



UNSW
SYDNEY

Australia's
Global
University



2022
ANNUAL
REPORT

HoS WELCOME

IT IS A PLEASURE TO INTRODUCE THE 2022 ANNUAL REPORT.

While COVID-19 continued to pose a health risk throughout the year, the shift in perspective now considers it a challenge we must live with, marking a relief as the difficulties of the past few years recede. The campus has rejuvenated with the resurgence of face-to-face teaching, research, and social events. Notably, our undergraduate and postgraduate coursework students are once again experiencing university life through a blend of face-to-face and online learning, accompanied by on-campus social activities. Additionally, many of our international coursework and research students successfully reached UNSW to complete their studies.

The balance of on-campus and online learning activities throughout the year was well-received by our students, as reflected in the School's consistently strong myExperience Teaching scores. I appreciate the efforts of all staff in creating a stimulating and interactive learning experience for our students.

The School continued to perform strongly across UNSW's three pillars of Educational and Research Excellence, and Social Impact, Engagement & Leadership. The various achievements of our students and staff are highlighted throughout this report.

The School is exceptionally proud of our students' broad ranging achievements. This report highlights several of these achievements and awards, including our undergraduate prize winners, research scholarship recipients, Industry Training poster presentation winners, postgraduate poster competition winners, and awardees in the Materials Australia annual student thesis competition.

Our very active student societies continue to work tirelessly in engaging with both new and existing students and our industry partners, and for creating a very close-knit School community. The School expresses gratitude to our 2022 undergraduate (MATSOC) and postgraduate (PGSOC) society presidents, Scott Jones and Hein Nguyen, and their Executive Committees for their incredible efforts throughout the year. Highlights of their events are provided in this report. We warmly welcome the incoming 2023 Executive Committees led by Louise McGuiggan (MATSOC) and Hossein Salehi (PGSOC), and we are confident that their teams will continue the exceptional efforts of the previous committees.

A significant staff highlight of the year was the announcement that Scientia Professor Veena Sahajwalla was named the 2022 NSW Australian of the Year! The School takes great pride in Veena's achievements, and this major accolade further underscores her enduring leadership as an exceptional Australian Scientist and Engineer.

The School celebrated several academic staff promotions in 2022: Dr Tao Wan was promoted to Lecturer, Drs Judy Hart, Damia Mawad, Kevin Laws, and Pramod Koshy were promoted to Associate Professor, and Associate Professor Sophie Primig was promoted to Professor. Other staff highlights include Sophie's Dean of Science Research Excellence Award, and Bill Joe's Values in Action Award. Dr Samane Maroufi was also honoured with the 2022 Vice-Chancellor's Award for Outstanding Contributions to Student Learning (Early Career). Lastly, the School welcomed Dr Zhi Li as an ARC Future Fellow and Scientia Senior Lecturer.

In terms of research, the School's integrated structure, featuring an enabling platform supporting four societal impact themes, has proven highly successful. Theme Leaders have been proactive in promoting their research themes both within the university and external communities. A notable achievement is the series of one-day mini-symposia, fostering a collaborative and engaging environment, especially beneficial for our research students and early career researchers. A comprehensive report on our research theme activities is provided herein.

Our research staff continue to cement their internationally leading reputations for research excellence, winning major grants through the ARC Discovery, Linkage, Fellowship, Infrastructure, and Industrial Transformation Research Hub schemes, as well as from other external funding agencies and industry partners. Additionally, they played a crucial role in securing the University's successful Trailblazer grant on Recycling and Clean Energy. This initiative, which received over \$200M in total funding, includes Veena Sahajwalla, Pramod Koshy, and Chris Sorrell as chief investigators, along with their industry partner investigators. Special congratulations go to Veena (and the SMaRT Centre team) for leading one of the four priority themes: Recycling and MICROfactories! Research excellence from our students and staff is further demonstrated through their published works in world-leading

multidisciplinary journals, including Science, Science Advances, Nature, Nature Materials Reviews, Nature Photonics, Nature Chemistry, and Nature Communications, in addition to numerous publications in the highest-calibre disciplinary journals in their respective fields. A summary of the School's 2022 research funding and publications is contained herein.

The School remains highly engaged in future student outreach, hosting various face-to-face events throughout the year. Our significant presence at UNSW's Open Day, held on campus for the first time since 2019, is crucial for attracting potential students. Marcus Wong led the coordination of the event, involving numerous student and staff volunteers, ensuring its resounding success.

In summary, the School has successfully overcome the challenges of the past few years, maintaining a strong position and delivering excellent outcomes on all fronts.

I close by thanking Nicole Cooney, Chris Seymour, and various other staff and students for producing this annual report. I hope you enjoy reading about our various achievements in 2022.

**PROFESSOR
MICHAEL
FERRY**

**HEAD OF
SCHOOL**



NUMBERS AT A GLANCE

2023

UNDERGRADUATES

77

MASTERS BY COURSEWORK

123

HIGHER DEGREES STUDENTS

31

RESEARCH STAFF

\$4,327,032

NEW GRANT FUNDING

\$11,497,049

RESEARCH FUNDING

\$1,225,771

STRATEGIC UNSW INCOME 2022

REFEREED RESEARCH PUBLICATIONS 2022

422

ACADEMIC STAFF



HONORARY PROFESSOR SAMMY CHAN

Sammy's research interests are in the areas of energy materials, hydrogen storage and metal matrix composites (MMCs).



ASSOCIATE DIRECTOR OF EMU ASSOCIATE PROFESSOR SHERY CHANG

Shery Chang joined UNSW in 2020 as an Associate Professor and Associate Director of the Electron Microscope Unit, Mark Wainwright Analytical Centre. Her research uses state-of-the-art transmission electron microscopy and spectroscopy to study structure-property relationships in a range of advanced functional materials, including nano-photonics materials, wide bandgap materials and nano catalysts. In addition, she is developing new strategies to enable an understanding of material properties over multiple length and energy scales, including machine learning of big data sets, as well as correlative, multi-modal strategies.



EMERITUS PROFESSOR ALAN CROSKY

Alan's research focuses on the effect of structure (both micro and macro) on mechanical behaviour. Specific areas of research include directed fibre placement in fibre reinforced plastic composites, failure of composites, natural fibre composites, wood plastic composites and engineering failure analysis.



PROFESSOR DEWEI CHU

Dewei's research interests include design, fabrication and printing of metal oxides and sulfides based nanoionic materials for nanoelectronics (including sensors, memories and transistors), as well as energy storage and conversion materials (including supercapacitor electrodes, solid-state electrolytes, and electro-catalysts). His group targets to develop solution processed, printable and flexible nanoionic materials for cost-effective and energy-efficient wearable electronics.



ASSOCIATE PROFESSOR JOHN DANIELS

John's research focuses on the understanding of the structural origin of physical properties of materials. This research has, to date, been primarily directed in the field of electro-mechanical materials where a wide range of underlying structural processes at different length scales leads to the coupling of mechanical load and electrical charge.



EDUCATION FOCUSED LECTURER DR CAITLIN HEALY

Caitlin's research interests are the design, development and characterisation of new metallic alloys. With a focus on single phase high entropy alloys and using the compositionally complex designs to enhance binary intermetallics.



HEAD OF SCHOOL PROFESSOR MICHAEL FERRY

Michael's research interests are concerned mainly with the mechanisms of microstructure and texture evolution during solidification, solid-state phase transformation and deformation & annealing with recent emphasis on the mechanical and physical properties of crystalline and amorphous light metals.



ASSOCIATE PROFESSOR RAKESH JOSHI

Dr Rakesh Joshi FRSC AFICChemE is a Senior Lecturer at the School of Materials Science and Engineering and leading a Graphene Research Group. He is the Fellow of the Royal Society of Chemistry (FRSC), A/Fellow of the Institution of Chemical Engineers (AFICChemE) and among a select group of researchers who have been awarded each of the world's most prestigious relevant International Research Fellowships; the JSPS Invitation Fellowship; the Humboldt Fellowship and the Marie Curie International Fellowship. He is currently leading various industry funded research projects on application. His research interest includes experiment design for application of graphene and 2D materials, membranes, separation and purification, diffusion mechanism.



ASSOCIATE PROFESSOR JUDY HART

Judy's research interests are in developing new semiconducting materials, particularly solid solutions and doped materials, for use in renewable energy applications such as photocatalysis and solar cells. The focus of this work is understanding relationships between composition and properties and finding effective ways of using computational and experimental techniques in parallel.



ARC FUTURE FELLOW & SCIENTIA FELLOW ASSOCIATE PROFESSOR KRIS KILIAN

Kris's research group explores how natural and synthetic materials influence the signalling that controls cell fate and function. Combining both 'soft' and 'hard' materials chemistry with nano- and micro-fabrication techniques, they specialise in designing and developing synthetic tissue models to more accurately explore cell signalling and tissue assembly across numerous physiological and pathological conditions including development and cancer.



ASSOCIATE PROFESSOR KEVIN LAWS

Kevin's research interests are concerned with the design, development and fundamentals of new or advanced metal alloys; specifically amorphous alloys (bulk metallic glasses) and single-phase high entropy alloys. This is closely tied with the design and development of new alloy production technologies and applications for these materials.

ACADEMIC STAFF



NHMRC EARLY CAREER FELLOW SCIENTIA SENIOR LECTURER TUSHAR KUMERIA

Tushar is a Scientia Senior Lecturer and an Australian National Health and Medical Research Council (NHMRC) Early Career Fellow with the School. He has co-authored over 84 journal publications in top-tier journals in the field of nanomaterials, biomaterials, drug delivery, and sensing. Tushar has been successful in securing over \$3.6 million in competitive research grants including an NHMRC fellowship, 2 ARC Discovery projects, a US Dept of Defence grant, and several others. Tushar's group focuses on: 1. Porous materials-based drug delivery systems for efficient and targeted delivery. 2. Porous materials/ Polymer composite scaffolds and implants for tissue engineering. 3. Porous photonic crystals-based point-of-care sensors for diagnostics and environmental applications.



PROFESSOR SEAN LI DIRECTOR OF MATERIALS AND MANUFACTURING FUTURES INSTITUTE

Sean's research interests mainly focus on advanced multifunctional materials including 2D electron gases of complex hetero-structured oxides, energy materials and other electrical and optical oxide based materials.



ASSOCIATE PROFESSOR DAMIA MAWAD

Damia's research interests are in conductive polymers as active materials in flexible organic bioelectronic devices. She leads a multidisciplinary research team that brings expertise in chemistry, physics and material science aimed at developing chemical strategies and electronic circuitry towards the realisation of flexible bioelectronics with advanced functionalities.

EDUCATION FOCUSED LECTURER SAMANE MAROUFI

Dr. Samane Maroufi is Lecturer at School of Materials Science and Engineering, UNSW where she teaches and conducts research. Her research spans across the fields of high temperature pyrometallurgical processing, sustainability of materials process (waste recycling and materials transformation) and synthesizing nano-structure materials from waste for energy storage devices. As an expert on innovative green solutions for waste challenges, she has considerable experience of working closely with industries, leading industrial projects in SMaRT Centre, and incorporating research into the manufacturing industry. Since 2018, Samane has made a significant contribution to education through teaching, fully



designing, developing, and delivering courses related to waste recycling and sustainability. Reflecting on her teaching pedagogy and practice earned her recognition against global standards as a Fellow of the Higher Education Academy (FHEA), awarded by Advance HE in 2021 and she was also the recipient of 2022 UNSW Vice-Chancellor award for outstanding contributions to student learning (early career).



DEPUTY DEAN - RESEARCH PROFESSOR PAUL MUNROE

Paul's research is focused on the characterization of materials using electron microscopy and related methods. This includes publication of a significant body of work focused on ion beam technology. He is also active in a range of areas in characterization of materials such as functional thin films, intermetallic alloys and biochars.



EDUCATION FOCUSED LECTURER BENJAMIN PACE

Dr Ben Pace joins us as an Education Focused Lecturer, with a teaching focus primarily in foundational materials science and sustainable materials. He also maintains a number of research interests spanning the range of thin film deposition technologies, particularly for highly tailored mechanical, biomedical and electrical/energy applications such as photovoltaics. More broadly, Ben maintains a strong interest and publishes in the: 1. Characterisation of coating morphology and behaviours, and; 2. Exploration of micro and nanoscale interactions that occur at interfaces between organic and metallic or mineral phases in composite products, biochars, soils and plant matter.



EMERITUS PROFESSOR OLEG OSTROVSKI

Oleg's major contributions are in the field of pyrometallurgical technologies for minerals processing, iron-, steel- and ferroalloy-making. Areas of research include thermodynamics, kinetics and mechanisms of metallurgical reactions, properties of molten metals and slags, reduction, smelting and refining processes, and environmental issues in pyrometallurgy.

ARC DECRA FELLOW & SCIENTIA FELLOW PROFESSOR SOPHIE PRIMIG

Sophie's current research contributions are in processing-structure-property relationships of structural metallic materials for high-performance applications such as aerospace. Currently, these materials include Ni-based superalloys and advanced steels processed by industrial forging or metal 3D printing. She combines state-of-the-art microscopy techniques with mechanical testing and contemporary modelling approaches. Her research philosophy is to achieve a balance between fundamental discovery and industrial application.

DIRECTOR - SMART CENTRE, ARC LAUREATE FELLOW SCIENTIA PROFESSOR VEENA SAHAJWALLA

As a leading expert in the field of recycling science, and founding Director of the Centre for Sustainable Materials Research & Technology at UNSW, Professor Veena Sahajwalla is producing a new generation of green materials, products and resources made entirely, or primarily, from waste. Veena also heads the ARC Industrial Transformation Research Hub for 'green manufacturing' - a leading national research centre that works in collaboration with industry to ensure new science is translated into real world environmental and economic benefits. Veena has been extensively recognised for the innovation and significance of her work, including via election to be a Fellow of the esteemed Australian Academy of Science.



ACADEMIC STAFF



PROFESSOR JAN SEIDEL

Jan's research interests are in the area of advanced electronic, photonic and spintronic materials, including scanning probe microscopy, nanotechnology enhanced photovoltaics, electrochromism, nanoscale phase separation, nano-optics, spectroscopy, plasmonics, x-ray based synchrotron techniques and high-resolution transmission electron microscopy.



PROFESSOR CHRIS SORRELL

The main focus of Chris's research has been the processing of ceramics, including fabrication, forming, and densification of bulk materials, thick films, and thin films. While his overarching approach is the use of phase equilibria to inform his strategies, his emphasis on publications is the elucidation of phenomenological mechanisms underpinning the data. His current research is focussed on chemocatalytic, biocatalytic, and photocatalytic nanomaterials for energy, environmental, and biomedical applications.

**DEPUTY HEAD OF SCHOOL,
SENIOR LECTURER
DR OWEN STANDARD**

Owen's research is in the processing/microstructure/property relationship of advanced ceramics for functional applications including colloidal processing of electroceramics, compositional and microstructural modification of bioactive and bioinert ceramics, sol-gel deposition of functional ceramic coatings, development of sol-gel coatings on textile fibres and ceramic coatings on biomedical alloys.

**PROFESSOR
NAGARAJAN
VALANOOOR**

Nagy's most significant contribution is in the field of thin film epitaxy functional property relationships for ferroelectrics, dielectrics and multiferroic nano-materials. Research includes thin-film oxide epitaxy, scanned probe microscopy of functional materials and Landau-Ginzberg modelling of phase transitions. Nagy is also our postgraduate coordinator.

**ASSOCIATE
PROFESSOR
DANYANG WANG**

Danyang's most significant contribution is in the field of growth and characterization of functional oxide thin films and heterostructures for nanoelectronic and energy applications. Areas of research include thin film technology, functional materials and devices, micro/nanofabrication techniques, heterointerface effects.



PROFESSOR TOM WU

Tom's research focuses on the vapour- and solution-based synthesis of transition-metal oxides and hybrid halide perovskites, in the forms of thin films, nanomaterials and mixed-dimensional nanocomposites. His team is interested in exploring composition-structure-property correlations in emerging materials, targeting at diverse disruptive electronic, data storage and energy conversion technologies.



**ASSOCIATE PROFESSOR
RUNYU YANG**

Runyu is focussed in the field of particle/powder science and technology. His primary research interests lie in particle technology, aiming to understand the behaviour of particles through rigorous modelling and simulation at microscopic and macroscopic levels. This knowledge is then applied to solving problems in various industrial applications.



**EMERITUS
PROFESSOR
DAVID YOUNG**

David's most significant contributions are in the field of high temperature alloy-gas interactions. Particular emphasis is placed on the diffusion and phase transformation processes which support these reactions. Current work includes fundamental studies of corrosion by CO₂, metal dusting reactions and water vapour effects on oxidation.

LECTURER DR JIANLIANG (JACK) YANG

Jack is Lecturer in Material Studies with Artificial Intelligence at the School of Material Science and Engineering and Materials and Manufacturing Futures Institute, UNSW. He is also a member of the Research Technology Service Team under the office of the Pro-Vice-Chancellor (Research Infrastructure) at UNSW, to provide support for computational research on HPC across the University. Jack obtained his BSc(Nanotech) in 2008 and PhD in 2011 from UNSW. Before returning to UNSW in 2017, Jack had been Postdoctoral Research Fellow in Westfälische Wilhelms-Universität Münster, Germany and University of Southampton, UK where he worked on developing new structure prediction and machine-learning methods for discovering new functional organic materials. Currently, Jack is leading his own group in AI-driven material studies in UNSW with major research interests on the electron and phonon dynamics in perovskites for electronic, photovoltaics, energy storage and catalytic applications.

**PROFESSOR
JIANQIANG ZHANG**

Jianqiang's research is focused in the field of gas-solid reactions at high temperature, including high temperature corrosion and processing metallurgy. Research emphasis is on reaction thermodynamics and kinetics, phase transformation and characterisation, reaction mechanism understanding, sustainable materials processing and new materials development.



