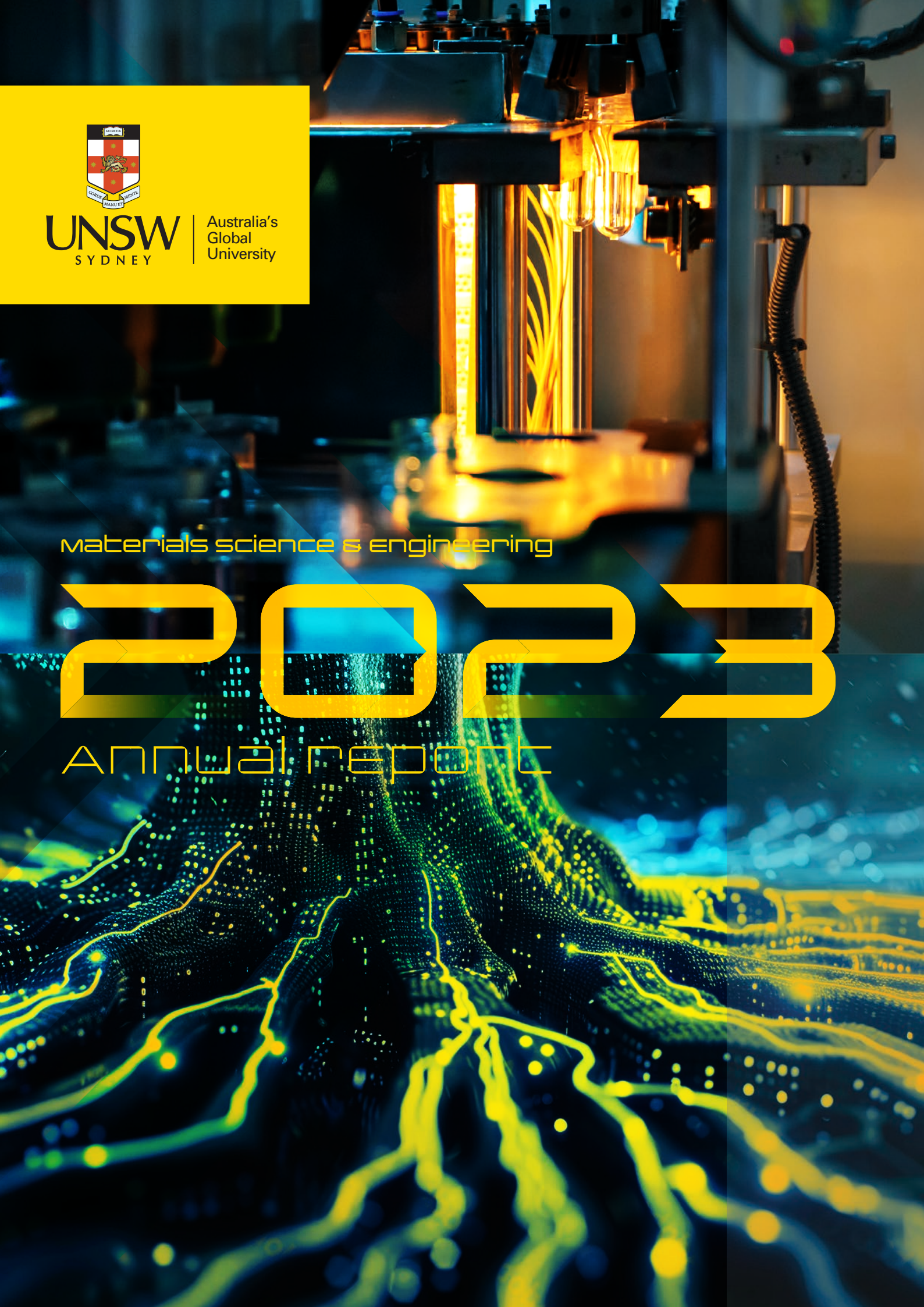
UNSW SYDNEY | Australia's Global University



materials science & engineering

2023

annual report

welcome from HoS

I am delighted to introduce the 2023 Annual Report.

The School has continued its strong performance across the university's three pillars: Educational Excellence, Research Excellence, and Collegiality, Engagement & Leadership. Thanks to the dedication of our staff and students, the School continues to be an inspiring place to work and study. Their accomplishments are celebrated throughout this report.

I would like to begin by congratulating Drs Rumana Hossein, Rasoul Nekouei, and Ji Zhang on their promotions to Lecturer, Dr Samane Maroufi on her promotion to Senior Lecturer, A/Prof. Kris Kilian on his promotion to Professor, and Dr Tushar Kumeria on his conversion to a continuing academic position. Additionally, we warmly welcome Dr Akif Kaynak to the School as an Education-focused Senior Lecturer.

After a challenging few years, it was pleasing to see student enrolments across our various coursework and research degree programs bounce back, with a particularly strong intake into our coursework Masters program. At both undergraduate and postgraduate levels, students receive excellent and innovative teaching and training from our staff, as reflected by consistently outstanding myTeaching evaluations- among the best in the university.

The School's reputation in research remains exceptional, as demonstrated by the most recent international discipline rankings; UNSW was ranked first in Australia in both the QS World Rankings in Materials Science and the ARWU World Rankings in Materials Science & Engineering. This success is a testament to our staff and their research teams, who continue to build strong international reputations for research excellence, ranging from publishing their fundamental discoveries in prestigious international journals to impactful translational outcomes with their industry partners.

To support this excellent research, several staff members secured major grants through the ARC Discovery, Linkage, Infrastructure, and Industrial Transformation Research Hubs schemes, as well as funding from other external funding agencies and industry partners. Several staff also won prestigious ARC DECRA, ARC Future, and ARC Laureate (Industry) Fellowships. Additionally, staff received personal awards, prizes, and fellowships from prestigious professional bodies. A summary of staff and student research funding, publications, and other professional accolades throughout the year is included herein.

The School is particularly proud of our students' many achievements. This report highlights several of their accomplishments and awards throughout the year, including our undergraduate prize winners, Industry Training poster presentation winners, postgraduate poster competition winners, recipients of Dean of Graduate School awards for outstanding PhD theses, UNSW Women in Maths and Science Champions, undergraduate winners in the Materials Australia annual student thesis competition, and awards and prizes earned by our research students at conferences.

A standout achievement of the year was the awarding of University Medals to two of our undergraduate students in the BE (MatSciEng) degree program, Fiona Chen and Marcus Miljak! The University Medal is highly prestigious and is awarded for the highest level of academic excellence across an entire degree program.

