of the Order of Australia (2020).



JULIE OSBORNE

Appointed 30 May 2012

Ms Julie Osborne has extensive experience across a range of sectors including in excess of 25 years in financial services. She currently chairs the Board of Assetinsure Pty Limited and serves as a non-executive director on the Boards of Auto & General Insurance Company Limited, NSW Crown Holiday Parks Land Manager and Police Bank Limited. Julie has also consulted to KPMG in the Audit, Assurance and Risk Consulting Division regarding the strategic alignment of capability and business development. Previously, in her executive career, Julie was an Executive Director at Westpac Banking Corporation for 15 years where she led the Structured Finance business within the Treasury Division and served on various Westpac Group subsidiary companies in Australia and the United States. Julie is a past member of the Summerland Financial Services Limited Board and the Starlight Children’s Foundation NSW Advisory Board.



PROFESSOR MATTHEW PETERS

Appointed 8 October 2015

Professor Matthew Peters is a Respiratory Physician and Head of Respiratory Medicine at Concord Hospital. He holds academic appointments at Macquarie University and The University of Sydney. He has long had an interest in preventative health and was Chair of Action on Smoking and Health (ASH) for many years. He is a past President of the Thoracic Society of Australia and New Zealand. He has research interests in respiratory physiology and the pulmonary and cardiac responses to hypoxia. He was made a Member of the Order of Australia for significant services to medical education in the 2019 Honours list.



SIMON BLACKBURN

Appointed 20 September 2013

Director, The Hunger Project Australia (2014-), Senior Partner, McKinsey & Company, Sydney (2012-), Partner, McKinsey & Company, Sydney (2008-2012), Partner, McKinsey & Company, Boston (2004-2008), Consultant, McKinsey & Company, Boston (1997-2004), Director, Parents as Teachers, USA (2007-2013), Director Massachusetts STEM collaborative, USA (2004-2007), Research Engineer, Telstra (1992-1993).



JAYNE SHAW

Appointed 12 October 2016

Ms Jane Shaw has significant experience in healthcare management and an experienced clinical background in nursing. She has acted in senior management roles in two Australian private hospitals and established an Australian and international consulting business which was sold to Healthsouth, a large US Healthcare company. After this, she became the co-founder of Vision Group, a business that was successfully listed on the ASX. Ms Shaw has been a member of several private healthcare boards involved with specialist consolidation including cardiology, cancer care, orthopaedics, and women's health and has continued to work with private equity firms on local and international healthcare transactions. She also holds positions on the boards of Mable Technologies, the Woolcock Institute of Medical Research, and the Hareda Foundation, and as Chairman of BCAL Diagnostics.



DAVID MACINTOSH AM

Appointed 7 April 2021

Member of the Order of Australia 2011, awarded National Medal for Service 2014, Chairman, The Macintosh Foundation, Macintosh Chair of Paediatric Respiratory Medicine – Endowed Chair 29 November 2005 in perpetuity; Founder since 2013 and Benefactor since 2007, Royal Alexandra Hospital for Children - The Children's Hospital at Westmead; Director, The Australian Lung Foundation (1994-2013); Governor, St Vincent's Hospital, Curran Foundation; Life Governor, Melanoma Institute of Australia; Deputy Chairman, Ainsworth Charitable Foundation (2016-); Executive Chairman, Manager Director and Independent Director of ASX listed public companies and private companies over 28 years; 35 years of Senior Management and Director level in the Transport and Construction Industries in Australia and Europe; Actively involved in the Surf Life Saving movement for over 50 years; Life Member, Long Reef Surf Life Saving Club Inc.; Life Member, Collaroy Surf Life Saving Club Inc.; Life Member, City Tattersalls Club; Director, Vice President, United Nations Australia Association (NSW) 2017-2019; Appointed Australia's United Nations Goodwill Ambassador Oceans – Life Under Water SDG-14 and The Pacific, 2018–2019 and Principal Advisor, Marine Life, and Oceans and The Pacific–United Nations Association of Australia (2019-); Awarded Honorary Associate Life Membership TSANZ 2020; Appointed to the Board of ARC in 1997; President of ARC (2000-2013, 2019-); Vice President of ARC (2013-2019); Elected Life Governor of ARC in 2010. Director, Woolcock Institute of Medical Research (2000-2011 and 2021-).



FIONA CAMPBELL

Appointed 22 February 2017

Fiona Campbell was admitted to practise law as a solicitor in the Supreme Court of New South Wales in 1993. She is currently a solicitor in private practice at Vizzone Ruggero Twigg Lawyers (1997-) specialising in plaintiff medical negligence and other personal injury litigation. Fiona has a particular interest in psychiatric injury and forensic mental health. She has conducted many cases for plaintiffs in numerous areas of medical specialties including orthopaedic surgery, obstetrics, maternal-foetal medicine, neurosurgery, infectious diseases, ophthalmic surgery and oncology. Prior to her employment with VRT Lawyers, Fiona commenced her legal career at Blake Dawson Waldron (now Ashurst) where she joined the insurance (Medical Defence) practice group acting for a large medical indemnity insurer, United Medical Defence. Fiona gained wide-ranging experience and medical knowledge acting for doctors in civil litigation as well as disciplinary and Health Care Complaints Commission proceedings.

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2020

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