SCHOOL STAFF

RESEARCH STAFF

Salim Al Khadhoori	Microfactorie Engineer
Ghazaleh Bahman Rokh	Postdoctoral Fellow
Ehsan Farabi	Postdoctoral Fellow
Luke Giles	Postdoctoral Fellow
Vivasha Govinden	Research Associate
Nima Haghdadi	Senior Research Associate
HERIYANTO	Microfactorie Engineer, SMaRT
Rumana Hossain	Research Associate
Jing-Kai Huang	Research Associate
Rasoul Khayyam Nekouei	Research Associate
Yee Khine	Postdoctoral Fellow
Ganesh Kokil	Research Assistant
Pramod Koshy	Associate Professor
Hanchen Li	Postdoctoral Fellow
Mengyao Li	Research Associate
Chun-Ho Lin	Postdoctoral Fellow
Tiziana Musso	Postdoctoral Fellow
Farshid Pahlevani	Associate Professor
Bo Qu	Industry Engagement Officer
Sajjad Seifi Mofarah	Senior Research Associate
Chuhan Sha	Postdoctoral Fellow
Pankaj Sharma	Research Associate
Sara Taherymoosavi	Research Fellow
Felix Theska	Postdoctoral Fellow
Tao Wan	Postdoctoral Fellow
Lucas Way	Microfactorie Engineer
Martin Xu	Research Fellow
Dawei Zhang	Postdoctoral Fellow
Dylan Wei Zhang	Research Associate
Ji Zhang	Postdoctoral Fellow
Qi (Peggy) Zhang	Research Associate

ADMINISTRATIVE STAFF

Alan Chow	Administrative Officer
Nicole Cooney	Projects Officer/Executive Assistant to HoS
Kim Foster	Executive Assistant to Prof Sean Li
Michael Lai	Student Advisor
Peggy Leung	Executive Assistant to Prof Veena Sahajwalla
Alec Rowan	Administrative Officer
Marcus Wong	Community and Engagement Officer
Qing Xia	Research Support Officer
Lucy Zhang	School Manager

TECHNICAL STAFF

Majid Asnavandi	Senior Technical Officer
Soo Chong	Technical Officer
Jane Gao	ITC Support Officer
Anirban Ghose	Head of Microfactories, SMaRT Centre
William (Bill) Joe	Technical Officer
Wenxian Li	Technical Officer
Xi Lin	Technical Officer
Irshad Mansuri	Research Operations Manager, SMaRT Centre
David Miskovic	Technical Officer
Thuan Nguyen	Research Officer
Thiam Teck (TT) Tan	Senior Research Scientist
George Yang	Technical Officer
Anthony Zhang	Safety Officer
Qi (Peggy) Zhang	Technical Officer

INDUSTRY ADVISORY BOARD

INDUSTRY REPRESENTATIVES:

Lyndon Edwards	ANSTO
Sean Windred	BGE
Jason Hodges	Bluescope
Cathy Inglis – Chair	Brickworks Ltd
Steven Kennedy	Cochlear
Holstein Wong	Schneider Electric
George Melhem	Perfect Engineering
Michael Gow	PGH Bricks and Pavers
Adam Berkovich	Rio Tinto
Andrew Petersen	Sustainable Business Australia
Edward Humphries	Weir Minerals

UNIVERSITY REPRESENTATIVES:

Sven Jogge	Dean of Science, UNSW
Michael Ferry	Head of School, UNSW School of Materials Science & Engineering
Owen Standard	Deputy Head of School, UNSW School of Materials Science & Engineering
Lucy Zhang	School Manager, UNSW School of Materials Science & Engineering

SCHOOL COMMITTEES

SCHOOL BOARD

Michael Ferry (Chair)
Academic Staff
Professional Staff (Technical)
Professional Staff (Administrative)

SCHOOL ADVISORY COMMITTEE

Michael Ferry (Chair)
Owen Standard
John Daniels
Peggy Zhang
David Miskovic
Lucy Zhang

LEARNING & TEACHING COMMITTEE

Owen Standard (Chair)
Michael Ferry
Judy Hart
Caitlin Healy
Damia Mawad
Nagarajan Valanoor
Runyu Yang

POSTGRADUATE COORDINATORS

Nagarajan Valanoor
Danyang Wang

UNDERGRADUATE PROGRAM COORDINATOR

Owen Standard

RESEARCH COMMITTEE

Jan Seidal (Chair)
Michael Ferry
Dewei Chu
Rakesh Joshi
Kris Killian
Sean Li
Sophie Primig
Veena Sahajwalla

HIGHER DEGREE RESEARCH COMMITTEE

Nagarajan Valanoor (Chair)
John Daniels
Michael Ferry
Kris Killian
Damia Mawad
Danyang Wang
Runyu Yang
Jianqiang Zhang

WORK HEALTH & SAFETY COMMITTEE

Jianqiang Zhang (Chair)
Michael Ferry
Rakesh Joshi
Teresa Kahwati (Faculty Sci.)
Florence Lui (HDR)
David Miskovic
Owen Standard
Anthony Zhang (School Safety Officer)

HONOURS PROJECTS COORDINATOR

Kevin Laws

MASTER BY COURSEWORK COORDINATOR

Runyu Yang

MARKETING & RECRUITMENT COMMITTEE

Jeremy Platt (Chair)
Nicole Cooney
Michael Ferry
Ben Pace
Owen Standard
Lucy Zhang

EQUITY, DIVERSITY & INCLUSION COMMITTEE

Damia Mawad (Chair)
Michael Ferry
Owen Standard
Lucy Zhang
Postgraduate Student (Tasmia Zaman)
Undergraduate Student (Naman Bansai)

WOMEN IN MATERIALS COMMITTEE

Judy Hart (Chair)
Caitlin Healy
Kris Killian
Samane Maroufi

MISCONDUCT AND GRIEVANCE OFFICER

Owen Standard

FACULTY UNDERGRADUATE ASSESSMENT

Owen Standard
Sammy Lap Ip Chan

SCHOOL SCHOLARSHIP COMMITTEE

Michael Ferry (Chair)
Owen Standard
Lucy Zhang

SCHOOL INFORMATION TECHNOLOGY COMMITTEE

Michael Ferry (Chair)
Paul Eccleston (UNSW IT)
Jan Gao (UNSW IT)
Kathleen Gray w(FSci. IT Business Partner)
Owen Standard
Lucy Zhang

SPACE COMMITTEE

Michael Ferry (Chair)
Lucy Zhang
Anthony Zhang

2022 FINANCIAL PERFORMANCE

INTRODUCTION

Third year into the Covid pandemic, the University has been using the bottom-up build budget model, i.e. each staff on the book is checked line by line to ensure our salary budget is accurate.

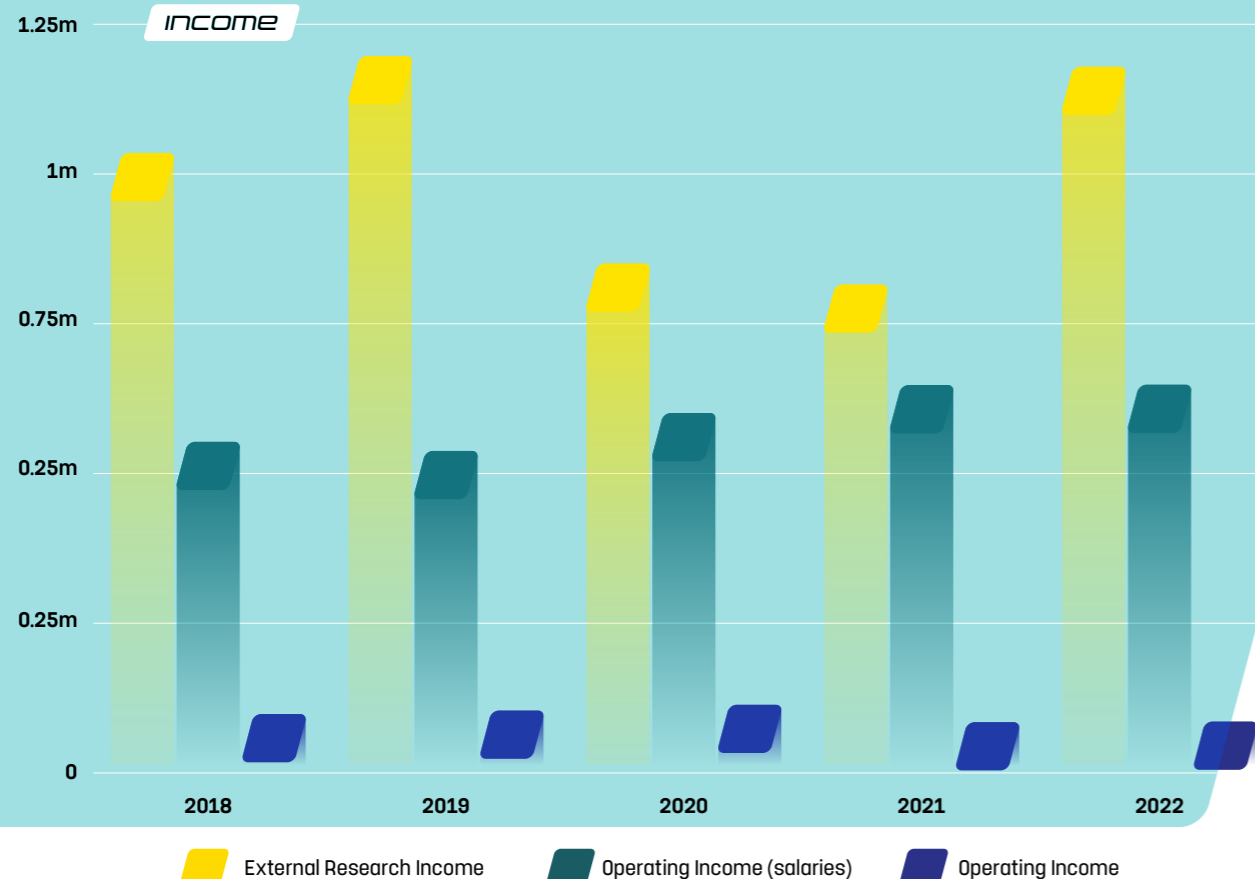
School's non-people budget remained flat as shown in the chart below. In 2022, we have been given a budget of strategic recruitment for one professional technical support role for teaching and research.

The school recruited Dr Majid Asnavandi, who had extensive prior experience in the School of Chemistry at UNSW before coming to our School.

INCOME

The School receives income from three primary sources: Operating income is allocations from the University, via the Faculty, to fund the day to day running of the School. For the 2022 financial year, budget allocations have been made using our current budget allocation principles. It is still based on enrolment plan student load from local and international undergraduates, postgraduate course work and higher degree research students.

Research income is from research grants obtained from bodies outside the university. Past and current research performance, and future research potential, are incentivised and supported by the University through Strategic Funds. In 2022, we are glad to see our external research has bounced back.



OPERATING INCOME

Operating income budgets have been derived from teaching revenue, research revenue from Commonwealth Government, indirect cost recoveries on contract research and other revenues projected from historical levels, adjusted for price and volume. Our allocated operating budget primarily is used for salaries for teaching and research academics, technical and professional staff. Even though several the School's academic staff hold externally funded research fellowships, there is invariably a shortfall in these fellowships which the School covers from its operating budget allocation, deriving a specific, though capped, allocation from the University for this purpose. Transitional fellow fund has been introduced to expect School to cover the gap over a three-year period.

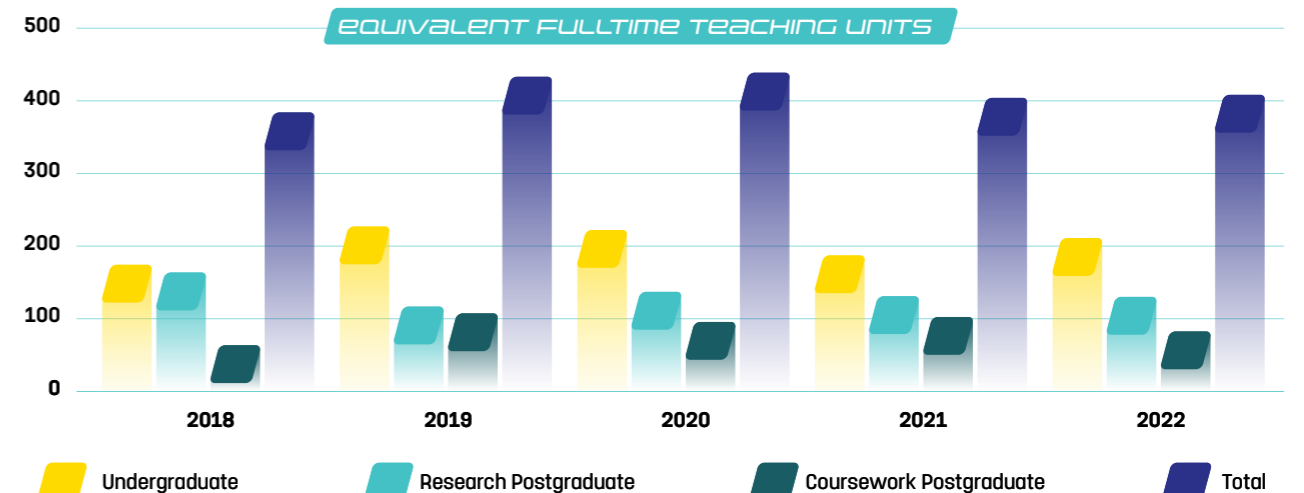
This budget is also used to pay for casual teaching staff. Other major expenditure items are support of teaching laboratories, daily operational expenses, marketing and undergraduate recruitment, allocations to teaching staff based upon research supervision and various research outputs including publications and provide start-up funds for newly started staff. We have Dr Samane Maroufi joined us as teaching focussed academic. We have Dr Zhi Li joined us as ARE Future Fellow.

The table below shows the breakdown of School operating income. Due to Covid budget cut, we did not receive capex as allocation but we received allowed expenses to purchase two items of capex equipment to sustain our teaching and research activities.

INCOME		
University:		
Teaching	\$9,554,212	
Other	\$103,306	\$9,657,518
Allocation to School:		
Committed people related budget	\$7,593,000	
Non committed people cost credit	-\$256,000	
Strategic recruitment adjustments	\$145,000	
		\$7,482,000

EXPENDITURE		
Salaries	\$6,681,959	
Non-salary	\$783,932	
Capital expenses	\$155,261	\$7,621,153
Variance		\$9,518,365

The primary driver for operating income at the School level is undergraduate and postgraduate teaching load. The graph below shows slight growth in the undergraduate program despite the geopolitical tension in our international market.



2022 FINANCIAL PERFORMANCE

UNSW STRATEGIC FUNDING

UNSW aspires to be Australia's global university, improving and transforming lives through excellence in research, outstanding education and a commitment to advancing a just society. In 2022, these included:

PROJECT NAME	MANAGER	(\$)
SHARP hire	Tom Wu	531,514
Scientia Fellow Support	Tushar Kumeria	50,000
Scientia Fellow Support-Salary	Kristopher Kilian	29,461
Scientia Fellow Support	Kristopher Kilian	25,000
Scientia Fellow Support Salary	Sophie Primig	226,328
Scientia Fellow Support	Sophie Primig	46,675
Scientia Fellow Support Salary	Zhi Li	42,996
Scientia Fellow Support	Zhi Li	37,500
SafetyNet	Tushar Kumeria	70,358
Strategic Research Support	Sean Li	248,650
Strategic post Laureate	Veena Sahajwalla	275,839
Goldstar Award-Sophie Primig	Sophie Primig	34,500
Goldstar Award-Tushar Kumeria	Tushar Kumeria	30,000
CTT Support Award-Ben Pace	Benjamin Pace	15,000
SPF02 Materials	Various	114,000
SPF04 Materials	Various	107,950
Total:		1,885,771

RESEARCH INFRASTRUCTURE SCHEME

The University receives a Research Infrastructure Block Grant. Through competitive internal grant process, UNSW can provide a world-class research environment to attract and retain a critical mass of research excellence. In 2022, the School was awarded the following major items:

Lead	(\$)
John Daniels Project title: <i>Upgrade of piezoelectric testing equipment</i>	110,000
Tushar Kumeria Project title: <i>Multi-angle light scattering with auto-dosing unit</i>	90,000

EXPENDITURE

The main component of School expenditure is staff salaries which comprised over 80% of total non-capital operating expenditure. This is in line with many schools across the campus. The table below shows the School's main expenditure items in 2022.

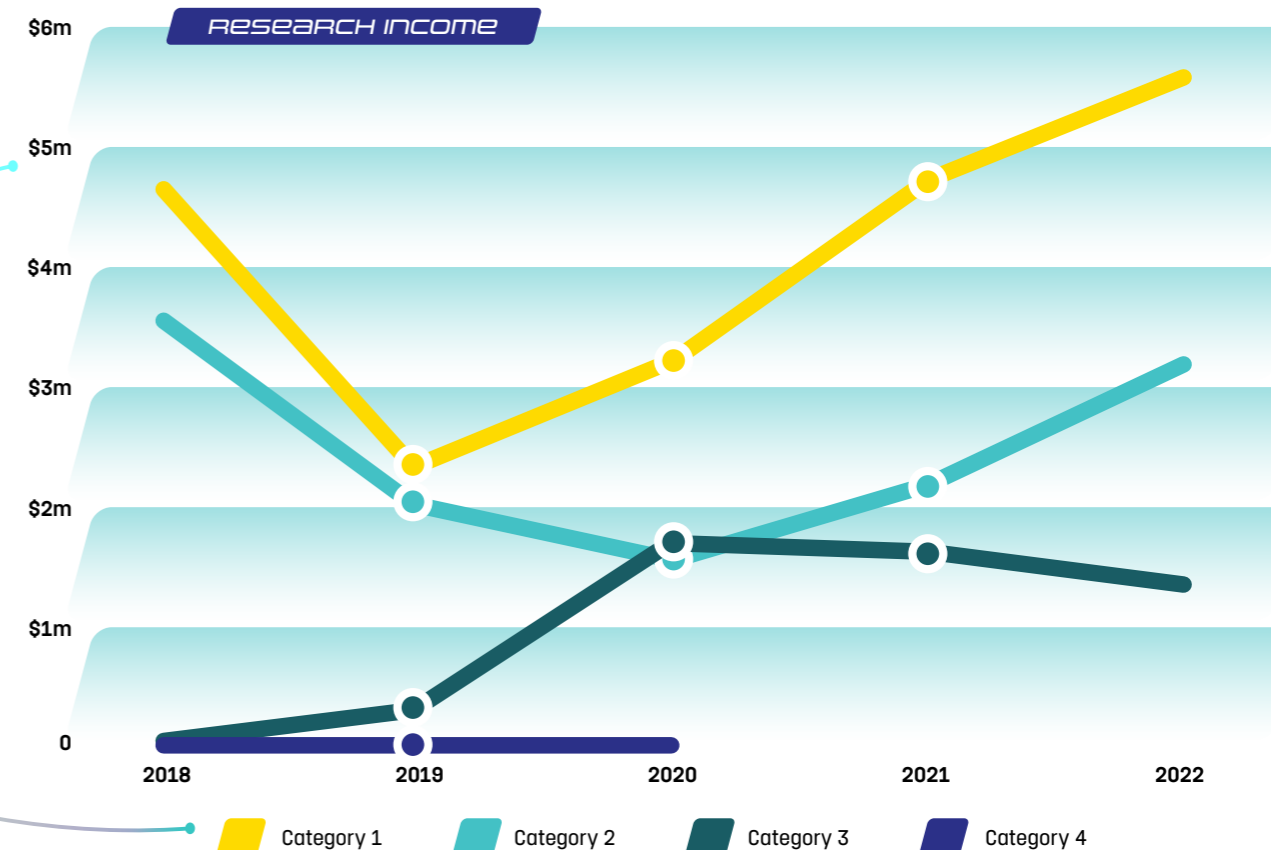
ITEM	(\$)
Student research allocations	100,000
Undergraduate scholarships	30,000
Publications allocation	100,000
Teaching laboratories	50,000
Safety	12,000
Staff start up	83,000
Education focused staff support	20,000
Early career research grant	20,000
School office	35,000
Marketing	15,000
Repair, maintenance & building utilities	25,000
Lower campus store salary contribution	8363
Undergraduate's association support	5,000
Postgraduate's association support	5,000

RESEARCH INCOME

The School's research income comprises the largest fraction of the overall income of the School. We had a successful outcome winning six new ARC Discovery Grants, including some notable first achievements. We also had six Chief Investigators from the school were awarded ARC LIFE grants. A worthy successful year slowly coming out of Covid dormancy.

LUCY ZHANG

School Manager



UNDERGRAD STUDIES

UNDERGRADUATE PROGRAMS OFFERED

The main undergraduate degree program offered by the School is a Bachelor of Engineering Honours (BEHons) in Materials Science and Engineering. The program consists of four years of full-time study and requires students to complete at least 60 days of approved industrial training (in materials engineering or a related field) and is fully accredited with Engineers Australia. In addition, the BEHons program is offered as formal structured combination with the following programs: Bachelor of Engineering Science in Chemical Engineering (BEHons/BSc); Bachelor of Commerce (BEHons/BCom); and a Master of Biomedical Engineering (BEHons/MBiomedE).