I would now like to express our gratitude to the 2023 undergraduate (MATSOC) and postgraduate (PGSOC) society presidents, Hossein Salehi and Louise McGuiggan, along with their Executive Committees, for their incredible efforts in keeping students engaged with a variety of social activities and events. We warmly welcome the incoming 2024 Executive Committees, led by Nelson Tear (MATSOC) and Sanjith Udayakumar (PGSOC), and are confident that they will continue the excellent work of their predecessors. Highlights of student society events are provided in this report.

A standout achievement was PGSOC and MATSOC jointly winning the Arc Club of the Year 2023 – Development Program Award for organising the 'Forge Your Future – Materials Industry Networking Night'. This award reflects months of dedicated teamwork from both societies in creating an exceptional event that attracted nearly 300 guests from UNSW and 20 industries. The success of 'Forge Your Future' sets a strong precedent for future events at UNSW and within the School, further enhancing networking and knowledge-sharing opportunities for all involved.

The School remains highly committed to the vital area of student outreach. This year, our prominent presence at UNSW's Annual Open Day, led by George Yang, Lucy Zhang, and Chris Seymour, attracted many potential future students and their families. Their coordination of student and staff volunteers made the day a wonderful success.

I would like to close by thanking Chris Seymour, Lucy Zhang, and all staff and students who contributed to this annual report. I also wish to thank Greg Hosking for his exceptional work in designing the final version.

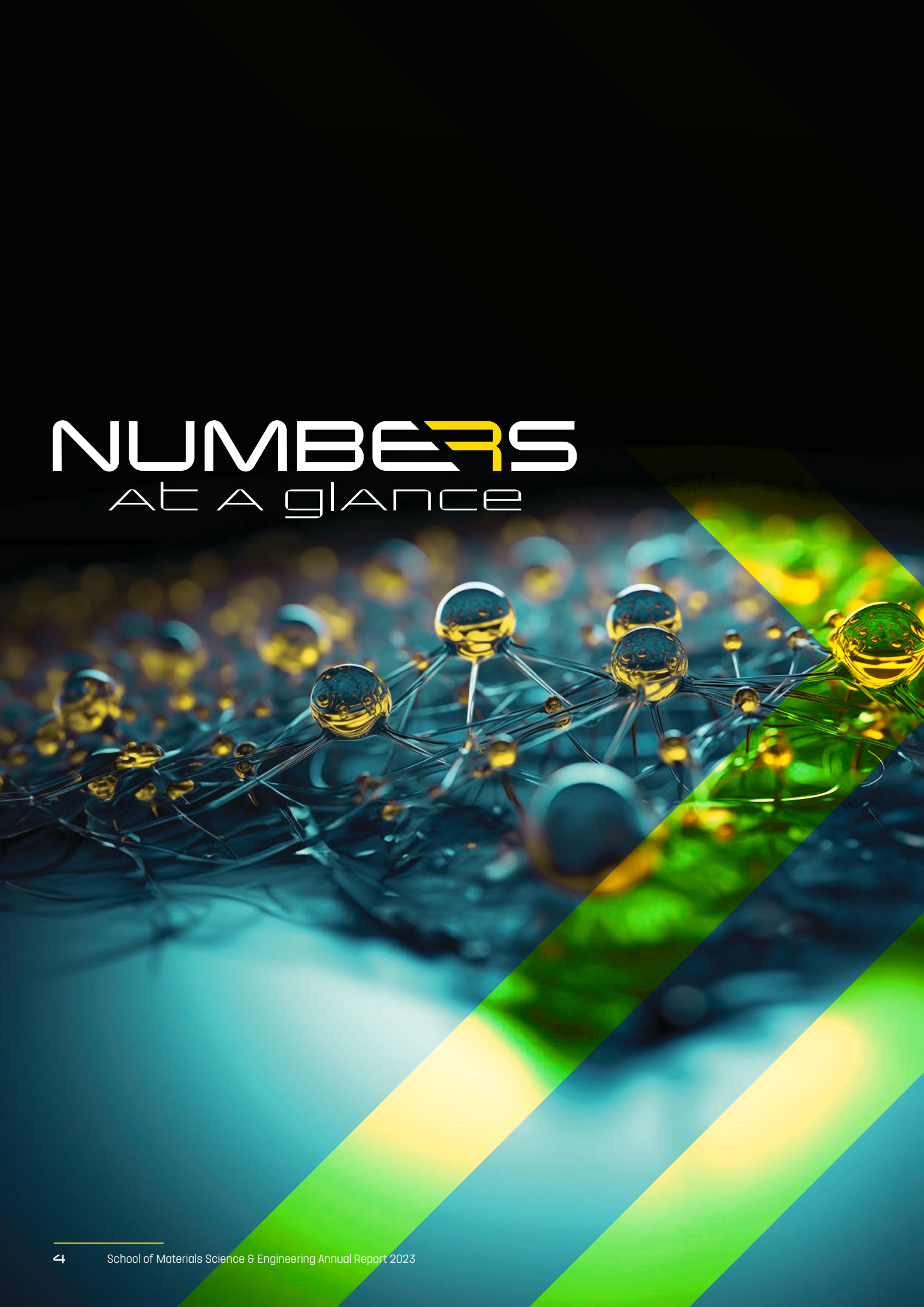
I hope you enjoy reading about our various achievements in 2023.