In the BE program students complete a common engineering first year, a common second year of fundamental materials engineering courses and mathematics courses, followed by more discipline-specific materials courses in Years 3 and 4, as well as an Honours research project in Year 4. Students major in either Materials Engineering, Ceramic Engineering, Functional Materials, Physical Metallurgy, or Process Metallurgy by selection of appropriate professional electives in Years 3 and 4 and an appropriate Honours research project in Year 4.

The School also offers a major in Materials Science in the Bachelor of Science (BSc) coordinated by the Faculty of Science. The BSc (Materials) consists of three years of full time study and Honours can be obtained by a further year of full-time study. The BSc can also be combined with degree programs in other Faculties, including Bachelor of Engineering, Bachelor of Arts, Bachelor of Law, etc. The major in Materials Science is also offered in the 4-year Bachelor of Advanced Science Honours (BAdvScHons) coordinated by the Faculty of Science.

The primary aim of the School's undergraduate programs is to deliver graduates possessing the fundamental knowledge, skills, and capabilities needed to succeed in the discipline of Materials Science and Engineering, as well as having the generic graduate attributes expected in a university graduate and, in the case of the BEHons program, having the Stage 1 graduate engineering competencies prescribed by Engineers Australia. The School's undergraduate programs are designed to have strong relevancy to today's material's industry and research whilst being adaptable to future trends and growth in the discipline.

NEW ENROLMENTS

Admission to the School's BE programs is through the Universities Admissions Centre (UAC) for local students. International students with appropriate qualifications apply through UAC International or directly through UNSW Apply Online. Enrolments into the School's BE programs (Table 1) have shown a decline over the past -5 years and this has been attributed to, in part, to the new trimester structure and a change to centralised management of program marketing. This decline is being addressed by various measures including a updating the School's BE program to align it with societal themes(see BE Program Revision below) and increasing of marketing activity at the School level.

Similar to previous years, the quality of the new local students was high as indicated by ATAR entry scores of >85 for the School's undergraduate programs with approximately 30% being female. Despite the decline in the number of first year enrolments, the School continues to have the largest undergraduate program in the discipline nationwide by a considerable margin and the total number of undergraduate students enrolled in the School's BE and double-degree programs in 2022 was approximately 200. Also, there is a significant number of first year students who will undertake the Materials Science major in the Faculty of Science's Bachelor of Science program (many in double degrees with other engineering disciplines) but meaningful data for first year intake is not available because many students do not declare their major until later years.

GRADUATING CLASS

The BE degree is awarded at Honours First Class (H1); Second Class Division 1 (H2/1), Second Class Division 2 (H2/2), or Pass classifications as determined by a weighted average mark calculated based on the year of study and the relative weighting of each course in the curriculum for that year. In addition, an exceptionally high level of attainment for H1 may be recognised by the awarding of the University medal. A summary of the graduating class is given in Table 2.

Table 1: First Year Intake (2018–2022) into the School's BE Programs

PROGRAM	2018	2019	2020	2021	2022
3131 BE(Materials Sci. & Eng.)	95	35	52	33	22
3132 BE(Materials Sci. & Eng.)/BEngSci.	6	1	6	11	3
3133 BE(Materials Sci. & Eng.)/MBiomedE	33	19	11	29	6
3134 BE(Materials Sci. & Eng.)/BCom	1	0	0	1	1
Total:	135	55	69	73	32

Table 2: 2021 Graduating Class

PROGRAM	H1 + Medal	H1	H2/1	H2/2	Pass	Total
3131/3135* BE(Materials Sci & Eng)	2	3	4	12	10	31
3132 BE(Materials Sci & Eng)/BEngSci						0
3133 BE(Materials Sci & Eng)/MBiomedE			7	10	1	18
3134 BE(Materials Sci & Eng)/BCom		1				1
3970 BSc (Materials Sci)		1				1
3972 BAdvSci(Materials Sci)			1			1
Total:	2	5	12	22	11	52

*In 2018, program codes changed from 3135-3136-3137-3138 to 3131-3134-3132-3133, respectively; had some students graduate from Program 3135 in 2022.

BE PROGRAM REVISION

In 2022, the School substantially revised its BE Hons (Materials Science and Engineering) program to update and renew the structure and content and to implement the School's strategic societal themes of Transport & Infrastructure, Biomedical & Health, Electronics & Communications, and Energy & Environment. The existing academic streams of Materials Engineering, Ceramic Engineering, Physical Metallurgy, Process Metallurgy, and Functional Materials were removed (the need for these was questioned in the last EA accreditation evaluation of the program) and replaced by a single, larger academic stream of Materials Engineering. The content and arrangement of core courses in Years 1 to 3 of the program were reviewed and revised, especially to improve coherency and sequencing, and to address any overlap or deficiencies. Computational and data handling methods have been explicitly integrated in selected courses throughout all years of the BE program. For Year 4, a new stand-alone materials selection and design course was introduced, and the suite of professional elective courses was revised to align with the 4 societal themes

and to include applied materials selection and design in each course. The existing Honours project course was split into separate courses of a research project and a data management and communication course, the latter course giving explicit evidence in student transcripts which is attractive for potential employers. The School's Industry Advisory Board was consulted and it provided input into the proposed changes. The program revision will continue in 2023 with submission of the revised program for University approval (with implementation of the new program in 2024 for the incoming cohort), detailed revision and design of course curricula and assessments, and curriculum mapping of the Stage 1 Engineering competencies prescribed by Engineers Australia. Details of the revised BE program can be found at: <https://www.handbook.unsw.edu.au/undergraduate/programs/2024/3131>

DR OWEN STANDARD

Undergraduate Program Coordinator

CO-OP SCHOLARSHIP PROGRAM

CO-OP SCHOLARSHIP PROGRAM

The Co-op Scholarship Program provides industry-funded scholarships to UNSW undergraduate students in various Faculties and degree programs. These scholarships provide students with a significant stipend (-\$20,000 per annum for 4 years) and substantial opportunity for industrial training with the sponsoring companies. For the School of Materials Science and Engineering, Co-op scholarships are an effective means to attract high-quality students into our discipline and to provide them with beneficial industrial training in the engineering sector.

Co-op scholarships in Materials Science and Engineering were introduced in 1989 and since then there have been a total of 132 scholarships from 30 different industrial sponsors. Co-op scholars are selected on the basis of their academic ability (successful students have ATARs typically 99+) as well as their communication skills, commitment and motivation, perseverance and resilience, teamwork skills, and leadership potential as well as passion and understanding for the materials science and engineering discipline.

Co-op scholars complete at least 68 weeks of structured and highly relevant industrial training with the sponsor companies which, from 2019, consists of 4 weeks at the end of year 1 (optional), 20 weeks during Term 3 of Year 2, and two 24 week placements in Year 3. Students are paid a scholarship stipend for the first 4 years of their Co-op program with an Honours scholarship possible for those students who elect to undertake their Honours research project with a sponsor company.

In 2022, there was a total of 5 scholarships across the current students provided by three industrial sponsors – Rio Tinto, Weir Minerals, and Bluescope Steel (see Table 1). The companies have been involved in the Co-op program for many years and their contribution to it and their role in the development of the Co-op scholars they have supported is highly valued and appreciated. One final year student completed their Honours research project with one of the sponsors and was employed by the sponsor on graduation.

Students take 5 years to complete their degree but this is offset by the scholarship and, more significantly, by the immensely valuable graduate skills, networking, and workplace experience obtained from the industrial training placements. Each IT placement is reviewed by the Academic Coordinator in the form of an interview with the scholar and sponsor representative(s) and by written appraisals of the placement by the scholar and sponsor.

Industry sponsors quantify the quality and value of work completed by the scholars during their placements to give the students meaningful feedback on the value (and importance) of their work to the business. The Co-op Program provides students with an ongoing professional development program to help them develop strong graduate attributes and to make a smooth transition to the workplace. The Co-op Program provides scholars with access to a range of support networks and academic mentor is assigned to each program cohort to offer specific program advice and guidance.

Workshops and training activities are offered throughout the duration of the scholarship and these provide an interactive environment for scholars to learn about professional expectations and ethics, reflect on their own work

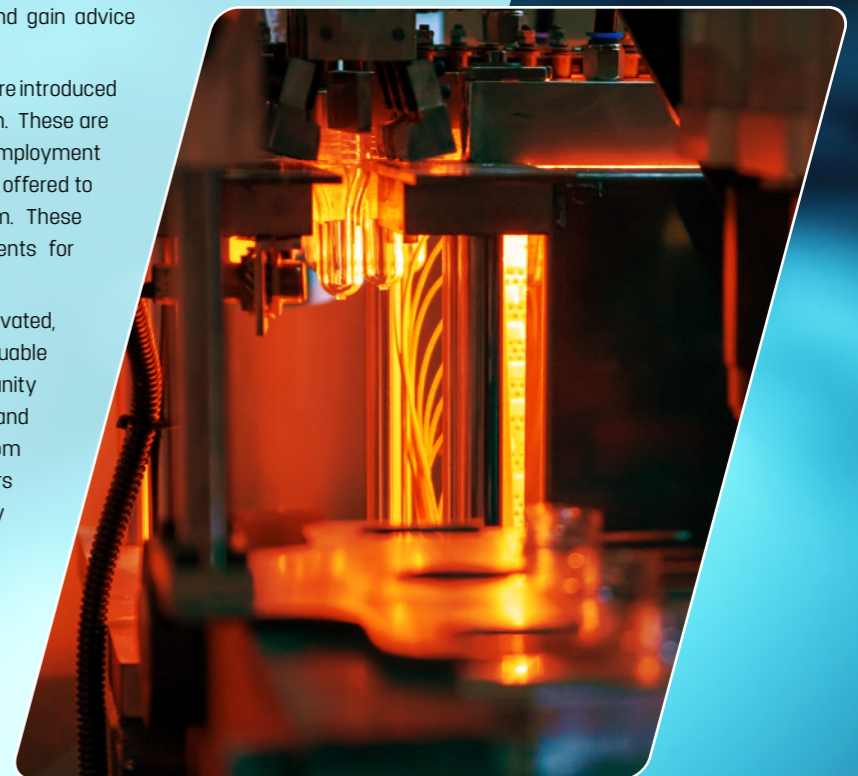
Table 1: Co-op Program in Materials Science and Engineering – (2018 to 2022)

INTAKE YEAR	2018	2019	2020	2021	2022
Current Year of Degree	4	3 (IT)	3	2	1
Number of Scholars	2	-	-	3	-

experiences individually and with peer support, and gain advice from industry representatives.

In 2022, single short-term internships of -\$20,000 were introduced to complement the main Co-op scholarship program. These are offered on an ad-hoc basis and involve full-time employment for 24 weeks with a Co-op industry partner and are offered to current students enrolled in the School's BE program. These internships provide valuable opportunity to students for professional experience prior to graduation.

The industrial sponsors are provided with highly motivated, capable students to complete important and valuable industrial work. It also provides sponsors the opportunity to have direct involvement in the education and development of our School's students and from whom they can potentially recruit their future managers and leaders. Co-op graduates are highly sought by industry and many of those who have entered the materials industry have risen to senior leadership and management positions. The School takes this opportunity to again thank its Co-op sponsors for the efforts they put into organising the placements as well as their training, guidance, and support of scholars during the placements, and for their continued generous support of the Co-op Program.



DR OWEN STANDARD

Academic Coordinator

Co-op Program in Materials Science and Engineering

<https://www.coop.unsw.edu.au/>

RESEARCH THEMES

STRUCTURE & GROUPS OVERVIEW

The field of materials science and engineering offers unlimited possibilities for innovation and development. Australia is a country rich in minerals and materials science is a priority area for research and development. Advanced materials and improvements in sustainability can give manufacturing companies, in virtually any industry, the edge over their competitors.

Beyond our basic scientific curiosity and the thrill of discovery, we consciously design materials and sustainable processes that impart a substantial benefit to society through the way they positively impact the environment, improve human health, increase our standard of living, increase productivity of our vital resources, enhance national security, or by simply promoting economic prosperity. Taking this fact into account, we have restructured our research to create four new interconnected society centred research themes (right).

Underpinning this new thematic structure is our enabling platform, which is the necessary suite of skills and expertise that materials scientists and engineers need to possess to be able to create the materials of use to society.

It consists of a deep understanding of fundamental phenomena, multi-scale computational methods, correlative structural analysis techniques, and the behaviour and properties of materials. The cornerstone of the platform is advanced manufacturing, which is the critical path for creating all those wonderful materials of significant benefit to a contemporary society.

Our four Theme Leaders are responsible for coordinating the various research groups within their theme and encouraging communication and collaboration between groups through to cross disciplinary collaboration between Themes and other Schools, and Research Centres, Hubs and Institutes both within UNSW and externally.

The close relationship between our four interconnected research themes and our enabling platform is illustrated in the diagram Figure 1 (opposite page).

**TRANSPORT & INFRASTRUCTURE:
THEME LEADER SOPHIE PRIMIG**

Primarily structural materials used expressly for creating the means of transportation, to large-scale structures and infrastructure that dominate our daily lives, including land, sea and aerospace vehicles to buildings, superstructures, machines and any other fixed or moving infrastructure.

**ENERGY & ENVIRONMENT:
THEME LEADER RAKESH JOSHI**

Materials that play a critical role in the production, storage and conversion of energy, through to eco-materials, created by sustainable processes using either raw constituents or recycled waste, that impart an overall positive impact on the environment. These are integral materials in next generation fuel cells, solar devices, gas-powered generators, electric vehicles, water purification systems, recycled products.

**ELECTRONICS & COMMUNICATIONS:
THEME LEADER DEWEI CHU**

Primarily functional materials with structural requirements used in electrical, electronics and microelectronics applications, including components and devices that comprise integrated circuits, circuit boards and visual displays, to cables, wires and optical fibres for transferring power and information.

BIOMEDICAL & HEALTH: THEME LEADER KRISTOPHER KILIAN

Structural materials exhibiting specific functionality to largely functional materials that are designed to interact with biological systems for therapeutic and diagnostic medical purposes. These materials are used in dental devices, orthopaedic implants, artificial organs, implantable devices, artificial skin, drug delivery.

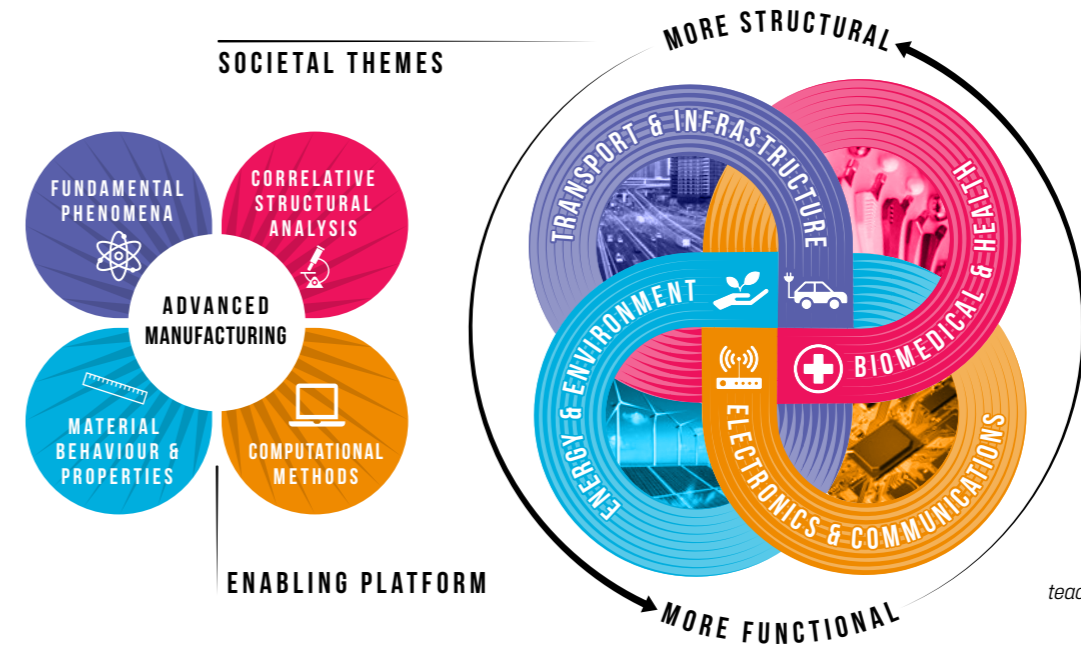


Figure 1: The School's new structure for teaching and research.

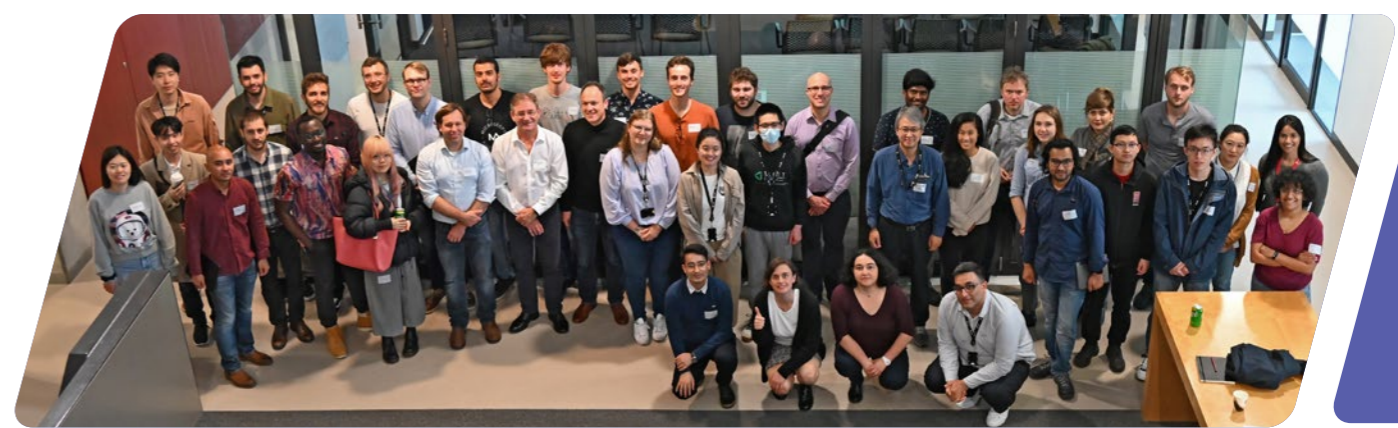
TRANSPORT & INFRASTRUCTURE

Innovations in structural materials are at the heart and centre of any advanced engineering design in transport and infrastructure. Advanced structural materials developed in our theme group can maintain their performance profiles even under the severest conditions such as high mechanical loads, wear, extreme temperatures, and in corrosive environments.

Next generation materials for transport and infrastructure combine several advanced properties including superior strength, ductility, and corrosion resistance, while also being lighter, safer, more cost efficient, and more recyclable than currently available materials. Various combinations of properties that are traditionally often in conflict with each other are unlocked via advancements in materials synthesis and processing. These routes include processing routes such as casting followed by thermo-mechanical processing, and, increasingly, additive manufacturing such as metal 3D printing. Our research efforts are enabled by the application of state-of-the-art techniques in characterisation, modelling and testing available in our School and at UNSW, across multiple length scales. The academics, researchers and students in this theme are leaders in advanced structural materials, with interests in fundamental and

applied research, often carried out in close collaboration with manufacturers, defence and government agencies.