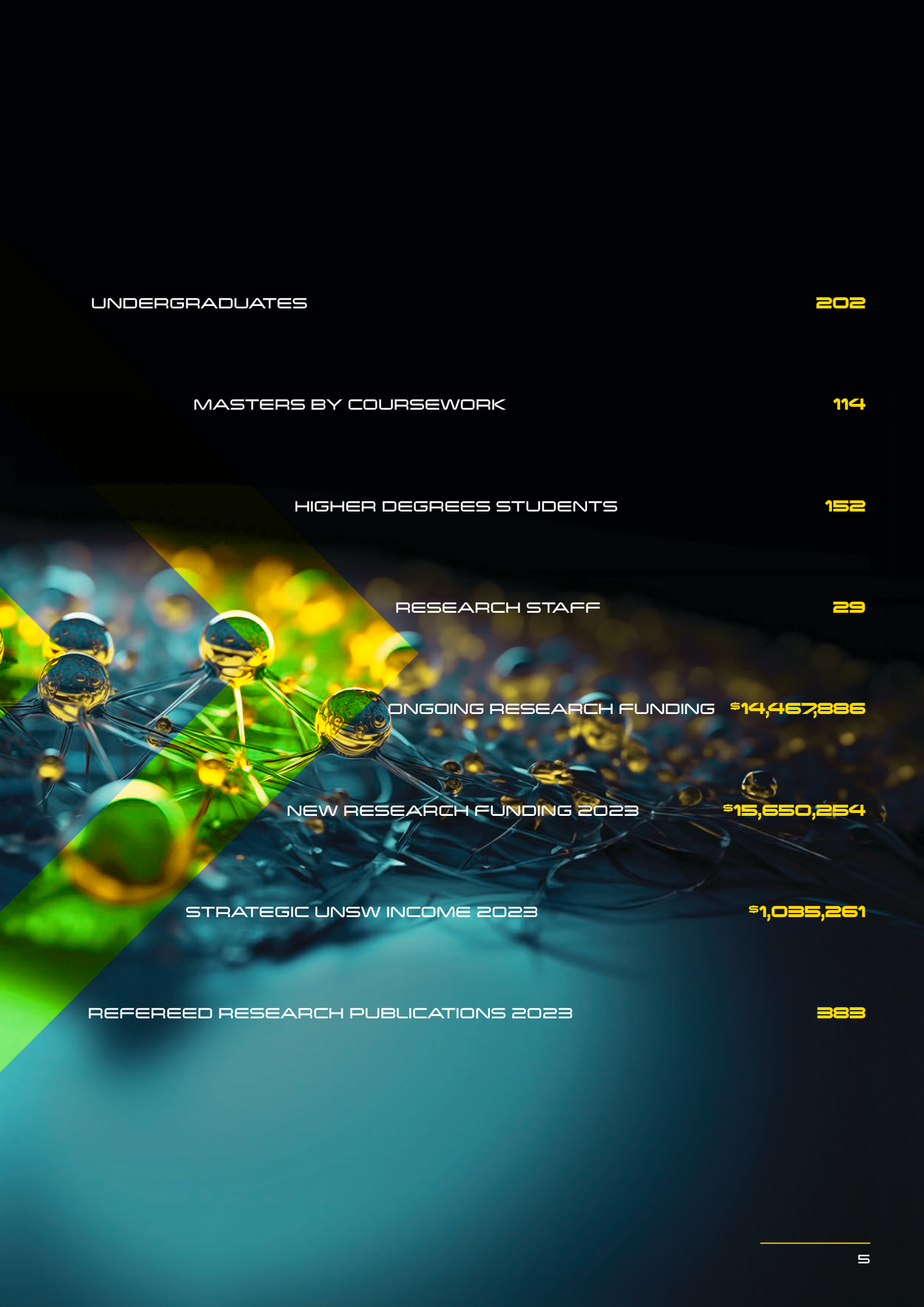
Professor Michael Ferry

Head of School


UNSW

NUMBERS
at a glance





UNDERGRADUATES	202
MASTERS BY COURSEWORK	114
HIGHER DEGREES STUDENTS	152
RESEARCH STAFF	29
ONGOING RESEARCH FUNDING	$14,467,886
NEW RESEARCH FUNDING 2023	$15,650,254
STRATEGIC UNSW INCOME 2023	$1,035,261
REFEREED RESEARCH PUBLICATIONS 2023	383

Academic staff

HONORARY PROFESSOR SAMMY CHAN

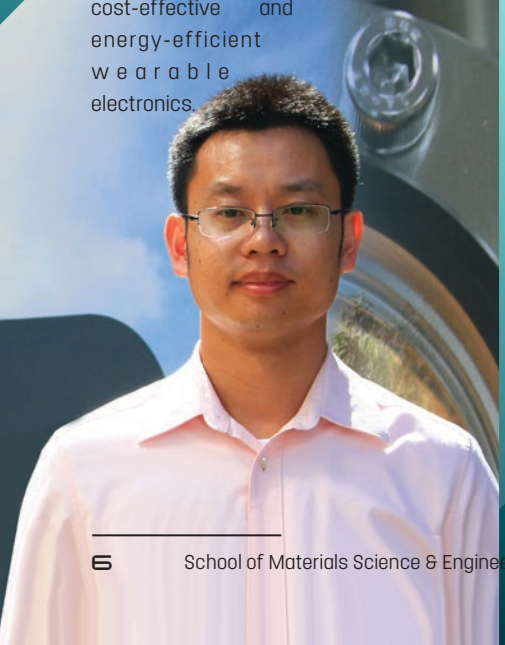
Sammy's research interests are in the areas of energy materials, hydrogen storage and metal matrix composites (MMCs).

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 suflides 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 SHERY CHANG ASSOCIATE DIRECTOR OF EMU

Shery's 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.

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.

PROFESSOR MICHAEL FERRY ▶ HEAD OF SCHOOL

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.

EDUCATION FOCUSSED 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.

ASSOCIATE PROFESSOR RAKESH JOSHI

Rakesh leads the Graphene Research Group. He is the Fellow of the Royal Society of Chemistry (FRSC), A/Fellow of the Institution of Chemical Engineers (AFIChemE) 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. ▼

SCIENTIA 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 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.

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.

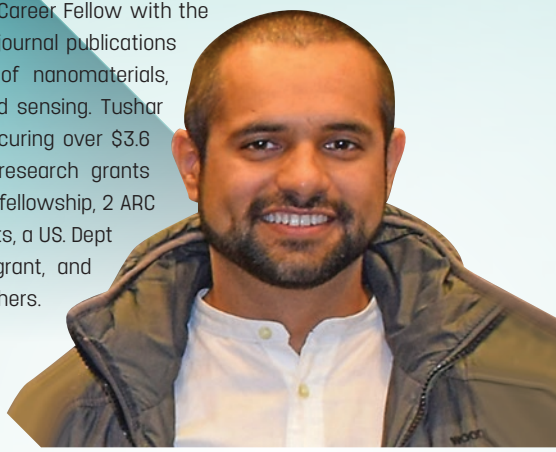
Academic staff

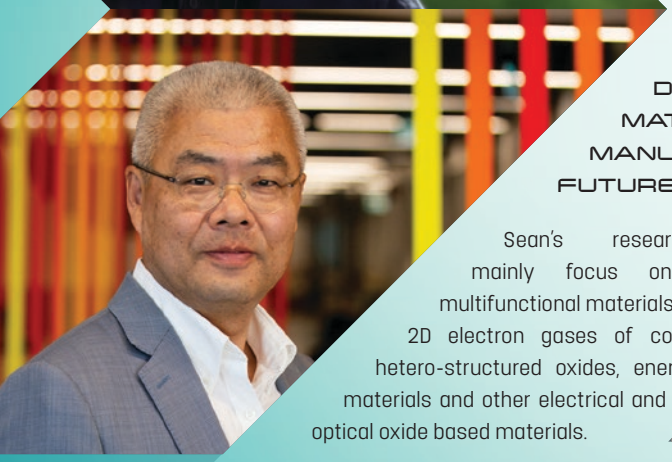
EDUCATION FOCUSED SENIOR LECTURER DR AKIF KAYNAK ▼