The highlight of 2022 was our first MSE Transport & Infrastructure mini-symposium in October. This successful day was jointly organised and facilitated by Drs. Ehsan Farabi, Nima Haghdadi, and student helpers. We brought together ~55 students, Post-Docs and academics from UNSW MSE and Mechanical Engineering with skills or interests in our research area, see group photo below. This event was an opportunity to create more awareness of the research projects and skills in other groups at and around UNSW Materials, promote collaborations and more efficient sharing of facilities, and develop ideas for future joint research projects. After a welcome by theme leader Sophie Primig and Head of School Michael Ferry, we enjoyed a series of presentations by all five academics or their talented deputies from our theme group, guest speakers with similar research interests from the UNSW School of Mechanical & Manufacturing Engineering and Prof. Gwénaëlle Proust who is the first director of the new Manufacturing Hub at The University of Sydney. She showcased their state-of-the-art facilities for advanced manufacturing including various electron beam and



Above: Group photo first MSE Transport & Infrastructure mini-symposium held in October 2022, on level 5 of Hilmer Building, Nima, Sophie, Gwénaëlle, and Ehsan at the front.



TRANSPORT & INFRASTRUCTURE (CONTINUED)

laser powder bed fusion metal 3D printers. After two difficult years of quarantine and isolation, chatting to peers over great food and real barista coffees was much appreciated by all, as was the fun trivia session on structural materials that concluded the day.

The academics in our theme group have continued to be greatly successful in 2022 as evidenced by two recent academic promotions: Kevin Laws was promoted to Associate Professor and Sophie to Professor, both effective by January 1, 2023.

Further, Sophie and Nima were awarded an Australian Research Council Discovery Grant on in-situ grain boundary engineering via metal additive manufacturing, amongst other funding from diverse sources attracted by the various members of our theme group.

The handpicked 2022 research example (Figure 2) shows a

- Prof Sophie Primig – Engineering Microstructures (Theme Leader)
- Prof Michael Ferry – Frontier Alloys & Processes
- AProf Kevin Laws – Metal Physics & Advanced Alloy Research Team
- Prof Paul Munroe – Structure-Property Optimisation Group
- Prof David Young – High Temperature Materials Group
- Prof Jianqiang Zhang – Advanced Corrosion Resistant Materials

schematic of the location-specific microstructure evolution during additive manufacturing of Ni-based superalloys. This is from a massive 42 pages review paper by Scientia PhD student Nana Kwabena Adomako published in Materials & Design, underpinning our research on metal additive manufacturing of various specialty alloys. What an effort! The full article is available open access.

BIOMEDICAL & HEALTH

The Biomedical & Health theme was established to bring together the diverse biomedical and health-based research conducted in the school, in order to establish a centralised structure that would provide regular interactions among members, disseminate opportunities to the theme through emails, and connect materials science students and staff to biomedical colleagues across all faculties.

The groups that are part of the Biomedical & Health theme are listed in the pink box below.

2022 started with a return to campus activities with signs of the lockdown phase of the pandemic receding. Discussion amongst the theme leaders led to identification of a mini symposium to disseminate research across the research groups would be an optimal step in a return to normal.

Dr. Kumeria suggested we establish a group of trainees across the themes to coordinate this activity. The following theme members took on this responsibility – Ganesh Kokil (Kumeria lab), Vina Putra (Kilian lab), Stephanie Nemece (Kilian lab),

Kochurani Johnson (Sorrell lab), and Qixuan Zhu (Yang lab). The B&H Symposium Committee did an outstanding job developing the program and running the event on the day.

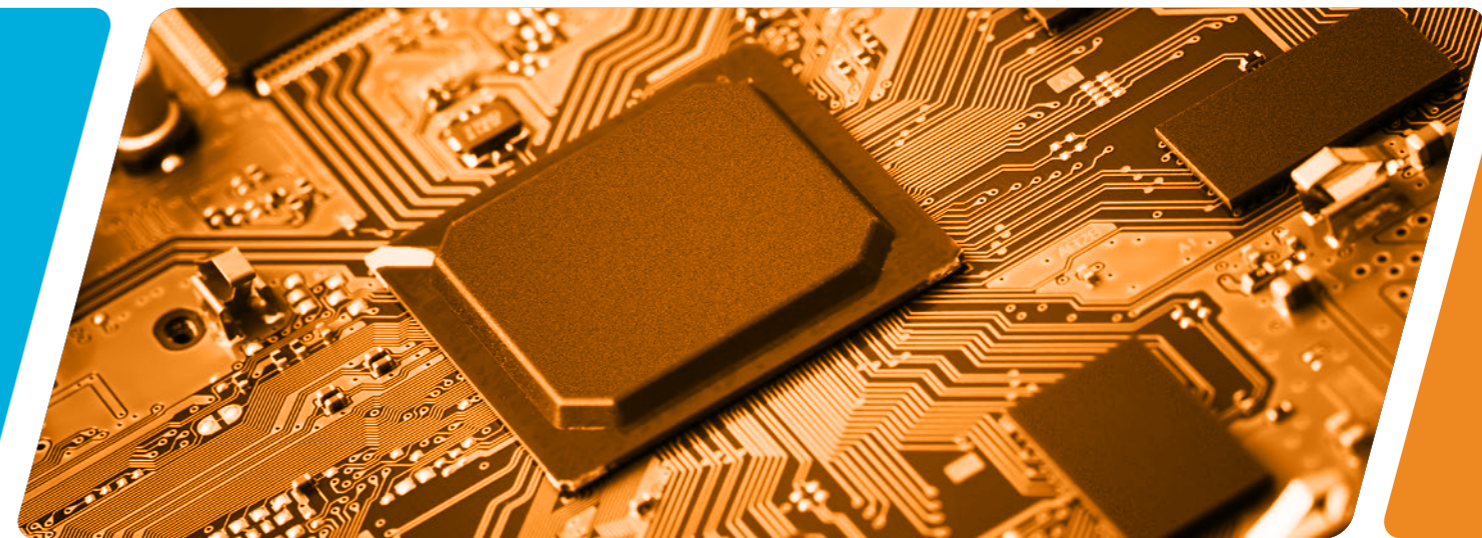
The inaugural B&H Mini Symposium was held from 10am-4pm on Wednesday 23 March 2022 and was a spectacular success. The event was opened by Head of School Prof. Michael Ferry, followed by seminars from each B&H research group leader. After a catered lunch the seminars continued, and there was a student run poster session at the end of the day for networking amongst students and staff.

The organising committee sponsored a “Best poster award” – the winners were: Kochurani Johnson (Judges’ vote for best poster); Ashley Nguyen (Attendees’ vote for their favourite poster).

Other theme related activities include a regular newsletter to notify theme members of workshops, seminars and related activities. Planning is underway for the next mini symposium which is being planned for early 2023.

- Polymer Research in Therapeutics (PRinT) group – led by Dr. Damia Mowad
- Laboratory for Advanced Biomaterials & Matrix Engineering (LAB&ME) – led by A/Prof. Kris Kilian
- Novel Engineered Materials for Conventional and Advanced Technologies (NEMCAT) group – led by Prof. Charles Sorrell
- Laboratory for Advanced Porous Nano-Biomaterials – led by Dr. Tushar Kumeria
- Electron Imaging for Advanced materials (EIAM) group – led by A/Prof. Shery Chang
- Computational Granular materials (CGM) group – led by A/Prof. Runyu yang





ENERGY & ENVIRONMENT

The research groups within the Energy and Environment (EE) theme maintain a strong collaborative spirit, actively working together through shared supervision of research students, joint project development, and co-authoring publications. The leaders of these research groups continuously exchange ideas, participating in both formal and informal meetings to enhance their research collaboration and leverage their collective expertise to its fullest potential. The EE theme has initiated a seminar series aimed at fostering collaboration and knowledge exchange. Esteemed guest speakers from outside UNSW are invited to deliver lectures and engage in discussions surrounding research ideas, paving the way for potential collaborative research endeavours.

Over the past year, researchers within the EE theme have achieved noteworthy accomplishments in the realm of cutting-edge and globally competitive research. Their achievements are evident through publications in high-impact journals, successful acquisition of ARC grants, and productive partnerships with local and international collaborators. For instance, A/Prof. Judy Hart's group was awarded an ARC Discovery Project in collaboration with researchers, including Professor Martin Green, from the UNSW School of Photovoltaics & Renewable Energy Engineering. Notable publications by her group in 2022 include a Nano Energy paper in collaboration with researchers from UNSW Chemical Engineering and a review paper published in the Journal of Materials Chemistry C.

Prof. Dewei Chu's group made significant progress in 2022 by publishing over 30 journal articles. The groups received multiple ARC projects with substantial funding from the industry for

translational research. This is one largest research groups in our school, with over 20 HDR students and 4 postdoctoral fellows.

Prof. Sammy Chan's group recently upgraded their laboratory with state-of-the-art equipment, enhancing their ability to conduct more effective studies on solid-state hydrogen storage. Prof. Chan leads a vibrant research group with 1 postdoctoral research fellow, 8 HDR students.

A/Prof. Rakesh Joshi's group has secured extended funding from multiple industrial collaborators, including Sydney Water and Vesi Water in Australia. The projects completed by the group are currently undergoing the patent application process.

A/Prof. Danyang Wang's group has contributed to this field with 12 publications in international journals such as Science, Nature, ACS Nano, Advanced Science. Group leader Wang obtained a Welcome Leap In Utero project, USA (\$2.7m) as a named CI in collaboration with the School of Clinical Medicine, UNSW aiming to create a non-invasive advanced ultrasound tool for 3D medical imaging.

In 2022, SMaRT successfully delivered the second-year milestones of ARC micro recycling hub. SMaRT successfully hosted for the second year the UNSW the consortia based NESP Sustainable Communities and Waste Hub, comprising five leading research institutions and many industries and government agency (local, state and national) partners. In 2022, SMaRT also continued its participation and leadership roles in various other research programs, including the Australia India Partnership with the CSIRO and numerous other industry contract research initiatives. More information is available on the SMART centre annual report

ELECTRONICS & COMMUNICATIONS

2022 is another fruitful year for the Electronics and Communications team with competitive grants, high impact publications and intensive international collaborations. The team have won 2 ARC 2023 Discovery grants and 1 ARC Linkage grant in the field of wearable electronics and nanoelectronics, with overall more than 120 peer-reviewed papers published in 2022.

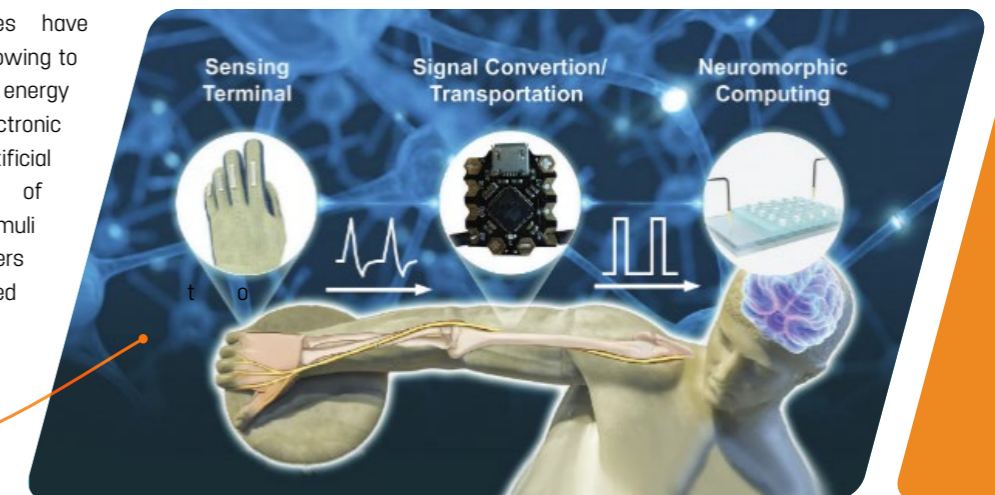
A new team member, Dr. Zhi Li joined the School as an ARC Future Fellow in April 2022. Dr. Zhi will bring his expertise in Scanning Tunnelling Microscope and nanoelectronics.

The Electronics and Communications theme also welcomed a new ARC DECRA Fellow, Dr. Long Hu who will carry out study in printable quantum dots based infra sensors.

Electronic materials and devices have attracted more and more attention owing to potential applications in the area of energy storage and conversion, optoelectronic and nanoelectronic devices. Artificial perception technologies capable of sensing and feeling mechanical stimuli like human skins are critical enablers for electronic skins (E-Skins) needed

achieve artificial intelligence. However, most of the reported electronic skin systems lack the capability to process and interpret the sensor data. Herein, a new design of artificial perceptual system integrating ZnO-based synaptic devices with Pt/carbon nanofibers-based strain sensors for stimuli detection and information processing is presented by Prof. Chu et al.

The team have invited a number of leading researchers in optical, nanoelectronic and energy conversion devices from Australia, New Zealand and Europe to deliver talks to academic staff and student. The team has successfully co-organized the Symposium on Advanced Materials & Sustainable Technology 2022 later this year.



SMaRT REPORT

EXECUTIVE SUMMARY

In 2022, the UNSW SMaRT Centre added the Trailblazer program to its already very busy schedule and was a leading member (and Recycling Lead) of the UNSW and UoN Trailblazer consortium that successfully secured the Trailblazer funding in early 2022. This program has been bedding down and the SMaRT Centre is leading the recycling stream through the centre's Director, Prof Veena Sahajwalla.

In 2022, SMaRT successfully delivered the second-year milestones of ARC microrecycling hub. This ARC Hub includes a team of people with considerable expertise and experience, along with excellent research facilities at different POs which can offer an outstanding research and academic environment, to provide critical contributions to the outcomes. Researchers maintained regular and close contact with industry partners via correspondence and other interactions. Progress updates were sent to industry partners fortnightly or monthly and the online/face to face team discussions were held quarterly. See attached document: ARC 2022 annual report.

In 2022, SMaRT successfully hosted for the second year the UNSW consortia-based NESP Sustainable Communities and Waste Hub, comprising five leading research institutions and many industry and government agency (local, state and national) partners. In 2022, the Hub's annual research plan was approved and the Hub's annual progress report was also submitted to the Department of Climate Change, Energy, the Environment and Water, demonstrating significant outputs and outcomes.

In 2022, SMaRT also continued its participation and leadership roles in many, various other research programs, including the Australia India Partnership with the CSIRO, and numerous other industry contract research initiatives. Importantly, SMaRT significantly progressed its IP and technology development and rollout in collaboration with many industry and other partners under its MICROfactorie™ Technologies division.

In 2022, SMaRT secured numerous journal publications as well as hundreds of media stories and appearances, and gave dozens of presentations across a wide range of stakeholders. This was all supported through an active media and communications program that delivered hundreds of published stories, videos, speeches, as well as advocacy by way of numerous government consultation submissions and committee advisory meetings.

In terms of a few education activity highlights only, new knowledge from the Centre's many research programs is continuously informing broader domains such as recycling complex waste for green metals, oxides and carbon for energy storage applications as well as various other applications, which is strongly contributing to building capacity for future innovation endeavour in this scientific field of recycling. Through industry relevant research progress, the Centre is also focussing on PhD training to help deliver real world impact in its subject matter expertise areas. Three PhD students achieved their degree in 2022, and four masters students completed their research projects. In 2022, another 10 PhD cohort and 3 masters students were continuing to acquire skills in industry collaboration and engagement, helping to develop a highly skilled workforce for both the research and industry sectors.

SMaRT's Dr Samane Maroufi developed and taught MATS6006 Recycling of Wastes and MATS6007 Sustainable Materials Engineering in 2022 with mean 'My Experience' ratings of 5.5/6, above School/Faculty/UNSW averages. MATS6006 enables students to comprehensively understand wastes of different categories (from daily wastes such as food packaging, textile and plastic to electronic waste, automotive and biomass wastes) and examine the principles of recycling and assess various recycling approaches including mechanical, chemical, and thermal processing. Through this course, they are able to identify the limitation of the conventional approaches in regard with recycling of new generation of waste.

MATS6007 enables students to gain in-depth understanding of sustainability, the root causes of unsustainability, environmental impacts, and how to create a sustainable system through applying suitable technologies and materials. This course teaches students different sustainable materials systems and introduces latest approaches towards sustainable energy production and storage, transportation, infrastructure, water treatment, soil remediation and carbon management. One of the aims of this course is to enable students to understand the concept of life cycle assessment (LCA) and circular economy and apply it in evaluation of the impact of a sustainable material system on environment and economy.

SMaRT Centre staff continued to attend several programs and workshop such as UNSW's 5-day Course Design Institute (CDI) to discover more about learner-centred teaching and active-learning

and mentorship program for career development strategy, while the SMaRT Centre was actively involved in UNSW Science Equity Diversity and Inclusion (EDI) representing the School of Materials Science and Engineering in the UNSW Science EDI team.

Led by SMaRT member Dr Rumana Hossain, Dr Smitirupa Biswal and Salim Al Khadhoori, SMaRT team continued to have contribution in EDI outreach via Curious Mind Program, a 6-month hands-on extension/mentoring program for >30 Y9/10 girls who identify as passionate, high performers in Science, Technology, Engineering, and Mathematics.

As part of a mixed education and research collaboration, various schools were involved in a NSW agencies project recycling used covid masks into filament for 3D printing. As part of the Up-Masking project various schools were involved including Catherine McAuley Catholic Girls Secondary School whose students visited the SMaRT Centre to learn more about the science and technology behind SMaRT's innovations that can reform waste face masks into completely new products such as ceramic tiles. Also involving Our Lady of Mercy College Parramatta, Westmead Hospital and Westmead Children's Hospital, single use disposable masks were collected over a period of time using bins provided by SMaRT Centre so SMaRT could find innovative ways of recycling them back into something useful. Approximately 114 kg of masks were collected and were re-manufactured into different tile products, with one 310 x 310 tile requiring 172 masks to be made.

MAJOR RESEARCH PROGRAM SUMMARIES

AUSTRALIAN TRAILBLAZER FOR RECYCLING & CLEAN ENERGY

The UNSW SMaRT Centre is the recycling stream lead for the \$277 million Australian Trailblazer for Recycling and Clean Energy (ATRaCE) Program. Hosted by UNSW and in partnership with the University of Newcastle and many industry partners, the ATRaCE Program runs for four years from 2022 to help Australia and the world transition to sustainable recycling and clean energy solutions and systems. SMaRT is working with its partners to accelerate commercialisation of several of its recycling MICROfactorie™ and other technologies. See UNSW announcement: UNSW recycling and clean energy initiative secures Trailblazer funding | UNSW Newsroom.

Upmasking project collection point at one of the western Sydney schools involved in the project. Students toured SMaRT and were able to see up close how the used face masks were recycled into ceramic tiles.

NESP SCaW HUB

The National Environmental Science Program Sustainable Communities and Waste (SCaW) Hub involves five research nodes working on developing policy, planning and design for more sustainable communities. The SCaW Hub predominantly focusses on applied science and capability for recommendations to government and end users, to help create more sustainable communities, and is engaging with local communities, businesses and councils in many rural, regional and metro locations to help achieve its goals.

ARC HUB

In partnership with numerous industry partners, the ARC Hub Microrecycling of Battery and Consumer Waste is focusing on new science in relation to being able to effectively recycle the many and complex materials found in battery waste, as well as other waste materials, in particular waste coffee grounds. Finding pathways to transform this science into industrial applications with Hub partners is central to the work. The ARC Hub focuses on creating new knowledge in relation to microrecycling science.

GREEN STEEL 2.0

In partnership with key and long term industry collaborator, Molycop, the SMaRT Centre has been carrying out new research into using waste bio-resources like coffee grounds, and rubbers and their application in steel making under its next generation SMaRT@UNSW Green Steel™ Polymer Injection Technology work. This includes not just using more wastes with the aim of one day replacing the need for coke and coal in electric arc furnace (EAF) steel making but using waste resources as a source of the vital steel making ingredient of hydrogen for an overall more efficient process. See announcements: Coffee grounds and hydrogen from waste Green Steel breakthroughs | SMaRT@UNSW and WED22: Producing green steel - Create (createdigital.org.au).

MICROFACTORIES™

Australia faces a growing waste crisis with vast amounts of waste materials, such as glass, electronic waste (e-waste) and plastics



stockpiled or landfilled across the country. Australia generated an estimated 74.1 million tonnes (Mt) of waste in 2019, equating to 2.94 Mt of waste per capita, one of the highest globally. This has helped enable SMaRT to further develop commercialisation opportunities for this technology. See announcement: New recycling facility to remanufacture waste plastics | Shoalhaven City Council (nsw.gov.au).

GREEN METALS (INCLUDING ALUMINIUM)

This capability of SMaRT's featured in the successful application for UNSW to secure Trailblazer funding. This recycling and clean energy consortium will be undertaking crucial, collaborative work to help create greater sustainability and transition to a more decarbonised society. SMaRT Centre innovations and partners are at the very heart of this new initiative.

ABOUT SMART

The UNSW Centre for Sustainable Materials Research and Technology (SMaRT) at the University of New South Wales works with industry, national and international research partners, industry and governments across Australia, on the development of innovative environmental solutions for the world's biggest waste challenges, with a strong focus on end users, to help UNSW achieve its strategic goals of creating social impact, innovation and engagement, and academic excellence.

The SMaRT Centre has state-of-the-art furnaces and laboratories, and sophisticated analytical and processing equipment. Combining the distinctive research capabilities of UNSW's academics, the SMaRT Centre has a track record of delivering research and multiple technologies suitable for implementation, the latest being various MICROfactorie™ technologies for which extensive future research and development initiatives are planned, as well as its next generation research for its patented Green Steel® Polymer Injection Technology®.

The core aims of the SMaRT Centre are to develop novel

research for sustainable materials and manufacturing processes, build industry partnerships to activate research for real world, end user impact, and to disseminate and commercialise green materials and manufacturing technologies that benefit industries, local communities, and enhance sustainable economic growth while delivering important environmental and social benefits.

SMaRT's pioneering of "microrecycling science" has resulted in the development of many novel processes, technologies and outcomes but extending this and creating new innovations with commercial and end-user benefits are our future goals, along with helping to chart a new 'materials circulatory' for the critical elements, resources and materials required for the future electrification of our society. Many of the natural resources and materials needed for batteries and other renewable energy technologies are becoming scarce and more costly (economically and environmentally) and recovering these materials from end of life products will be crucial to future global efforts around sustainability. We are turning our attention to this challenge. SMaRT is advancing its work to create real world impact via multiple collaborations involving industry, the community organisations and government agencies



MATERIALS & MANUFACTURING FUTURES INSTITUTE

MMFI REPORT

The UNSW Materials and Manufacturing Futures Institute maintains steady advancement at the forefront of manufacturing and materials engineering.

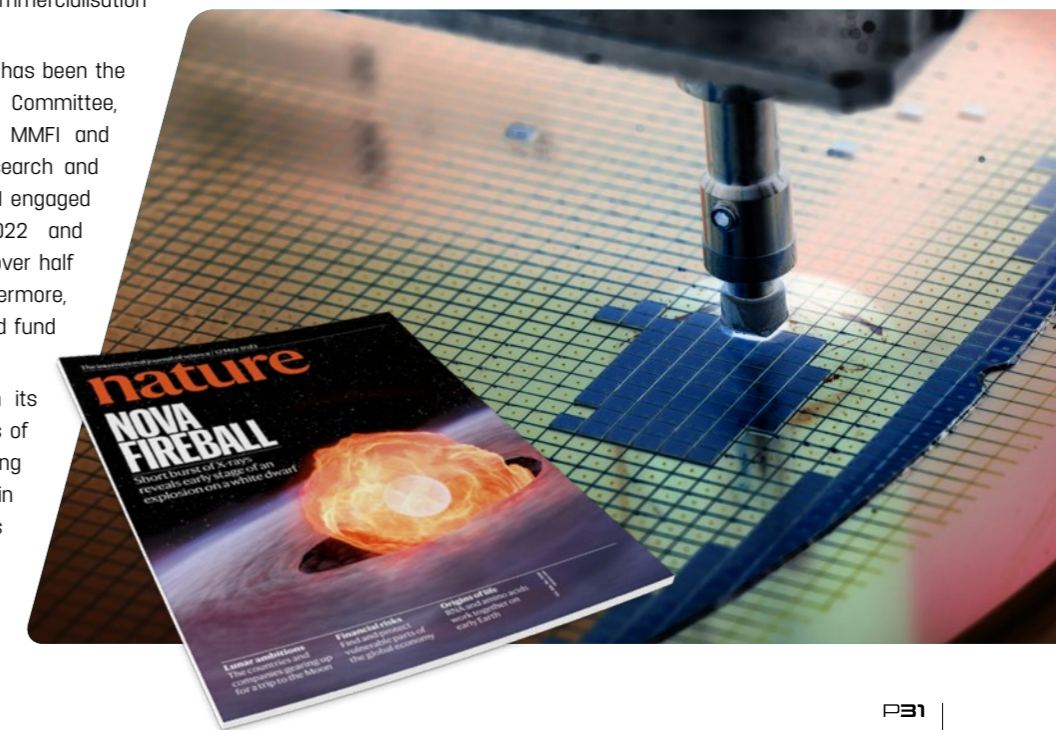
Most notable is our recent focus on the development of novel semiconductor materials and the cultivation of local manufacturing capabilities in this rapidly evolving field.

This pursuit led to the publication of MMFI's groundbreaking work in the world's leading scientific journal, Nature. In a world-first, the paper (*High-k perovskite membranes as insulators for two-dimensional transistors*) showcased the viability of large-scale fabrication of 2D field-effect transistors, overcoming the challenges of nanoscale silicon semiconductor manufacturing and delivering dependable capacitance and efficient switching behaviour.

MMFI has also been working hard to develop strategic pathways to enable the translation and commercialisation of these pioneering technologies.

A crucial component of this endeavour has been the establishment of a Scientific Advisory Committee, enabling a critical dialogue between MMFI and industry stakeholders to steer our research and development efforts. To that end, MMFI engaged with new industry partners in 2022 and progressed existing projects, securing over half a million AUD in industry support. Furthermore, MMFI continues to sustain ongoing seed fund projects.

As always, MMFI remains resolute in its commitment to expanding the frontiers of manufacturing and material engineering and is eager to deliver further success in our mission to deliver tangible solutions and effect meaningful societal change, all grounded in collaborative efforts and robust scientific principles.



STAFF AWARDS & ACHIEVEMENTS

ACHIEVEMENTS

Professor Veena Sahajwalla was named the **2022 NSW Australian of the Year**

Dr Tushar Kumeria has been elected the incoming **Vice President of the Australian Chapter of the Controlled Release Society (AusCRS)**!

Scientia Professor Veena Sahajwalla was awarded the **Celestino Eureka Prize** for Promoting Understanding of Science at the 2022 Australian Museum Eureka Prize Awards Night. The Eureka prizes are Australia's most high-profile science awards!

Dr Long Hu was successful with his application for an Australian Research Council Discovery Early Career Researcher Award (ARC DECRA) for commencement in the School in 2023! These are very prestigious early career research fellowships with a low annual success rate. Dr Hu will be mentored by Prof. Tom Wu and Prof. Dewei Chu.

Scientia Professor Veena Sahajwalla has been awarded the highly prestigious **Clunies Ross Innovation Award** for her globally recognised waste transformation technologies at the Annual ATSE Awards Gala Dinner to celebrate outstanding achievements of Australians working in applied science, technology and

engineering. This award is for those who have been responsible for the discovery, development and adoption of a technology that has significantly improved societal and/or industry capabilities.

Dr Samane Maroufi has been honoured with a **2022 Vice-Chancellor's Award for Outstanding Contributions to Student Learning (Early Career)**!

Dr Peggy Zhang received the JMST Best Early Career Researcher Presentation Award from Journal of Materials Science and Technology at the 2022 International Symposium on Advanced Materials & Sustainable Technologies! Peggy is currently a research fellow under the supervision of Prof. Nagy Valanoor.

Dean of Science Staff Excellence Awards

It is with the greatest pleasure to announce that **Bill Joe** and **Sophie Primig** each received an award!

Bill Joe - Dean of Science Award for Values in Action.

Sophie Primig - Dean of Science Award for Research Excellence (Academics).

Congratulations Bill and Sophie!

What a wonderful achievement!

GRANT SUCCESS

2022 ARC grant recipients:

Jianqiang Zhang & David Young (\$450K)

Nagy Valanoor, Shery Chang & John Daniels (\$465K)

Sean Li & Danyang Wang (Discovery) (\$510K)

Kevin Laws & Warren McKenzie (Linkage) (\$444K)

Jan Seidel & Damia Mawad (LIEF) (\$738,750)

The University was awarded its second Trailblazer grant under the Australian Government's Trailblazer Universities Program! The **Recycling and Clean Energy Trailblazer Initiative**, led by UNSW in partnership with UoN, involves several of the School's staff and their industry partners. This Trailblazer was awarded **\$50M** from the Federal Government, which was matched by an additional **\$50M** cash and **\$47M** in-kind support from the universities. Over twenty industry partners have also committed **\$130M+** in cash and in-kind support.

Recycling and MICROfactories (UNSW+UoN Theme Leader: Prof. Veena Sahajwalla, SMaRT Centre & MS&E)



PROMOTIONS

Sophie Primig → **Professor**

Judy Hart → **Associate Professor**

Damia Mawad → **Associate Professor**

Pramod Koshy → **Associate Professor**

Kevin Laws → **Associate Professor**

Dr Tao Wan → **Lecturer**

PAPERS

Prof. Sean Li and his research team and colleagues paper published in the May edition of **Nature!** The paper entitled '*High-k perovskite membranes as insulators for two-dimensional transistors*' involved considerable teamwork from several of our HDR students throughout COVID-19, so a special congratulations goes to them for their awesome teamwork!

The MS&E authors on the paper are: **Jing-Kai Huang (HDR)**, **Junjie Shi (HDR)**, **Ji Zhang (HDR)**, **Wenxuan Wang (HDR)**, **Ni Yang (HDR)**, **Yang Liu (HDR)**, **Chun-Ho Lin**, **Xinwei Guan (HDR)**, **Long Hu**, **Jack Yang**, **Danyang Wang**, **Tom Wu**, and **Sean Li**. It is worth noting that Jing-Kai, Junjie and Ji contributed equally as principal authors, and Ji and Xinwei have now completed their theses. <https://www.nature.com/articles/s41586-022-04588-2>

A/Prof. Danyang Wang and **Prof. Sean Li** were co-authors on a paper published in the April edition of **Science**, entitled '*Ferroelectric crystals with giant electro-optic property enabling ultracompact Q-switches*'. <https://www.science.org/doi/10.1126/science.abn7711>

Prof. Jan Seidel and members of his research group, **Drs Dawei Zhang**, **Peggy Schoenherr** and **Pankaj Sharma** have just published a review paper in the world's leading review journal, **Nature Reviews Materials**. <https://www.nature.com/articles/s41578-022-00484-3>

The paper focuses on the emerging field of 2D ferroelectric materials, to which Jan's group made some key initial contributions. Getting published in this journal is a real confirmation of Jan and his team's international leadership in this emerging field.

Dr Jack Yang, **Prof. Sean Li** and members of their research group, **Ashraf Azam**, **Wenxian Li** and **Jing-Kai Huang**, have just published a review paper in **Progress in Materials Science**. The paper entitled '*Tungsten diselenides (WSe₂) quantum dots: Fundamental, properties, synthesis and applications*' is the culmination of a 2+ year effort from Ashraf during COVID who collected and carefully analysed the existing literature on the synthesis and physical properties of WSe₂ quantum dots, which is the topic of his PhD thesis. The publication really shows the resilience of our students during such a difficult period! <https://authors.elsevier.com/c/1g8iMI6yuEvz6>

A/Prof. Pramod Koshy has co-authored a paper published in **Science!** <https://www.science.org/doi/10.1126/science.abm2731>

STAFF STORY

THE BIRTH OF A NEW BREED OF BATTERIES



A SMART CENTRE SCIENTIFIC BREAKTHROUGH COULD PAVE THE WAY FOR A NEW BREED OF BATTERIES TO HELP MEET DECARBONISATION GOALS.

Results from a UNSW SMaRT Centre scientific paper demonstrate that recovered carbon from automotive waste can be used as a vital ingredient (anode active materials) for sodium ion batteries.

Given the finite and constricted supply of raw materials for the most common form of energy storage device, lithium ion batteries, this finding could be the spark needed to commercialise manufacturing of sodium ion batteries.

Research supervisor and UNSW SMaRT Centre Director, Prof Veena Sahajwalla, said the research, conducted as part of the SMaRT Centre-hosted ARC Research Hub for Microrecycling of Battery and Consumer Wastes, could be a game changer in meeting future battery storage needs.

GAME CHANGER

"In the face of rising materials costs for lithium ion batteries and the fact that battery production will fall well short of decarbonisation requirements (see Australian National Battery Strategy Issues Paper 2023), this is a very important finding," she said.

"We found automotive shredder waste, or ASR, contains very high-quality carbon and our studies show that the carbon we recovered from this common and growing form of waste, when made into a graphite anode performed better than the carbon graphite anodes found in manufactured batteries."

"What this means is that there is a ready supply of a vital but hard to manufacture ingredient for sodium ion batteries, thus creating a pathway for the development of a new battery type and industry which could be done right here in Australia."

Sodium ion batteries, otherwise known as 'Na batteries', 'Na-ion batteries' and 'NIBs', are known to have greater potential for large scale storage compared to more common and commercialised battery types like lithium ion batteries (LIBs).

And, crucially, NIBs are not manufactured at scale due to cost and performance issues of the carbon anodes.

BATTERY RECYCLING

Other waste and recycling technologies R&D programs at the UNSW Sustainable Materials Research and Technology (SMaRT) Centre have been forging ahead with some exciting commercialisation opportunities.

The R&D projects are adding to the growing body of innovative waste and recycling knowledge, processes and technologies developed by the UNSW SMaRT Centre, which are mostly being implemented through its various MICROfactorie™ Technology modules.

Work has been underway developing a new module to create a demonstration battery recycling MICROfactorie™ capable of dismantling spent batteries, including those made of alkaline and lithium, adding to the existing modules of Green Ceramics, Plastics Filament, and E-waste.

COMMERCIAL PARTNERSHIP

And a new commercial partnership between Jamestron, a regional manufacturer of metal cans for leading Australian and international brands, and the UNSW SMaRT Centre, is developing a ground-breaking project to revolutionise aluminium manufacturing and recycling in Australia.

The Green Aluminium MICROfactorie™ partnership will commercialize UNSW SMaRT Centre's aluminum recycling technology into Jamestron's can manufacturing process at its plant in Taree, NSW.

This will establish Jamestron as one of the first aluminum aerosol can producers in the world to not only make aerosol cans from recycled content but also from waste currently not recycled due to the presence of mixed materials, including plastics.



STUDENT AWARDS & ACHIEVEMENTS

INDUSTRY TRAINING WINNERS

- Ally Bradley - 1st Prize
- Martin Li - 2nd Prize
- Daniel Tjoe - 3rd Prize

POSTGRADUATE POSTER COMPETITION

Judging Panel winners:

1. Maxwell Moyle (\$500)
2. Joel Luke Abraham (\$300)
3. Bernd Schulz (\$200)

Audience choice:

1. Ming Luo
2. You Jiang

UNSW GRS DEAN'S AWARD

Oliver Paull was awarded a UNSW GRS Dean's Award for Outstanding PhD Thesis! Oliver was supervised by Daniel Sandos and Nagy Valanoor. This Award recognises the high quality higher degree research that is carried out at UNSW. It is awarded to PhD graduates who have produced a thesis that requires only minimal corrections, received outstanding and/or excellent levels of achievement for all examination criteria, and in the opinion of both examiners is in the top 10% of PhD theses they have examined.

2022 NSW MATERIALS AUSTRALIA STUDENT PRESENTATION COMPETITION

The First Prize Oral Presentation valued at \$500, sponsored by Frank Soto of Soto Consulting Engineers, was awarded to **Hubert Lee** for his presentation on "Direct Reduction of Iron Ore by Hydrogen". Hubert is carrying out his honours thesis with Prof. Jianqiang Zhang.

The First Prize Poster Presentation valued at \$300, sponsored by Dr Phillip Carter of Kestrel Capital, was awarded to **Jodie Mann** for her poster "Canister (HIPed)-Wasteform Interactions in Synroc Ceramic Wasteforms". Jodie is carrying out her honours thesis with A/Prof. Pramod Koshy.

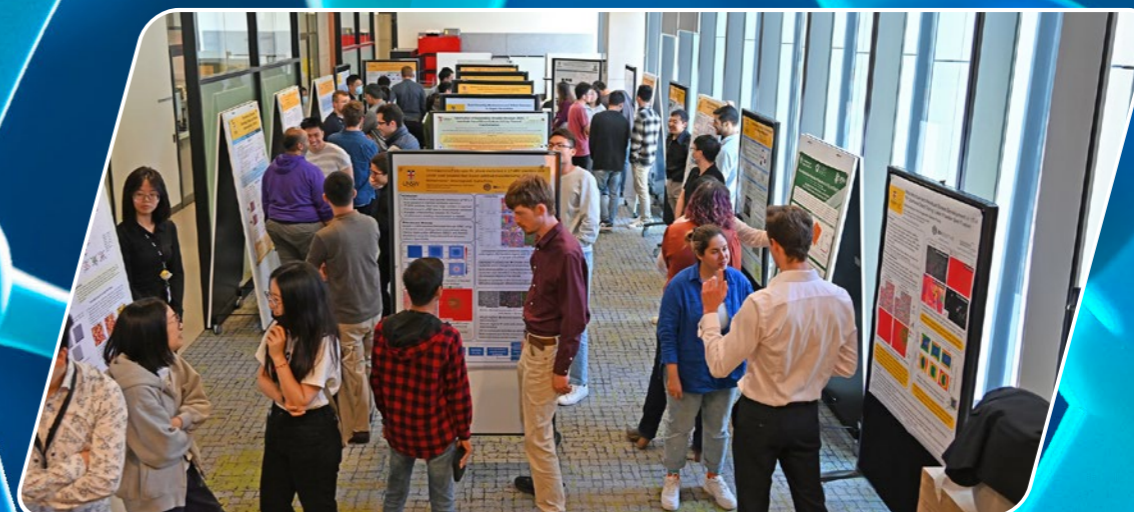
The Second Prize Oral Presentation valued at \$400, sponsored by Dr Sam Moricca of Gravitas Technologies, was awarded to **Marcus Miljak** for his presentation on "Portable EDXRD Mineralogical Analyser for Lunar Applications". Marcus is carrying out his honours thesis with A/Prof. Pramod Koshy.

The Fifth Prize Oral Presentation valued at \$100, sponsored by Alyssa Taylor of Taylor Ceramic Engineering, was awarded to **Gabi Moss** for her presentation on "Thermomechanical Behaviours of Copper Conducting Rods for the Aluminium Smelting Industry". Gabi is jointly supervised by A/Prof. Sophie Primig and Dr Ehsan Farabi for her honours thesis.