Akif is an accomplished lecturer with nearly 30 years of teaching and convening experience in a broad range of courses, including Engineering Materials, Mechanical Properties, Engineering Mechanics, Statics & Dynamics, Stress & Failure Analysis, Structural Design, and Physics. Akif also has broad research interests in the areas of electroactive polymers, polymer coatings, functional materials, fibres, sensors, and actuators, as well as applied physics and the mechanical and electrical properties of materials.

SCIENTIA SENIOR LECTURER DR TUSHAR KUMERIA ▲

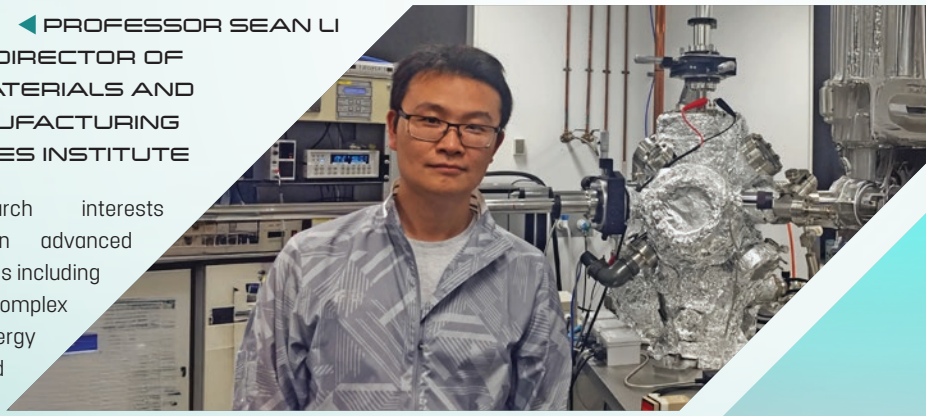
Tushar's group focuses on: 1. Porous materials-based drug delivery systems for efficient and targeted delivery. 2. Porous materials/Polymer composite scaffolds and implants for tissue engineering. 3. Porous photonic crystals-based point-of-care sensors for diagnostics and environmental applications. 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.





◀ 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.



ARC FUTURE FELLOW & SCIENTIA SENIOR LECTURER DR ZHI LI ▲

Dr. Zhi Li is a Scientia Senior Lecturer and ARC Future Fellow at the School of Materials Science and Engineering, University of New South Wales. Prior to joining UNSW, he was an ARC DECRA Fellow at the University of Wollongong. His research focuses on quantum materials and their applications in energy, quantum sensing, and future electronics.

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 FOCUSSED LECTURER DR SAMANE MAROUFI

Samane conducts research 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. Samane was the recipient of 2022 UNSW Vice-Chancellor award for outstanding contributions to student learning (early career).

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.

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.

EDUCATION FOCUSSED LECTURER DR BENJAMIN PACE

Ben is 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.

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.

Academic staff

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.

ARC LAUREATE FELLOW SCIENTIA PROFESSOR VEENA SAHAJWALLA, SMART CENTRE DIRECTOR

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.

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 NAGARAJAN VALANOOR

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.

SENIOR LECTURER DR OWEN STANDARD, DEPUTY HEAD OF SCHOOL

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

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 ▲

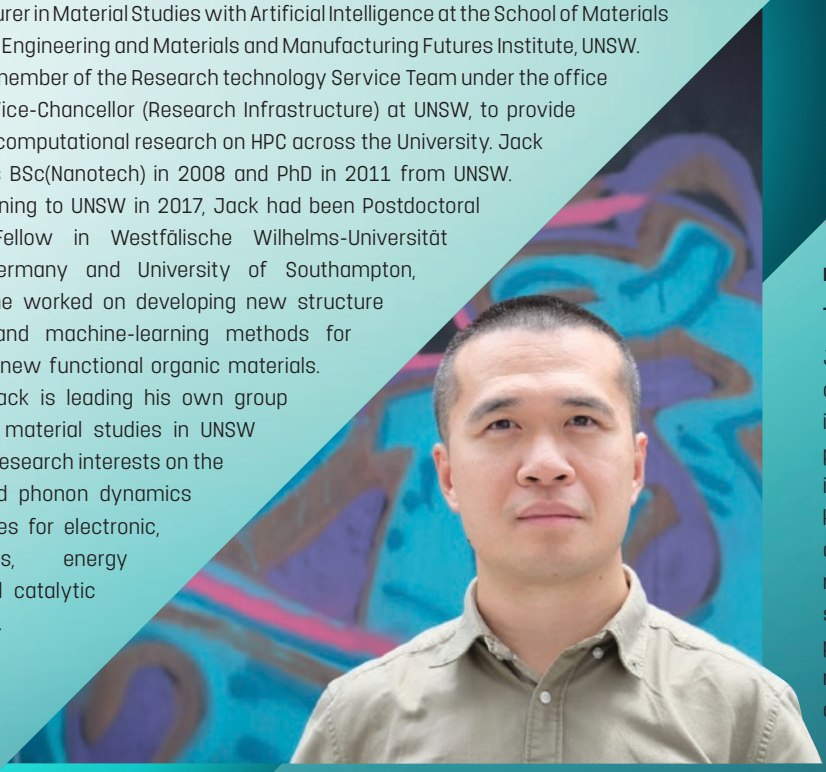
Runyu is focussed in the field of particle/powder science and technology. His primary research interests lie in particle technology, aiming to understand the behaviour of particles through rigorous modelling and simulation at microscopic and macroscopic levels. This knowledge is then applied to solving 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 Materials 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
Kim Foster	Executive Assistant to Prof Sean Li
Michael Lai	Student Advisor
Peggy Leung	Executive Assistant to Prof Veena Sahajwalla
Alec Rowan	Administrative Officer
Chris Seymour	Student Engagement and Outreach 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