2022 INTERNATIONAL SYMPOSIUM ON ADVANCED MATERIALS & SUSTAINABLE TECHNOLOGIES

Ms Chao Liu won the Best Higher Degree Research Student Presentation Award

Chao is currently carrying out her PhD under the supervision of Prof. Dewei Chu, and her presentation last week was entitled 'High-Performance Ti3C2 MXene-Based Moist-Electric Generator for Powering Electronic Devices and Self-Actuated Humidity Sensor'.



JO KAWAHASHI

STUDENT STORY

MY TIME AS A MATERIALS SCIENCE & ENGINEERING STUDENT AT UNSW

As a recipient of the Sir Rupert Myers Scholarship and the Co-op Scholarship, I was able to study and live on campus at UNSW, for which I am incredibly grateful for the enriching experiences and opportunities that have shaped my journey in 2023.

This year has been a remarkable chapter in my academic and personal growth, marked by involvement in extracurricular activities, student life, and a fascinating dive into the field of Materials Sciences and Engineering.

One of the many highlights of my student life was the first-year camp where I made new friendships with people across the world and developed closer bonds within our materials cohort and across other engineering disciplines, getting involved in MATSOC and university events. As a materials science and engineering student you will inevitably go through all kinds of stresses and so, spending quality time with great friends or studying hard with your fellow engineering friends has helped me dissipate some of those strained feelings and gave strength to push past our limits together.

Another standout experience of my year was my participation in the Talented Students Program (TSP), a program designed to introduce high-performing students to cutting-edge research within UNSW Science as soon as your first year of your degree. Under the guidance of Associate Professor Nagarajan Valanoor, our research group delved into the fascinating world of nanoscale materials. Exploring the relationship between the form and function of oxides with minute dimensions, the research spanned topics such as piezoelectricity, photochemical effects, and quantum confinement.

This hands-on research experience with advanced equipment was possible due to the efforts of my lab manager, Dr Mohammadmoein Seyfour and current PhD student, Gordon Luo, who has taken the time out of their busy schedule to help mentor me through the process. I developed technical skills and grew confidence as I shadowed them, participated in lab meetings and ultimately, operated the Neocera Pulsed Laser Deposition (PLD) system to grow epitaxial thin films through a process of ablating a target material with a pulsed laser and depositing the ablated material onto a substrate. The TSP program's emphasis on continuous learning and effective communication equipped me with a deeper understanding of research methodologies and the importance of collaboration and I would like to express my greatest thanks to

everyone making this such a wonderful program.

At UNSW, materials classes are taught in small lecture classes, providing opportunities to engage closely with lecturers and this direct interaction has helped me develop a deeper understanding of mechanical behaviour materials around us and foster that tight-knit community within the Materials Science and Engineering program. I found this tight-knit community very helpful and student felt well-supported with the provided ample opportunities for networking and exposure to the job market. Visits to companies like ANSTO, Brickworks, Cochlear, and Boral Cement offered a glimpse into real-world applications of our field. The MATSOC "Forge Your Future" Networking night, with participation from more than 20 leading companies, allowed me to connect with industry professionals and gain insights into potential career paths.

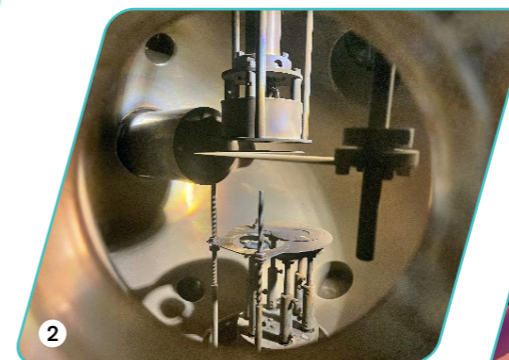
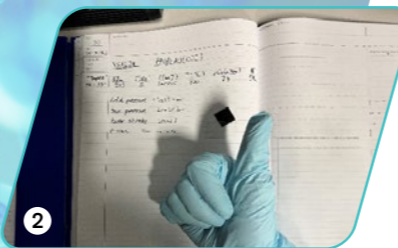
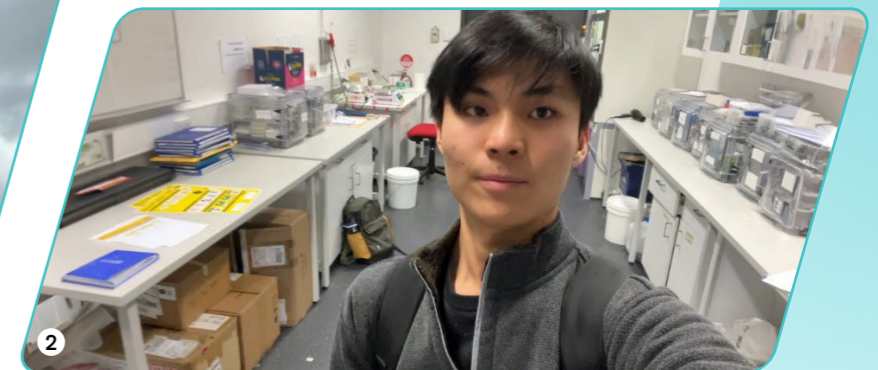
Stepping outside of my comfort zone, I embraced new experiences such as taking up Lacrosse through the UNSW Learn to Play program and taking on the leadership roles of MATSOC 2024 as Social Director and 2nd-year representative. These roles will not only allow me to contribute to the vibrant student life and build lasting memories but also help me develop leadership skills that will make positive impact in the years to come. Finally, most of my fondest memories started with an open willingness to try new things, so I encourage new incoming Materials students to be actively curious about the world and UNSW for the countless opportunities that lie ahead of you.

JO KAWAHASHI

(1st Year Undergraduate Materials Science and Engineering Student)

Photos:

1. Site Visit to Brickworks
2. TSP Lab
3. MATSOC 1st year camp
4. Exploring Sydney life
5. Lacrosse
6. MATSOC Networking Night
Viridian Glass
(Co-op Sponsor Company)



2022 REPORT

MATSOC

FOREWORD

MATSOC ran a very successful 2022. With the students' return to campus and most events were held in-person, the sense of community of MATSOC has never been higher. There were great collaborations with many UNSW societies including the Chemical Engineering Undergraduate Society (CEUS), the Food Science Association (FSA), the Renewable Engineering Society (RESOC), Biomedical Engineering Students' Society (BESS), and Society of Medical Innovation (SOMI). These collaborations have been extremely rewarding and helped MATSOC provide more fulfilling events to its members.

One of the initiatives for MATSOC this year was to improve engagement with students. It was achieved by regularly updating students through our social media and newsletter outlets. Engagements were also improved with expansion onto other social media platforms such as Discord and Instagram. MATSOC is carrying good momentum to continue to increase student engagements.

EVENTS SUMMARY

MATSOC organised 26 events in total, with 5 industrial events and 21 social events in 2022, meaning an event was held almost every week during the term timetable. Of the 26 events, 10 were collaborations with other UNSW societies.

Social events were successful in 2022, especially those running in collaboration. Collaborations gave rise to greater attendance, which made these events more exciting and allowed members to meet and get to know others from different science and engineering disciplines, all while expanding the scope of provisions available to the collective pool of members.

MATSOC's engagement with external industry groups such as Circular Australia, Materials Australia, The Australasian Institute of Mining and Metallurgy, and more, was incredibly beneficial for students.

Helping them connect with potential employers from relevant industries and learn more about their work. Members' feedbacks were very positive. They found the events useful in clarifying possible career paths following graduation, as well as current opportunities available to them such as internships. Many students were ultimately recruited by these groups.

CONCLUDING REMARKS

Overall, MATSOC has had a very successful year with a significant increase in engagement that we can attribute to the great efforts of our team and the gradual return to campus. In 2023, we aim to further improve student engagement by running more social events and bringing back First Year Camp, which was not possible this year or in previous years due to COVID-19 restrictions. Additionally, we hope to increase the scale of professional and career-focused events as these events were well received by members.

MATSOC greatly appreciates the continued support of the School of Materials Science and Engineering and their assistance in providing the best possible university experience to students.

MATSOC PRESIDENT

The year of 2022 was a year of hope and growth for the undergraduate Materials Science and Engineering Society at UNSW. We were very excited to enter a year where COVID restrictions were loosening and students were able to gain access to campus again.

Through the year we ran an incredible 24 in-person events including our annual cruise and ball which has become a tradition to run with CEUS and FSA. We looked for as many opportunities to engage with students as possible to improve engagement and welcome them back to campus. This year also provided new opportunities to engage with industry and professionals as we collaborated with the CEUS, RESOC and BESS societies, showcasing a variety of career opportunities to students. We were proud to run very successful industry events including the NSW Circular Talk, Biotech and Engineering Night, the Quickstep Site Visit and the ACA Industry Event.

To further improve engagement with students, the society decided to continue growing its online presence. We ran a Materials Australia Online Industry Evening and an ongoing Online Games Night on Saturdays which always had a good attendance. These events were also a huge help engaging with international students that were still unable to return to Australia.

I am very proud of my time I have spent as president but the success of MATSOC in 2022 could not have been achieved without the incredibly strong executive committee. I am also incredibly thankful for the support of the School of Materials Science and Engineering in helping us bring the best possible experiences to students.

SCOTT JONES



2022 REPORT

PGSOC

In 2022, despite the unprecedented challenges posed by the COVID-19 pandemic, PGSOC remained unwavering in its commitment to providing support and fostering a sense of community among the postgraduate students of the School of Materials Science and Engineering. While prioritizing the safety and well-being of all members, PGSOC successfully organized a variety of events that adhered to all necessary guidelines and restrictions. The dedication and resilience of PGSOC members allowed the society to overcome these challenges and continue providing a supportive and inclusive environment for postgraduate students. Our 2022 calendar was packed with exciting events, including:

- Lunar New Year Celebration
- Career Advancement Workshop
- Nowruz Festival (Persian New Year Celebration)
- Collaborative Sports Day with MATSOC
- Peer Mentoring Welcome BBQ
- Eid al-Fitr Celebration
- International Cuisine Fundraising Fest
- Blue Mountains Adventure
- Festival of Lights: Diwali
- Annual Poster Competition
- Year-end Get-Together
- Biweekly Friday Social Gathering

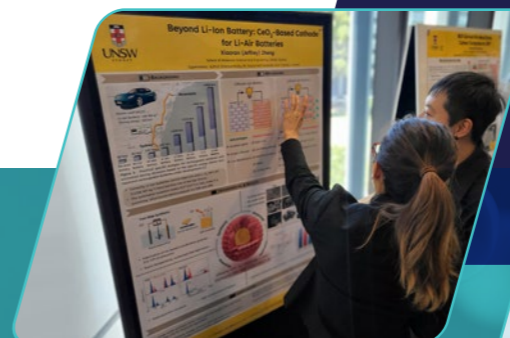
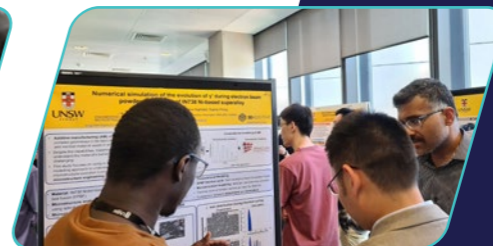
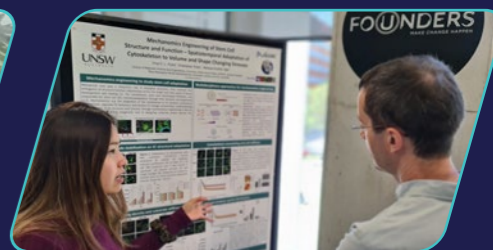
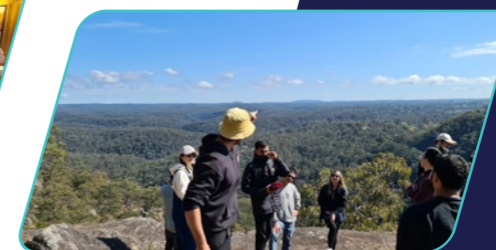
Throughout the year, PGSOC organized a diverse range of events that aimed to support postgraduate students and foster a sense of community among them. These events were not only successful in creating an inclusive and supportive environment but also played a pivotal role in promoting academic excellence, healthy living, teamwork, and cultural exchange. PGSOC events provided students with the opportunity to connect with each other, share experiences, and form supportive networks. This sense of community was crucial to the well-being and academic success of postgraduate students, and PGSOC was proud to contribute to it.

Celebration of cultural festivals has always been an integral part of PGSOC, and the society was delighted to provide opportunities for students to learn about and appreciate different cultures. The events were organized in a fun and social atmosphere that allowed students to come together and bond over shared experiences. The success of the events was a testament to the resilience and dedication of PGSOC members who worked tirelessly to make them a success. Looking ahead, PGSOC remains committed to creating an inclusive and supportive environment for the postgraduate students of the School and will continue its efforts in 2023 and beyond.

Hossein Salehi, 2022-2023 President

MSE POSTGRADUATE SOCIETY | PGSOC

School of Materials Science and Engineering
UNSW Sydney | Sydney NSW 2052 Australia
W: Materials Postgraduate Society
E: MaterialsPgsoc@unsw.edu.au
Follow Us LinkedIn | Facebook | Instagram





WORKPLACE
HEALTH &
SAFETY

EQUALITY, DIVERSITY
& INCLUSION

In 2022, School of Materials Science and Engineering organised several cultural events including celebration of **Lunar New Year, Persian New Year, Diwali and Eid-UI-Fitr** to embrace the diversity of our community. These events created opportunities to bring the staff and students together from diverse backgrounds to learn about different cultures and foster our inclusive community.

- PERSIAN NEW YEAR EVENT 21ST MARCH 2022
- DIWALI EVENT 25TH OCTOBER 2021

The school also had a fundraising event to support one of our postgraduate students who was in process of kidney transplant. With the support of student and staff across school we were able to raise \$2000.

In 2022, the School of Materials Science and Engineering (MSE) has organised several events aimed at bringing staff and students together from diverse backgrounds fostering an inclusive and equitable community. Cultural events including Lunar New Year, Persian New Year, Diwali and Eid-UI-Fitr were celebrated to embrace the diversity of our community.

Our activities also extended to gender equity, reinforcing that our school provides a safe environment away from hostile judgement.

The MSE community recognises that men tend to be silent about problems they face. That's why this November, mighty moustaches were grown at the school to support men's health. The MATSOC team raised a total of \$2,000, a combination of individually raised money and direct donations to the page. A fantastic effort from these mighty men.

The school also had a fundraising event to support one of our postgraduate students who needed a kidney transplant. With the support of student and staff across the school we were able to raise \$2000.

BLUE MOUNTAIN TRIP
29TH AUGUST 2022

A one-day Blue Mountain trip was also organised for post-graduate students as an informative/recreative event with a tour guide educating our international students about Indigenous Australians and their cultures.

WHS COMMITTEE MEMBERS:

The members of the School WHS Committee in 2022 were **Jianqiang Zhang** (Chairperson), **Michael Ferry** (HOS, management representative), **Owen Standard** (Deputy HOS), **Anthony Zhang** (School Safety Officer), **David Miskovic** (technical and administrative staff representative), **Rakesh Joshi** (Academic representative), and **Tasmia Zaman** (postgraduate student representative). School WHS committee would like to thank all staff and students in the School for all their understanding, cooperation and compliance with WHS requirements and procedures.

BUILDING

- Budling access was reviewed by the School.
- Updated/ Completed Life Safety System gas sensor servicing.
- Updated Schneider electric Building management System (BMS), new interface and access.
- Updated Hilmer building Emergency Control Organisation and First aid officers.
- Completing annual checks for RCD, and fume cupboards.
- Continuation of good neighbors meeting with staff in Hilmer, SEB and F10.

COMPLIANCE

- Completed annual fire drill within the building.
- Completed quarterly level 3 Safety committee meetings.
- Issue quarterly safety WHS newsletter to the whole School.
- Hygienist (Workplace Environment Consultants) checked our areas and assessed our Schedule 14 health monitoring program for the School.
- WHS monitoring program for auditing and lab inspection.
- Checking and updating all high-risk safe work procedures (SWPs) in the School.
- Updated our MSE Chemicals in JAGGAER chemical inventory.
- Changes in UNSW RECS in particular Lasers/ laser trainings.
- Continuation of SafeSys documents archiving for moving to new system Salus this year.

COVID-19 CHALLENGES

- Mandatory face masks for MSE F2F laboratory teaching.
- Mask wearing is still highly recommended by the School/ University.

INSPECTIONS

- Completed monthly Senior leadership tours done by our head of School/ Faculty.
- Completed inspections of our Lead Labs as well as the TORCH Labs.
- Building visits by all the WHS School reps in the Faculty.
- Completion of annual electrical test and tagging for the year.
- Quarterly workplace/laboratory safety inspections and completion of corrective actions.

TRAINING

- All staff working from home have completed the WFH checklist/ assessment, done in WHS monitor.
- Updated warden and first aid training.
- Staff and students completed new Laser Training courses.
- Mandatory School WHS info sessions (-11 per year) for all new staff, postgrad and Honours students.
- External company SUPAGAS training for gas and cryogenics for both staff and students.
- WHS monitor to School for inspections and incident reporting.
- HF training/ practical for specific research students.
- Laboratory staff completed contractor engagement training.

MARKETING OUTREACH

ANNUAL REPORT MARKETING & OUTREACH

We had a great start to 2022 with plans to get students back on campus and running in-person outreach activities again. With COVID lockdowns and restrictions eased, we were able to run more on campus events.

MATERIALS RESEARCH SOCIETY VIDEO

The school embarked on an exciting project with MRS to produce a video which covered our research and education focus of the school to showcase at their fall conference. The resulting videos featured some stars of the school and was a great success. The full video can be viewed at www.youtube.com/watch?v=ORlcokyfAil

OPEN DAY

Open Day was back on campus for 2022, and it was great to see the crowds and faces in campus eve if the weather wasn't that great to start off with. We were able to host a school stand both within the science section as well as the engineering section which allowed us some great exposure, and access to students who aren't sure where to find us. Besides our ice-cream stand was a major attraction! Open Day is always extremely important for the School as it is the biggest event in the domestic undergraduate recruitment calendar and often a major factor in a student's decision to study materials science & engineering. We had our academics and student representatives on standby to answer any questions about degrees, student community and experiences on Materials Science and Engineering on what it's like to study with us.

NEW MERCHANDISE

A lot of new and exciting merchandise were purchased during 2022. Focusing on practicality and function, our merchandise line now has a variety of tote bags, bamboo themed wireless chargers and phone holders, business card sized multitools, A5 and A4 notebooks, and vacuum sealed drink bottles. The merchandise will be handed out as awards for exceptional work in hackathons and trivia events, gifts for guest speakers, and participation in assisting the school.

SOCIAL MEDIA

Like always with our social media platforms, our primary objective is to showcase the brilliant achievements of our undergraduates, postgraduates, and staff. Our marketing strategy on these platforms enforce our online presence and advertise our research, outreach, and industry opportunities. This year, we had 12 separate posts both on Facebook and Instagram, with many viewers engaging with us through comments, messages, and emails.

SCIENCE & ENGINEERING INDIGENOUS PRE-PROGRAM

As part of a 3-week introduction to science and engineering at UNSW we welcomed students from the Science and Engineering Indigenous Pre-program into our labs for a 3-hour workshop. The students ran through the different structures of materials from the unit cell up and conducted tensile testing, Charpy testing of metals and polymers to see how different materials behave and how temperature plays an important part in failure.

NATIONAL YOUTH SCIENCE FORUM WORKSHOP

David Miskovic and Marcus Wong hosted 20 exceptional Yr 11 and 12 students from the National Youth Science Forum in a Materials Science and Engineering workshop. The students got hands on experimental experience looking into the mechanical testing of metals and polymers. The students looked into the impact of pre-existing damage on material strength through notched tensile tests of PMMA.



2022 RESEARCH GRANTS

Amounts provided below are apportioned amounts for 2022

HERDC CATEGORY 1: AUSTRALIAN COMPETITIVE GRANT RESEARCH INCOME

ARENA - Australian Renewable Energy Agency / Research and Development (R&D) Program. UNSW – R&D Project – Advanced Silicon - Reduced Solar Module Temperature R&D Project. Green, M; Ekins-Daukes, N; Bilbao, J; Keevers, MJ; Jiang, Y; Zhou, Z; Timchenko, V; de Silva, C; Tkachenko, SA; Pillai, S; Chu, D; Egan, RJ; Chang, N. \$29462.

Australian Coal Research (ACR) Limited / Australian Coal Association Research Program (ACARP). Scoping Study: Design of Cokes from Biomass-Coal Blends for Sustainable Blast Furnace Ironmaking. Koshy, P. \$58200.

Australian Research Council / Discovery Project. Unlocking the Diverse Property Profile of Ultra-Lightweight Mg Alloys. Ferry, M; Primig, S; Birbilis, N; Nakashima, P. \$81822.

Australian Research Council / Discovery Project. High Temperature Corrosion Induced by Multiple Secondary Oxidants. Zhang, J; Young, DJ. \$180000.

Australian Research Council / Discovery Project. Designed to last: Novel Gradient Coatings for Extreme Environments. Munroe, PR; Xie, Z. \$200000.

Australian Research Council / Discovery Project. Bioinspired Flexible Haptic Memory Materials for Artificial Sensory Nerves. Chu, D; Furlong, TM; Wu, L; Peng, S. \$30082.

Australian Research Council / Discovery Project. Topotactic Control of Magnetism in Multiferroic and Skyrmion Materials. Seidel, J; Cazorla Silva, C. \$145000.

Australian Research Council / Discovery Project. Multiferroic Skyrmion Materials for Next Generation Nanoelectronics. Seidel, J. \$65000.

Australian Research Council / Discovery Project. Designing a Photo-Electro-Catalysis System for Selective Organic Oxidation. Scott, JA; Toe, C; Amal, R; Hart, J; Valanoor, N. \$93107.

Australian Research Council / Discovery Project. Cell Membrane Coated Photonic Crystal to study Receptor-Ligand Interactions. Kumeria, T. \$138000.

Australian Research Council / Discovery Project. Corrosion of Heat Resisting Alloys in Steam/Hydrogen-Rich Environment. Zhang, J; Young, DJ. \$75000.

Australian Research Council / Discovery Project. Beyond the Ferroelectric Field Effect Transistors. Li, S; Zhang, S; Wang, D. \$170000.

Australian Research Council / Discovery Project. Ferroelectric Bilayer Composites with Giant Electromechanical Properties. Valanoor, N; Chang, L; Daniels, JE. \$77500.

Australian Research Council / Future Fellowship. Oxide-Semiconductor Epitaxy: Towards Next Generation Nanoelectronics. Wang, D. \$100000.

Australian Research Council / Industrial Transformation Research Hubs. ARC Research Hub for Microrecycling of Battery and Consumer Wastes. Sahajwalla, VH; Wang, H; O'Mullane, A; Pahlevani, F; Joshi, RK; Boehme, T; Pozo-Gonzalo, C; Prashant, S; Giurco, D; Bhattacharya, S; Tricoli, A; Sharma, N; Maroufi, S; Kerr, R; Perez, P; Malik, A; Florin, NH; Tricoli, A. \$530000.

Australian Research Council / Industrial Transformation Research Hubs. ARC Research Hub for Connected Sensors for Health. Wang, C; Lovell, N; Gooding, J; Chu, D; Celler, BG; Wu, T; Peng, S; Zhang, J; Do, T; Bilston, LE; Stevens, M; Liu, G; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Neff, R; Lord, SR; Yeoh, GH; Parameswaran, S; Hill, DJ; Foroughi, J; Li, B; Bhaskaran, M; Cheng, W; Gu, Y; Xi, J; Minichiello, MA; Wu, S; Sriram, S; Kou, L; Egglestone, P; Raad, R; Carroll, N; Ooi, S; Sonar, P; Wright, R; Drummond, J; Liao, T; Phan, H. \$52083.

Australian Research Council / Industrial Transformation Training Centres. ARC Training Centre for The Global Hydrogen Economy. Amal, R; Aguey-Zinsou, K; Macgill, I; Zhao, C; Scott, JA; Daiyan, R; Cazorla Silva, C; Lovell, EC; Lu, X; Shen, Y; Kara, S. \$110305.

Australian Research Council / Linkage Project. Advancing the Australian Specialty Alloy Processing Capability. Primig, S. \$100959.

Australian Research Council / Linkage Project. Microbiologically Induced Stress Corrosion Cracking in Underground Mines. Saydam, S; Lamei Ramandi, H; Kumar, N; Crosky, A; Manefield, M; Canbulat, I. \$44338.

Australian Research Council / Linkage Project. Engineering Nanoionic Interfaces towards High Performance Cathode Coatings. Chu, D; Cazorla Silva, C; Wang, D; Sharma, N. \$71238.

Australian Research Council / Linkage Project. New Ceramic: Fully Stabilised Monoclinic ZrO₂ by Al₂O₃ + SiO₂ Additions. Sorrell, CC; Hart, J; Koshy, P; Swain, MV. \$142350.

Australian Research Council / Linkage Project. High Performance Metal Oxide Inks for Printable Memory Arrays. Chu, D; Cazorla Silva, C; Wu, T; Chesman, A; Howard, M. \$112184.

Australian Research Council / Linkage Project. Structure-Property Relationships of Next Generation Aero-Engine Materials. Primig, S; Ringer, SP. \$190000.

Australian Research Council / Linkage Project. Powering Next Generation Wearable Electronics: Moisture Electric Generator. Chu, D; Wu, T; Joshi, RK; Hart, J. \$157720.

Department of Agriculture, Fisheries and Forestry (DAFF) / Soil Science Challenge. Engineering Novel Amendments for Regenerating Soil C Without the Greenhouse Gas Implications of Using More N Fertilizer. Munroe, PR; Vinu, A; Van Zwieten, L; Tavakkoli, E; Fang, Y; Taherymoosavi, S. \$273896.

Department of Climate Change Energy the Environment and Water / National Environment Science Program (NESP 2). Sustainable Communities and Waste Hub. Sahajwalla, VH; Green, D; Wiedmann, T; Downing, M; Ghose, A. \$1876500.

Monash University / ARC Centres of Excellence Shared Grant. ARC Centre of Excellence in Future Low-Energy Electronics Technologies FLEET. Hamilton, A; Fuhrer, MS; Ostrovskaya, E; Helmersson, K; Wang, X; Kalantar Zadeh, K; Kalantar Zadeh, K; Bao, Q; Culcer, DM; Davis, J; Davis, M; Klochan, D; Medhekar, N; Parish, M; Seidel, J; Schiffrin, A; Sushkov, OP; Valanoor, N; Vale, C; Wang, L; Cole, J. \$428241.

Monash University / Defence Science & Technology Group (DSTG) - Hazardous Agent Challenge Shared Grant. Porous Photonic Microcavities Enhanced In-field Toxic Chemical Sensors. Kumeria, T; Voelcker, N; Prashant, S. \$200000.

National Health & Medical Research Council / Early Career Fellowships. Bioresponsive Porous Silicon for Site Specific Oral Delivery of Antibodies for the Treatment of Inflammatory Bowel Disease. Kumeria, T. \$21010.

National Heart Foundation of Australia / Vanguard Grants. The Next Generation of Cardiac Pacemakers: Leadless and Flexible Organic Optoelectronics for Optical Pacing of the Heart. Mawad, D; Lovell, N; Al Abed, A. \$24845.

Royal Melbourne Institute of Technology / ARC Industrial Transformation Research Hub Shared Grant. ARC Research Hub for Transformation of Reclaimed Waste Resources to Engineered Materials and Solutions for a Circular Economy. Gao, W; Setunge, S; Mendis, P; Wang, H; Horne, R; Fernando, N; Choudhury, NR; Shah, K; Giustozzi, F; Law, D; Pathirana, PN; Pahlevani, F; Li, W; Tam, V; Polonsky, M; Halgamuge, S; Zhang, G; Smith, S; Lokuge, W; Gravina, R; Iyer-Raniga, U; Madapusi, S; Daver, F; Nguyen, T; Sofi, M; Sabri, Y; Wijayasundara, M; Costa, S. \$30000.

Swinburne University of Technology / ARC Discovery Project Shared Grant. DP210103318 - Design of Non-Equilibrium Architectures: Leveraging High Entropy Materials. Munroe, PR; Berndt, C; Ang, A. \$37609.

University of Adelaide / DISER Australia-India Strategic Research Fund Shared Grant. Photonic Viropsy: Harnessing Light on Chip for Precise SARS-Cov-2 Diagnosis. Kumeria, T; Shiddiky, M; Nguyen, N; Santos, A; Voelcker, N. \$14155.

University of Sydney / ARC Linkage Project Shared Grant. High-Load Powder Dispersion and Aerosol Delivery: An Integrated Approach. Yang, R; Chan, H; Kourmatzis, A. \$59384.

University of Sydney / ARC Linkage Project Shared Grant. Advanced Hard Metals: Microstructure-Property-Processing Relationships. Primig, S; Ringer, SP; Czettl, C. \$109483.

2022 RESEARCH GRANTS

HERDC CATEGORY 2: OTHER PUBLIC SECTOR RESEARCH FUNDING

Australian Nuclear Science & Technology Organisation (ANSTO) / ARC Centre of Excellence in Future Low-Energy Electronics Technologies (FLEET) Student Project Agreement. FLEET Scholarship Awarded to PhD Student Michael Lord. Valanoor, N. \$32000.

Australian Nuclear Science & Technology Organisation (ANSTO) / FutureNow Plus Scholarships. Development of Ultra-High Temperature Ceramics (UHTCs) for Extreme Environments (Energy, Aerospace, and Defence Applications) - Scholarship for Vienna Wang. Koshy, P; Sorrell, CC; Muransky, O; Holmes, RL; Wong, V. \$15000.

Australian Nuclear Science & Technology Organisation (ANSTO) / Student Project Agreement. Effect of Perovskite Crystal Orientation on Aqueous Durability - Student Research Agreement for Sherry Chen. Koshy, P; Gregg, D. \$600.

Australian Nuclear Science & Technology Organisation (ANSTO) / Student Project Agreement. Developing Models to Establish the Life-Cycle Costs of Nuclear Waste Treatment - Student Research Agreement for Jenny Huang. Koshy, P; Holmes, RL. \$600.

Australian Nuclear Science & Technology Organisation (ANSTO) / Student Project Agreement. Hot Isostatically Pressed (HIPed) Canister-Wasteform Interaction Study of Synroc Type Ceramic Wasteforms - Student Research Agreement for Jodie Mann. Koshy, P; Gregg, D. \$600.

Australian Nuclear Science & Technology Organisation (ANSTO) / Student Project Agreement. Modelling the Life-Cycle Costs of Nuclear Waste Treatment: Comparison of Borosilicate Glass vs Glass-Ceramic Synroc Processing Route. Scholarship for Jenny Huang. Koshy, P; Huang, J. \$6000.

Australian Nuclear Science & Technology Organisation (ANSTO) / Student Project Agreement. Effect of Crystal Orientation on Perovskite and Zirconolite Ceramics on Their Aqueous Durability for Wasteform Applications. Student: Sherry Chen. Koshy, P. \$6000.

Australian Nuclear Science & Technology Organisation (ANSTO) / Student Project Agreement. Conceptual Wasteforms for Immobilising Fluoride-Containing Nuclear Waste from Next Generation Nuclear Reactors - Student Ratan Venkatesan. Koshy, P; Gregg, D; Farzana, R; Venkatesan, R. \$2000.

Australian Nuclear Science & Technology Organisation (ANSTO) / Student Project Agreement. Dissolution mechanisms of Perovskite - Student Frederick Zhang. Koshy, P; Gregg, D; Dayal, P. \$2000.

Centered Around You Pty Ltd / Investment NSW COVID-19 TechVoucher. Development of BheemSense. Li, S. \$25000.

CSIRO - Commonwealth Scientific and Industrial Research Organisation / Commonwealth Government Contract. Characterisation of Surfaces and Advanced Thin Film Materials for Devices - Part 2. Koshy, P. \$26730.

CSIRO - Commonwealth Scientific and Industrial Research Organisation / Dept of Industry, Science, Energy and Resources - Australia-India Strategic Research Fund (AISRF) - COVID-19 Collaborative Research Project Subcontract. India - Australia Industry and Research Collaboration for Reducing Plastic Waste coordinated by the CSIRO. Sahajwalla, VH. \$125000.

Department of Climate Change Energy the Environment and Water / Commonwealth Government Contract. Sustainable Communities and Waste Hub - Research Support Services NESP. Sahajwalla, VH. \$275709.

Director of National Parks / Commonwealth Government Contract. Prototyping a MICROfactorie Solution for Ghost Nets and Marine Debris. Sahajwalla, VH; Ghose, A. \$160000.

Grains Research & Development Corporation (GRDC) / Department of Agriculture, Water & the Environment Soil Science Challenge Partner Contribution. Engineering Novel Amendments for Regenerating Soil C Without the Greenhouse Gas Implications of Using More N Fertilizer. Munroe, PR; Taherymoosavi, S; Tavakkoli, E; Van Zwieten, L; Vinu, A; Fang, Y. \$75000.

Greater Sydney Commission / State Government Contract. Green Ceramics™ Prototyping. Sahajwalla, VH; Ghose, A; Nelson, N. \$180986.

Investment NSW / NSW Circular Economy Innovation Network. NSW Circular Economy Innovation Network. McLean, L; Sahajwalla, VH. \$70000.

Investment NSW / NSW RAAP - Co-Investment in Industrial Transformation Research Program (Hubs and Centres). ARC Research Hub for Connected Sensors for Health. Wang, C; Lovell, N; Gooding, J; Chu, D; Celler, BG; Wu, T; Peng, S; Zhang, J; Do, T; Bilston, LE; Stevens, M; Liu, G; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Hill, DJ; Foroughi, J; Li, B; Bhaskaran, M; Cheng, W; Gu, Y; Xi, J; Minichiello, MA; Wu, S; Sriram, S; Kou, L; Wright, RF; Egglestone, P; Raad, R; Carroll, N; Sonar, P; Neff, R; Drummond, J; Liao, T. \$1136.

NSW Department of Planning and Environment / RAAP - ARC Industrial Transformation Research Program (ITRC & ITRH). ARC Research Hub for Microrecycling of Battery and Consumer Wastes. Sahajwalla, VH; Joshi, RK; Boehme, T; Sharma, N; Maroufi, S; Wang, H; Forsyth, M; Perez, P; Pahlevani, F; Giurco, D; Bhattacharya, S; O'Mullane, A; Kerr, R; Tricoli, A; Malik, A; Florin, NH; Tricoli, A. \$16000.

NSW Department of Primary Industries / CRC for High Performance Soils Ltd Subcontract. Amelioration of Subsoil Constraints Using Innovative Products and Precision Placement of Soil Amendments - PJA3.002. Munroe, PR. \$10000.

Sydney Water Corporation / ARC ITRH Industry Partner Contribution. ARC Research Hub for Microrecycling of Battery and Consumer Wastes. Sahajwalla, VH. \$20000.

Sydney Water Corporation / State Government Contract. Graphene Oxide-Coated LPG Fibre for Ammonia Sensing in Water. Joshi, RK; Stenzel, M; Grattan, KT; Tong, S. \$37500.

University of Sydney / DIIS - Dept of Defence US-Australia International Multidisciplinary University Research Initiative (AUSMURI) Shared Grant. Microstructure Control in Metal Additive Manufacturing. Primig, S; Ringer, SP; Liao, X. \$292900.

HERDC CATEGORY 3: INDUSTRY AND OTHER FUNDING

AINSE - Australian Institute of Nuclear Science and Engineering / AINSE Honours Scholarships. HIPed-Canister-Wasteform Interactions in Synroc Ceramic Wasteforms. Student: Jodie Mann. Koshy, P; Mann, J. \$5000.

AINSE - Australian Institute of Nuclear Science and Engineering / Residential Student Scholarship. Pyrochlore Glass-Ceramic Wasteforms for Immobilising Nuclear Waste - Student Joel Abraham. Koshy, P. \$8732.

AINSE - Australian Institute of Nuclear Science and Engineering / Residential Student Scholarship. Designing Glass-Ceramic Wasteforms for Actinide Immobilisation through Understanding of Actinide Crystal Chemistry Structure. Student: Aurpa Bhuiyan. Koshy, P; Bhuiyan, A; Zhang, Y. \$4311.

AIT Austrian Institute of Technology / The Austrian Research Promotion Agency (FFG) Energy Research. Novel Advanced Titanium Superalloys for Additive Manufacturing. Primig, S; Spörk-Erdely, P; Fischer, T; Hawranek, G; Klein, T; Schneider, C. \$22857.

Allegra Orthopaedics Limited / Contract Research. Optimisation of Processing Parameters for Superior Biomedical Product Characteristics - Part 1. Sorrell, CC; Koshy, P. \$16131.

AOTOL Pty Ltd / ARC Linkage Project Industry Partner Contribution. Engineering Nanoionic Interfaces towards High Performance Cathode Coatings. Chu, D; Cazorla Silva, C; Wang, D; Sharma, N. \$16640.

Aqua Firma Solutions Pty Ltd / INSF Industry Partner Contribution. Surface Modification of Biochars Using Nanobubbles and Magnetic Fields to Generate Reactive Oxygen Species for Animal Feeds. Munroe, PR; Taherymoosavi, S. \$10000.

Australian Advanced Materials Pty Ltd / ARC Industrial Transformation Research Hubs Industry Partner Contribution. ARC Research Hub for Connected Sensors for Health. Chu, D; Lovell, N; Gooding, J; Celler, BG; Wu, T; Peng, S; Zhang, J; Do, T; Bilston, LE; Stevens, M; Liu, G; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Hill, DJ; Li, B; Neff, R; Bhaskaran, M; Cheng, W; Gu, Y; Xi, J; Minichiello, MA; Wu, S; Sriram, S; Kou, L; Wright, RF; Egglestone, P; Raad, R; Carroll, N; Ooi, S; Wang, C; Sonar, P; Foroughi, J; Drummond, J; Liao, T. \$1957.

2022 RESEARCH GRANTS

Australian Advanced Materials Pty Ltd / ARC Linkage Partner Contribution. High Performance Metal Oxide Inks for Printable Memory Arrays. Chu, D; Cazorla Silva, C; Wu, T; Howard, M. \$50000.

Australian Advanced Materials Pty Ltd / ARC Linkage Partner Contribution. Powering Next Generation Wearable Electronics: Moisture Electric Generator. Chu, D; Wu, T; Joshi, RK; Hart, J. \$70000.

Australian Nuclear Science & Technology Organisation (ANSTO) / AINSE Honours Scholarship. Hot Isostatically Pressed (HIPed) Canister-Ceramic Interactions in Titanate-based Ceramics - Scholarship for Jodie Mann. Koshy, P; Mann, J. \$2000.

Baxter Healthcare Corporation (USA) / International Contract. Graphene Based Membranes for the Removal of Chlorine and Hardness from Water. Joshi, RK. \$96674.