Cathy Inglis AM	Group CEO, Think Brick Australia
Steve Kennedy	Vice President Global Regulatory Affairs, Cochlear Limited
Adam Berkovich	General Manager Transformation and Technical Support (Acting) Aluminium, Rio Tinto
Lyndon Edwards	Chair, Generation IV Advanced Manufacturing and Materials Engineering Working Group, & Honorary Fellow, ANSTO
George Melhem	Managing Director, Perfect Engineering
Jason Hodges	Open Innovation & Intellectual Property Manager, BlueScope Steel Ltd
Andrew Petersen	Chief Executive Officer, Business Council for Sustainable Development Australia
Michael Gow	NPD Project Manager CSR Limited
Edward Humphries	Director, Applied Materials Technology Group, Weir Minerals
Holstein Wong	Key Account Manager, Industrial Automation in Mining, Minerals and Metals, Schneider Electric
Sean Windred	Associate - Materials, BG&E

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

research committee

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

higher degree research committee

Nagarajan Valanoor (Chair)
Danyang Wang
Tushar Kumeria
Michael Lai

work health & safety committee

Jianqiang Zhang (Chair)
Michael Ferry
Owen Standard
Anthony Zhang
Rakesh Joshi
David Miskovic
Linghui Meng

marketing & recruitment committee

Christopher Seymour (Chair)
Michael Ferry
Lucy Zhang
Owen Standard
Benjamin Pace
Cailin Healy

equity, diversity & inclusion committee

Damia Mawad (Chair)
Michael Ferry
Lucy Zhang
Owen Standard
Chris Seymour
Samane Maroufi
Sanjith Udayakumar

women in materials committee

Judy Hart (Chair)
Caitlin Healy
Kris Kilian
Samane Maroufi

school scholarship committee

Michael Ferry (Chair)
Owen Standard
Lucy Zhang

school information technology committee

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

space committee

Michael Ferry (Chair)
Lucy Zhang
Anthony Zhang

honours projects coordinator

Tushar Kumeria

postgraduate coordinators

Nagarajan Valanoor
Danyang Wang

undergraduate program coordinator

Owen Standard

honours projects coordinator

Tushar Kumeria

master by coursework coordinator

Runyu Yang

misconduct and grievance officer

Owen Standard

faculty undergraduate assessment

Owen Standard

overseas degree programs/ asia engagement

Shery Chang

faculty enterprise committee

Dewei Chu

financial report

The School's budget has been calculated based on the composition of the workforce and non-salary costs which saw a reduction to ensure that the total budget allocated to all schools and centres does not exceed the Faculty's permitted 2023 spend.

income

The School receives its 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 2023 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 2023, we are glad to see our external research has bounced further 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 of 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 gas over a three-year period. This budget is also used to pay for casual teaching staff.

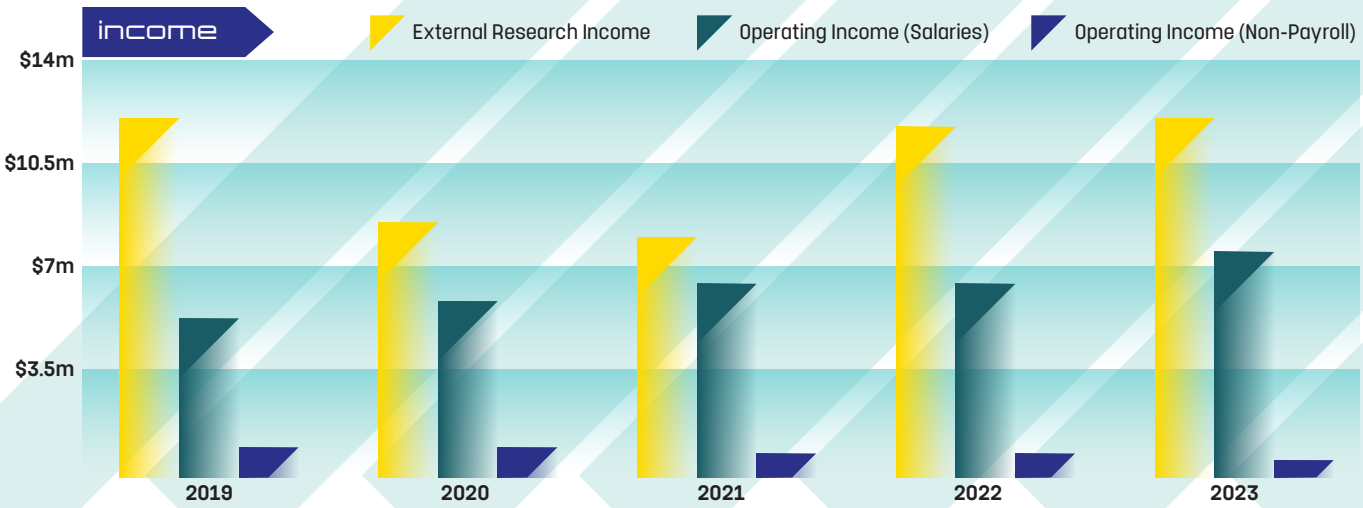
Other major expenditure items are support of teaching laboratories, daily operational expenses, marketing and undergraduate recruitment, allocations to teaching staff based upon research supervision and various research outputs including publications and provide start-up funds for newly started staff. We also had Christopher Seymour join us as Community and Current Student Engagement Officer.

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

INCOME		
University:		
Teaching	$8,439,628	
Other	$62,535	$8,502,163
Allocation to School:		
Committed people related budget	$7,547,958	
Non fixed workforce budget	553,651	
		$8,101,609

EXPENDITURE		
Salaries	$7,846,805	
Non-salary	$562,242	
Capital expenses	$211,253	$8,620,300
Variance		-118,137

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 geo pollical tension in our international market.



2023

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 2023, these included:

project	manager	($)
SHARP hire	Tom Wu	57,747
Scientia Fellow Support Salary	Zhi Li	42,996
Scientia Fellow Support	Zhi Li	61,958
SafetyNet	Tushar Kumeria	23,863
Strategic Research Support	Sean Li	312,126
Strategic post Laureate	Veena Sahajwalla	235,440
Translation Launchpad	Zhi Li	2,000
Translation Launchpad	Jack Yang	2,000
Goldstar Award	Danyang Wang	15,000
Goldstar Award	Jack Yang	5,000
SPF02 Materials	Various	70,420
SPF04 Materials	Various	199,800
Total:		1,035,261

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:

Lead	project	($)
Dewei Chu	All-in-one printing system	78,941

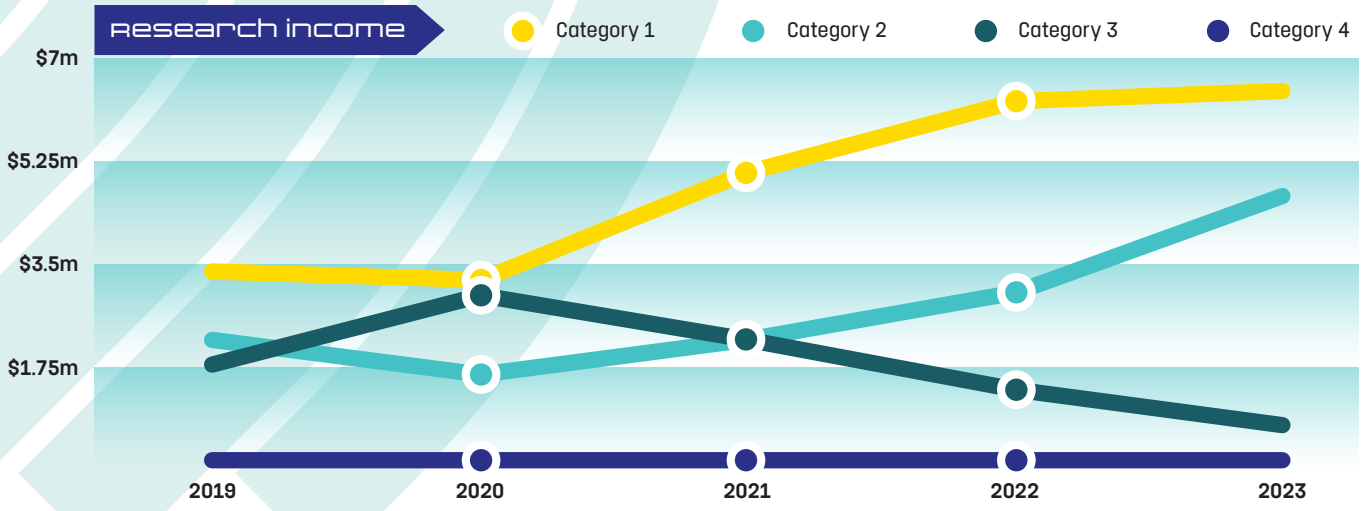
Expenditure

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 2023.

item	($)
Student research allocations	100,000
Publications allocation	100,000
Teaching laboratories	50,000
Safety	14,500
Staff start up	15,000
Education focused staff support	12,000
Early career research grant	17,000
School office	30,000
Marketing	15,000
Repair, maintenance & building utilities	25,000
uDASH contribution	5,000
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 two new ARC Discovery Grants and seven Chief Investigators from the school were awarded ARC LIFE grants.



under graduate 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 has been 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 2023 was approximately 190. 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.

Table 1: First Year Intake (2019–2023) into the School's BE Programs

Program	2019	2020	2021	2022	2023
3131 BE(Materials Sci. & Eng.)	35	52	33	22	19
3132 BE(Materials Sci. & Eng.)/BEngSci.	1	6	11	3	2
3133 BE(Materials Sci. & Eng.)/MBiomedE	19	11	29	6	16
3134 BE(Materials Sci. & Eng.)/BCom	0	0	1	1	1
Total:	55	69	73	32	38

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 2: 2023 Graduating Class

Program	H1 + Medal	H1	H2/1	H2/2	Pass	Total
3131 BE(Materials Sci & Eng)	2	4	1	13	4	24
3132 BE(Materials Sci & Eng)/BEngSci	–	1	–	1		2
3133 BE(Materials Sci & Eng)/MBiomedE	1	2	8	8	–	19
3134 BE(Materials Sci & Eng)/BCom	–	–	–	–	–	–
3970 BSc (Materials Sci)	N/A	N/A	N/A	N/A	20	20
3972 BAdvSci(Materials Sci)	–	1	–	–	–	1
Total:	3	8	9	22	4	46

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, Health & Wellbeing, 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. In 2023, detailed revision and design of course curricula and assessments, and curriculum mapping of the Stage 1 Engineering competencies prescribed by Engineers Australia, were completed and submitted for University approval. The changes were approved for implementation of the new program in 2024 for the incoming cohort. Details of the revised BE program can be found at:

www.handbook.unsw.edu.au/undergraduate/programs/2024/3131

DR Owen Standard

Undergraduate Program Coordinator

Co-op scholarship program

The Co-op Scholarship Program has a long-standing history of providing industry-funded scholarships and associated developmental activities to UNSW undergraduate students across 18 program streams. In 2023, these scholarships provided students with a stipend of $19,600 per annum (which will increase to $21,600 p.a. from 2024) for 4 years and substantial opportunity for industrial training with 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 key industries operating in the engineering sector. Moreover, Co-op graduates are highly sought by industry and many who have entered the materials industry have risen to senior leadership and management positions.

Co-op scholarships in Materials Science and Engineering were first introduced in 1989 and since then there have been a total of 129 scholarships (including three Honours scholarships) across 29 different sponsor companies. Co-op scholars are selected largely based on their personal skill, leadership potential and motivation, their academic achievements (eligible students require a 96+ ATAR) as well as their passion and understanding for the materials science and engineering discipline. Students who apply for the Program and are successful for an interview, are interviewed by a panel comprised of UNSW Co-op staff, the Academic Co-ordinator, UNSW Academics and/or sponsor representatives and then selected into the Program.

The Co-op scholars in the School of Materials Science and Engineering are at university for 5 years, and as part of the Program, benefit from gaining immensely valuable graduate skills and networking, communication, and workplace experience through both the industrial training placements as well as professional development workshops and events run by the UNSW Co-op Program.

As part of the program, Co-op scholars complete up to 18 months of structured and highly relevant industrial training with the sponsor companies which, from 2019, consists of up to 4 weeks at the beginning of Year 2 during Summer Term (optional and at the sponsor's discretion), 20 weeks during Term 3 of Year 2, and two 24-week placements in Year 4. Students are paid a scholarship stipend for the first 4 years of their Co-op program with the added option for being awarded an additional Honours scholarship in their 5th year for those students who elect to undertake an industry Honours research project with a sponsor company.