Bradken Resources Pty Ltd / Contract Research. Systematic Literature Review about the Effect of Hydrogen on Steel. Pahlevani, F. \$20000.

Catalan Institute of Nanoscience and Nanotechnology / European Commission Marie Skłodowska-Curie MSCA Postdoctoral Fellowships - Global Fellowships Shared Grant. 2D Graphene-Based devices for Biosensing cancer biomarkers (GraBBing). Joshi, RK; Quintano, V. \$57743.

Centered Around You Pty Ltd / COVID-19 TechVoucher Industry Partner Contribution. Development of BheemSense. Li, S; Qu, B. \$13038.

Chuangqi Times (Qingdao) Technology Company Ltd / ARC Industrial Transformation Research Program Industry Partner Contribution. ARC Training Centre for The Global Hydrogen Economy. Amal, R; Aguey-Zinsou, K; Macgill, I; Zhao, C; Scott, JA; Daiyan, R; Cazorla Silva, C; Lovell, EC; Lu, X; Shen, Y; Kara, S. \$10000.

Commonwealth Steel Company / ARC ITRH Industry Partner Contribution. ARC Research Hub for Microrecycling of Battery and Consumer Wastes. Sahajwalla, VH. \$275000.

Critus / Defence Innovation Network Seed Project Leverage Scheme Industry Partner Contribution. Development of Novel Crystal Growth Furnace Allowing High-Volume Production of Relaxor Ferroelectrics for Sonar Applications. Daniels, JE. \$41067.

CSIRO - Commonwealth Scientific and Industrial Research Organisation / Meat & Livestock Australia Limited (MLA) Subcontract. BGBP0032 Fit-for-purpose Biochar to Improve Efficiency in Ruminants. Munroe, PR. \$11000.

DMTC Limited / Contract Research. Characterisation of Relaxor Ferroelectric Single Crystals in Support of Crystal Growth, Utilisation and Compositional Development. Daniels, JE; Cairney, J. \$179404.

Flame Security International Pty Ltd / ARC Industrial Transformation Research Hubs Industry Partner Contribution. ARC Research Hub for Connected Sensors for Health. Mao, G; Lovell, N; Gooding, J; Chu, D; Celler, BG; Wu, T; Peng, S; Zhang, J; Do, T; Bilston, LE; Stevens, M; Liu, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Hill, DJ; Li, B; Neff, R; Bhaskaran, M; Cheng, W; Gu, Y; Xi, J; Minichiello, MA; Wu, S; Sriram, S; Kou, L; Wright, RF; Egglestone, P; Raad, R; Carroll, N; Ooi, S; Wang, C; Foroughi, J; Sonar, P; Drummond, J; Liao, T. \$10384.

Genesys Electronics Design Pty Ltd / ARC Industrial Transformation Research Hubs Industry Partner Contribution. ARC Research Hub for Connected Sensors for Health. Lovell, N; Gooding, J; Chu, D; Celler, BG; Wu, T; Peng, S; Zhang, J; Do, T; Bilston, LE; Stevens, M; Liu, G; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Hill, DJ; Li, B; Neff, R; Bhaskaran, M; Cheng, W; Gu, Y; Xi, J; Minichiello, MA; Wu, S; Sriram, S; Kou, L; Wright, RF; Egglestone, P; Raad, R; Carroll, N; Ooi, S; Wang, C; Foroughi, J; Sonar, P; Drummond, J; Liao, T. \$6522.

H_Potential / ARC Industrial Transformation Research Program Industry Partner Contribution. ARC Training Centre for The Global Hydrogen Economy. Amal, R; Aguey-Zinsou, K; Macgill, I; Zhao, C; Scott, JA; Daiyan, R; Cazorla Silva, C; Lovell, EC; Lu, X; Shen, Y; Kara, S. \$3000.

Hasnur Group / ARC Industrial Transformation Research Program Industry Partner Contribution. ARC Training Centre for The Global Hydrogen Economy. Amal, R; Aguey-Zinsou, K; Macgill, I; Zhao, C; Scott, JA; Daiyan, R; Cazorla Silva, C; Lovell, EC; Lu, X; Shen, Y; Kara, S. \$2000.

Kumul Petroleum Holdings Limited / ARC Industrial Transformation Research Hubs Industry Partner Contribution. ARC Industry Transformation Research Hub for Resilient and Intelligent Infrastructure Systems (RIIS) in Urban, Resources and Energy Sectors. Khalili-Naghadeh, N; Rajabifard, A; Chan, T; Zlatanova, S; Samadi, B; Wang, C; Canbulat, I; Perera, S; Gao, W; Parameswaran, S; Prasad, D; Sammut, C; Zhang, W; Li, B; Shen, X; Barton, J; Cholette, M; Clark, SR; Aryal, J; Raval, SA; Ma, L; Shahbodaghkhan, B; Vahab, M; Mao, G; Le, K; Felson, A; Chu, D; Ronagh, HR; Makki Alamdari, M. \$10002.

Mattress Recycle Australia / ARC ITRH Industry Partner Contribution. ARC Research Hub for Microrecycling of Battery and Consumer Wastes. Sahajwalla, VH. \$50000.

Neuroscience Research Australia (NeuRA) / ARC Industrial Transformation Research Hubs Industry Partner Contribution. ARC Research Hub for Connected Sensors for Health. Wang, C; Lovell, N; Gooding, J; Chu, D; Celler, BG; Wu, T; Peng, S; Zhang, J; Do, T; Bilston, LE; Stevens, M; Liu, G; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Hill, DJ; Li, B; Neff, R; Bhaskaran, M; Cheng, W; Gu, Y; Xi, J; Minichiello, MA; Wu, S; Sriram, S; Kou, L; Wright, RF; Egglestone, P; Raad, R; Carroll, N; Ooi, S; Foroughi, J; Prashant, S; Drummond, J; Liao, T. \$2609.

Nutromics Pty Ltd / ARC Industrial Transformation Research Hubs Industry Partner Contribution. ARC Research Hub for Connected Sensors for Health. Gooding, J; Lovell, N; Chu, D; Celler, BG; Wu, T; Peng, S; Zhang, J; Do, T; Bilston, LE; Stevens, M; Liu, G; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Hill, DJ; Li, B; Neff, R; Bhaskaran, M; Cheng, W; Gu, Y; Xi, J; Minichiello, MA; Wu, S; Sriram, S; Kou, L; Wright, RF; Egglestone, P; Raad, R; Carroll, N; Ooi, S; Wang, C; Sonar, P; Foroughi, J; Drummond, J; Liao, T. \$11478.

OneSteel Manufacturing Pty Ltd / Contract Research. Advancing Australian Steelmaking for Next Generation Construction Applications. Primig, S. \$20000.

Origin Energy Limited / ARC Industrial Transformation Research Program Industry Partner Contribution. ARC Training Centre for The Global Hydrogen Economy. Amal, R; Aguey-Zinsou, K; Macgill, I; Zhao, C; Scott, JA; Daiyan, R; Cazorla Silva, C; Lovell, EC; Lu, X; Shen, Y; Kara, S. \$7500.

Planet Ark Environmental Foundation / ARC ITRH Industry Partner Contribution. ARC Research Hub for Microrecycling of Battery and Consumer Wastes. Sahajwalla, VH. \$50000.

Qidong Qiao New Materials Technology Co Ltd / ARC Linkage Project Industry Partner Contribution. Engineering Nanoionic Interfaces Towards High Performance Cathode Coatings. Chu, D; Cazorla Silva, C; Sharma, N; Wang, D. \$10000.

Regional Development Australia - Northern Rivers NSW / Social Good Seed Fund Partner Contribution. The Solutions of End-of-Life Maritime Waste: Conversion of Fibreglass Reinforced Plastic Waste into Biodegradable Silicon for Agricultural Applications. Kumeria, T. \$10000.

Roobuck Pty Ltd / ARC Industrial Transformation Research Hubs Industry Partner Contribution. ARC Research Hub for Connected Sensors for Health. Li, B; Lovell, N; Gooding, J; Chu, D; Celler, BG; Wu, T; Peng, S; Zhang, J; Do, T; Bilston, LE; Stevens, M; Liu, G; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Hill, DJ; Neff, R; Bhaskaran, M; Cheng, W; Gu, Y; Xi, J; Minichiello, MA; Wu, S; Sriram, S; Kou, L; Wright, RF; Egglestone, P; Raad, R; Carroll, N; Ooi, S; Wang, C; Foroughi, J; Drummond, J; Liao, T. \$5217.

Santevation Pty Ltd / ARC Industrial Transformation Research Hubs Industry Partner Contribution. ARC Research Hub for Connected Sensors for Health. Wang, C; Lovell, N; Gooding, J; Chu, D; Celler, BG; Wu, T; Peng, S; Zhang, J; Do, T; Bilston, LE; Stevens, M; Liu, G; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Hill, DJ; Li, B; Neff, R; Bhaskaran, M; Cheng, W; Gu, Y; Xi, J; Minichiello, MA; Wu, S; Sriram, S; Kou, L; Wright, RF; Egglestone, P; Raad, R; Carroll, N; Ooi, S; Foroughi, J; Prashant, S; Drummond, J; Liao, T. \$13043.

Shenzhen Evolution Technology Co. Ltd / ARC Industrial Transformation Research Program Industry Partner Contribution. ARC Training Centre for the Global Hydrogen Economy. Amal, R; Aguey-Zinsou, K; Macgill, I; Zhao, C; Scott, JA; Daiyan, R; Cazorla Silva, C; Lovell, EC; Lu, X; Shen, Y; Kara, S. \$1875.

Southern Green Gas Limited / ARC Industrial Transformation Research Program Industry Partner Contribution. ARC Training Centre for The Global Hydrogen Economy. Amal, R; Aguey-Zinsou, K; Macgill, I; Zhao, C; Scott, JA; Daiyan, R; Cazorla Silva, C; Lovell, EC; Lu, X; Shen, Y; Kara, S. \$4688.

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Standard Bio / Norwegian Research Council Shared Grant. Catch&Kill - Sustainable Low-Cost Materials for Air and Water Disinfection. Munroe, PR; Joseph, SD. \$102559.

Sydney Pain Research Centre / ARC Industrial Transformation Research Hubs Industry Partner Contribution. ARC Research Hub for Connected Sensors for Health. Wang, C; Lovell, N; Gooding, J; Chu, D; Celler, BG; Wu, T; Peng, S; Zhang, J; Do, T; Bilston, LE; Stevens, M; Liu, G; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Hill, DJ; Li, B; Neff, R; Bhaskaran, M; Cheng, W; Gu, Y; Xi, J; Minichiello, MA; Wu, S; Sriram, S; Kou, L; Wright, RF; Egglestone, P; Raad, R; Carroll, N; Ooi, S; Sonar, P; Foroughi, J; Drummond, J; Liao, T. \$3913.

TES-AMM Australia Pty Ltd / ARC ITRH Industry Partner Contribution. ARC Research Hub for Microrecycling of Battery and Consumer Wastes. Sahajwalla, VH. \$100000.

Tiger Pharm Pty Ltd / ARC Industrial Transformation Research Hubs Industry Partner Contribution. ARC Research Hub for Connected Sensors for Health. Chu, D; Lovell, N; Gooding, J; Celler, BG; Wu, T; Peng, S; Zhang, J; Do, T; Bilston, LE; Stevens, M; Liu, G; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Hill, DJ; Li, B; Neff, R; Bhaskaran, M; Cheng, W; Gu, Y; Xi, J; Minichiello, MA; Wu, S; Sriram, S; Kou, L; Wright, RF; Egglestone, P; Raad, R; Carroll, N; Ooi, S; Wang, C; Foroughi, J; Sonar, P; Drummond, J; Liao, T. \$2609.

University of Newcastle / BHP Shared Contract. Effect of Microalgae Blending in Cokemaking. Koshy, P; Hockings, K; Tahmasebi, A; Lee, S. \$33081.

University of Queensland / US Department of Defense Congressionally Directed Medical Research Program (Discovery Award) Shared Grant. Designer Artificial Cells: Customized Cell Membrane Coated Porous Nanoparticles for Targeting Lethal Cytokine Storm. Kumeria, T; Wang, R; Liang, X. \$47890.

University of Sydney / ARC Linkage Project - Ceratizit Shared Partner Contribution. Advanced Hard Metals: Microstructure-Property-Processing Relationships. Primig, S; Ringer, SP; Czetti, C. \$36183.

University of Sydney / ARC Linkage Project - Singapore Medical Device Design & Development Pte Ltd Shared Partner Contribution. High-load Powder Dispersion and Aerosol Delivery: An Integrated Approach. Yang, R; Chan, H; Kourmatzis, A; Tong, Z. \$35000.

Vecor Australia / ARC Linkage Project Industry Partner Contribution. New Ceramic: Fully Stabilised Monoclinic ZrO₂ by Al₂O₃ + SiO₂ Additions. Sorrell, CC. \$100000.

Vecor Australia / Contract Research. Vecor Co-Location Agreement. Koshy, P; Mofarah, S; Sorrell, CC. \$955383.

Vesi Water Pty Ltd / Contract Research. Graphene Oxide Desiccant Project. Joshi, RK. \$63142.

voestalpine BÖHLER Aerospace GmbH & Co KG / International Contract. Direct Ageing Plus: Process Design Through High Resolution Characterisation of Alloy 718. Primig, S; Stanojevic, A. \$7780.

voestalpine BOHLER Edelstahl GmbH & Co KG / ARC Linkage Project Industry Partner Contribution. Structure-Property Relationships of Next Generation Aero-Engine Materials. Primig, S; Ringer, SP. \$271000.

voestalpine BOHLER Edelstahl GmbH & Co KG / International Contract. Processing-Structure-Property Relationships of Forged Ni-Based Superalloys. Primig, S; Plesiutchnig, E; Turk, C; Kapp, M; Leitner, T; Kleber, S. \$40538.

voestalpine BOHLER Edelstahl GmbH & Co KG / International Contract. Processing-Structure-Property Relationships of Forged Ni-Based Superalloys. Primig, S; Turk, C. \$71215.

Walking Tall Health Pty Ltd / ARC Industrial Transformation Research Hubs Industry Partner Contribution. ARC Research Hub for Connected Sensors for Health. Brodie, AM; Lovell, N; Gooding, J; Chu, D; Celler, BG; Wu, T; Peng, S; Zhang, J; Do, T; Bilston, LE; Stevens, M; Liu, G; Mao, G; Argha, A; Han, Z; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Hill, DJ; Li, B; Neff, R; Bhaskaran, M; Cheng, W; Gu, Y; Xi, J; Minichiello, MA; Wu, S; Sriram, S; Kou, L; Wright, RF; Egglestone, P; Raad, R; Carroll, N; Ooi, S; Wang, C; Prashant, S; Drummond, J; Liao, T. \$3913.

Wellcome Leap / In Utero Program. Detecting the 'at risk' Fetus by Non-Invasive Rapid Assessment of Fetoplacental Blood Flow. Welsh, AW; Barber, TJ; Li, S; Thomas, SJ; Wang, D. \$65165.

Western Australian Specialty Alloys Pty Ltd / ARC Linkage Project Industry Partner Contribution. Advancing the Australian Specialty Alloy Processing Capability. Primig, S. \$41301.

Woolworths Format Development Limited / Contract Research. Coil Leakage Analysis in Refrigerators. Pahlevani, F. \$17500.

OTHER RESEARCH FUNDING

Australian Research Council / LIEF. A 4-D X-Ray Microscopy Laboratory. Halim, A; Foster, SJ; Gan, Y; Li, Q; Daniels, JE; Einav, I; Steel, K; Ferry, M; Schrank, C; Regenauer-Lieb, K; Regenauer-Lieb, K. \$72000.

Australian Research Council / LIEF. Nano-IR Facility for the Search of New Multifunctional Materials. Seidel, J; Fuhrer, MS; Green, M; Kim, D; Huang, S; Mawad, D; Yun, JS. \$295500.

Macquarie University / ARC LIEF Subcontract (UNSW Admin). Nano-IR Facility for the Search of New Multifunctional Materials. Seidel, J; Fuhrer, MS; Green, M; Kim, D; Huang, S; Mawad, D; Yun, JS. \$16000.

Monash University / ARC Centre of Excellence in Future Low-Energy Electronics Technologies (FLEET) Write-Up Scholarship. FLEET Write-Up scholarship awarded to Hien Nguyen. Seidel, J. \$3565.

Monash University / ARC Centres of Excellence Subcontract. Women in FLEET Fellowship awarded to Dr Qi Zhang. Zhang, Q; Valanoor, N. \$57500.

Monash University / ARC Centres of Excellence Subcontract. FLEET Strategic Research Funding Program - Nagy Valanoor. Valanoor, N. \$70000.

Monash University / ARC Centres of Excellence Subcontract. FLEET Translation Program - Toward Practical Development of Efficient Rechargeable Aqueous Zn-Ion Battery Technology. Kumar, P; Valanoor, N; Kundu, D; Musso, T; Shang, Y. \$10000.

Monash University / ARC LIEF Subcontract (UNSW Admin). Nano-IR Facility for the Search of New Multifunctional Materials. Seidel, J; Fuhrer, MS; Green, M; Kim, D; Huang, S; Mawad, D; Yun, JS. \$4000.

Queensland University of Technology / ARC LIEF Subcontract (UNSW Admin). A 4-D X-Ray Microscopy Laboratory. Halim, A; Gan, Y; Li, Q; Daniels, JE; Schrank, C; Regenauer-Lieb, K; Steel, K; Ferry, M; Einav, I; Foster, SJ; Regenauer-Lieb, K. \$4400.

Royal Melbourne Institute of Technology / ARC Industrial Transformation Research Hubs Collaborating Organisation Contribution. ARC Research Hub for Transformation of Reclaimed Waste Resources to Engineered Materials and Solutions for a Circular Economy. Gao, W; Setunge, S; Mendis, P; Wang, H; Horne, R; Fernando, N; Choudhury, NR; Shah, K; Giustozzi, F; Law, D; Pathirana, PN; Pahlevani, F; Li, W; Tam, V; Polonsky, M; Halgamuge, S; Zhang, G; Smith, S; Lokuge, W; Gravina, R; Iyer-Raniga, U; Madapusi, S; Daver, F; Nguyen, T; Sofi, M; Sabri, Y; Wijayasundara, M; Costa, S. \$30000.

Royal Melbourne Institute of Technology / Department of Defence Subcontract. A Prototype Portable, Rechargeable and Silent Power Supply Based on a Reversible Hydrogen Fuel Cell. Chan, SL; Chu, D; Bahman Rokh, G. \$23000.

University of Queensland / ARC LIEF Subcontract (UNSW Admin). A 4-D X-Ray Microscopy Laboratory. Halim, A; Gan, Y; Li, Q; Daniels, JE; Schrank, C; Regenauer-Lieb, K; Steel, K; Ferry, M; Einav, I; Foster, SJ; Regenauer-Lieb, K. \$2000.

University of Sydney / ARC LIEF Shared Grant (UNSW Non-Admin). Advanced Materials Synthesis and Environmental Characterisation Facility. Li, S; Bilek, MM; Green, M; Hao, X; Zheng, Y; Wang, D; Kepert, CJ; Neta, C; Dehghani, F; Kingshott, P; Akhavan, B; Hessel, V; Moss, D; Bulone, V; McArthur, S. \$243826.

University of Sydney / ARC LIEF Subcontract (UNSW Admin). A 4-D X-Ray Microscopy Laboratory. Halim, A; Gan, Y; Li, Q; Daniels, JE; Schrank, C; Steel, K; Ferry, M; Einav, I; Foster, SJ; Regenauer-Lieb, K; Regenauer-Lieb, K. \$24000.

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