The Co-op Program provides students with an ongoing professional development and leadership program to help them develop strong graduate attributes to make a smooth transition to the workplace. The Program provides scholars with access to a range of support networks including Co-op alumni, and an Academic Co-ordinator is assigned to each program stream to offer specific program advice and guidance. Workshops and training activities are offered throughout the Program, providing an interactive environment for scholars to learn about professional expectations and ethics, reflect on their own work experiences individually and with peer support, and gain advice from industry representatives, particularly Co-op alumni.

Through the Program, industry sponsors have access to highly motivated, capable students to complete important and valuable industrial work. Moreover, as part of their industrial training placements, sponsors quantify the quality and value of work completed by the scholars during their placements to give meaningful feedback on the impact (and importance) of their work to the business. This experience also provides sponsors the opportunity to have direct involvement in the education and development of the School's students and establish pathways for the potential recruitment of future employees and leaders.

In 2023, there were a total of 4 current scholarships provided by 4 industrial sponsors – Rio Tinto Aluminium, Weir Minerals, BlueScope Steel, and Viridian Glass (see Table 1). Rio Tinto Aluminium, Weir Minerals, and BlueScope Steel have been major partners in the Co-op Program for many years and thus, their contribution to this program and their critical role in the development of the Co-op scholars has been highly valued and appreciated. In 2023, Viridian Glass became a new sponsor of the UNSW Co-op Program, with the partnership initiated by David Pender (General Manager, NSW & ACT), a Ceramic Engineering Co-op Alumnus (1990). This is a clear demonstration of the unique and versatile nature of the Co-op ecosystem and this scholarship potentially opens avenues for mutual benefits and collaborative opportunities for all relevant stakeholders.

Moreover, over the last 5 years, there were also 5th Year Co-op Honours thesis scholarships awarded to Gajan Shivaramanan (2019, Rio Tinto Aluminium), and Gabrielle Moss and Emma Donovic (2022, Rio Tinto Aluminium). Additionally, for the calendar year ending 31 December 2024, there was one Co-op Program scholarship in Materials Science & Engineering from Weir Minerals.

One-off internships were introduced to complement the main Co-op Scholarship Program, with the first standalone one-off internship in Materials Science & Engineering being offered in 2018. These are

2023 Co-op Scholar
Jo Kawahashi with Coop
Coordinators Owen & Koshy

cohort year	2019	2020	2021	2022	2023
Number of Scholarships	–	–	3	–	1
Names of Scholar			Olivia Lloyd Rory Vallejo		Jo Kawahashi
Scholarship Sponsors			Rio Tinto Aluminium BlueScope Steel Weir Minerals		Viridian Glass
Current Year of Degree (during 2023)	Y5 (Thesis)	Y4 (IT2 & IT3)	Y3	Y2 (Intro & IT1)	Y1

offered to existing UNSW students on an ad-hoc basis and involve up to 24-weeks of full-time placement with a Co-op industry partner. These internships provide a valuable opportunity for students (not in the scholarship program) to gain professional experience prior to graduation, which can also count towards the 60-day Industrial Training requirement.

The School is extremely thankful to its Co-op sponsors for the extensive efforts they put into hosting students on placement, including their training, guidance, and support during the placements, and for their continued generous support to the Co-op Program.

The School is also very grateful to the Co-op office team, particularly Ms. Karen Le, for their enormous efforts in securing scholarships from the sponsors, organising interviews, and managing the progress and activities of the scholars during their tenure.

A/Prof. Pramod Koshy
Academic Co-ordinator

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.

research themes

structure & groups overview

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

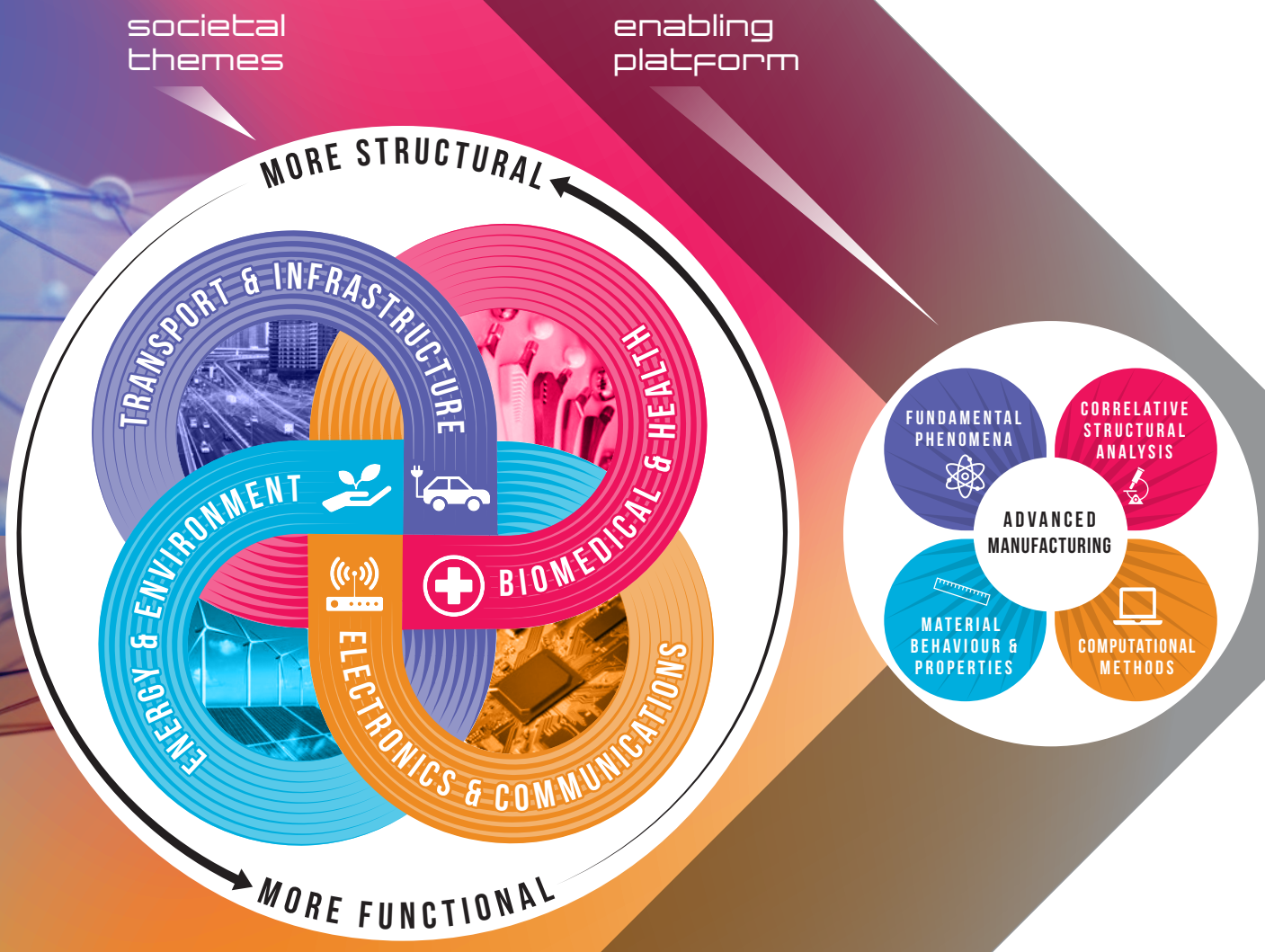
Primarily structural materials used expressly for creating the means of transportation, to large-scale structures and infrastructure that dominate our daily lives, including land, sea and aerospace vehicles to buildings, superstructures, machines and any other fixed or moving infrastructure.

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.

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



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.

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.

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, sustainable, and 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 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 academics in our theme group have continued to be greatly successful in 2023 as evidenced by various new publications, grants, and new collaborations. The following two new ARC Linkage grants led by academic in this group have been awarded in 2023: Round 1 (2023) to Prof Primig and Dr Steven Street (Adjunct Lecturer in our School) on sustainable and robust Australian Ni-based superalloy manufacturing routes and round 2 (2022) to AProf Kevin Laws, Prof Michael Ferry and four further CIs and PIs on next-generation advanced ammunition alloy production.

The handpicked 2023 research example is from Prof Jianqiang Zhang's group and is on hydrogen as a clean future fuel. Its production and utilisation unavoidably involve water vapour and hydrogen at high temperatures, which is, however corrosive to the materials used in the system. The high temperature materials group has been investigating corrosion behaviour of heat resistant alloys in the presence of both hydrogen and water vapour, mechanisms of water transport in oxide scale, and the effect of hydrogen on water vapour corrosion. Their recent results shown in Figure 1 reveal that the addition of H2 to Ar-5H20 at 850˚C accelerates oxidation kinetics and leads to the formation of numerous fine pores of oxide in Cr203 scale. These phenomena can be attributed to the accelerating effect of hydrogen on cation diffusion and local reduction reaction inside the oxide scale. Based on this understanding, a strategy by alloying to slow or prevent water vapour corrosion in the presence of hydrogen has been devised.

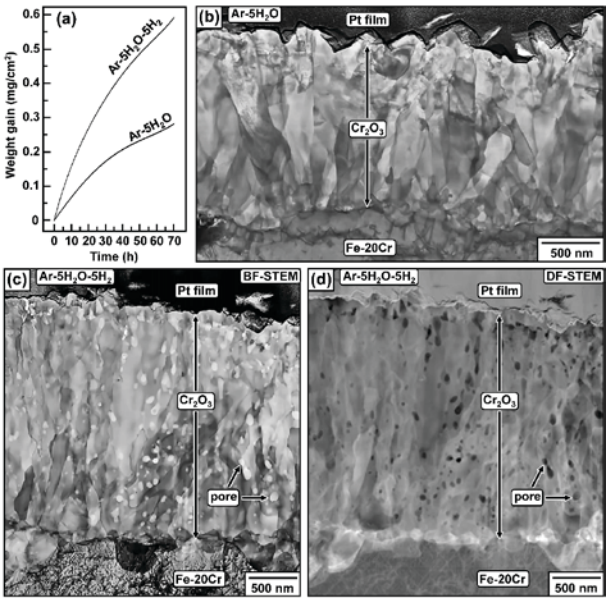


Figure. 1. (a) Weight gain kinetics of Fe-20Cr oxidised in Ar-5H20-(5H2) with dense columnar structure; (b) BF-STEM cross-section of Fe-20Cr oxidised in Ar-5H20 for 70 h; (c) BF-STEM and (d) DF-STEM cross-sections of Fe-20Cr oxidised in Ar-5H20-5H2 for 70 h (the scale containing numerous, fine pores highlighted in bright and dark contrasts, respectively).

Prof Sophie Primig – Engineering Microstructures (Theme Group 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

Biomedical & Health

Materials are in everything, even us! The Biomedical & Health theme in the School of Materials Science and Engineering was established to provide a coordinated structure that fosters regular interactions among member students and staff, and connects materials science researchers to biomedical colleagues across UNSW and beyond. The research groups within the theme include:

2023 was a spectacular year, with a wide variety of accomplishments and many new partnerships formed to advance B&H research in the School of Materials Science and Engineering. With respect to funding, the theme was awarded funding for research in excess of $2.4M. Some highlights include: A/Prof. Mawad received an NHMRC Ideas grant 'Wireless stimulator with no impinging electrodes, circuitry and connections for improving nerve regeneration in a crush injury model'; Prof. Kilian received a Senior Research Grant from NSW Health for his project 'Dynamic extracellular matrices for in vitro maturation of cardiac tissue'; Dr. Kumeria was awarded a discovery project from the ARC for his project 'Cell Membrane Coated Photonic Crystal to study Receptor-Ligand Interactions'. Two B&H group leaders were part of successful ARC Research Hubs: A/Prof. Yang for his work with the 'Smart Process Design and Control' hub, and A/Prof. Mawad for her work with 'Connected Sensors for Health' hub. The results of the themes research were featured in 75 peer reviewed research articles in 2023. Students and staff received numerous awards in 2023. Some highlights include, Dr. Qixuan Zhu from the CGM group was awarded two best paper awards: 9th China-UK International Forum on Particle Technology and the 3rd International Conference of Computational Particle Technology; A/Prof Shery Chang was successful in the "Deragon Gate" program funded by the National Science and Technology Council, Taiwan; and Prof. Kilian was a finalist in the Australian Museum Eureka Prizes in the category of 'Innovative Use of Technology'.

In May the theme hosted its 2nd Annual B&H Mini Symposium, a one-day event that included 50+ students and staff and invited speakers who engaged in presentations and poster events throughout the day. The aim of this year's symposium was to provide higher degree research (HDR) students and early career researchers (ECRs) with insights into clinical and commercial translation, and to showcase the cutting-edge work of the themes ECRs and HDR students through oral and poster sessions. The day was opened by Ms Vina Putra, the Chair of the B&H Organising Committee, followed by a brief overview of the school's research by Prof. Michael Ferry. There were numerous presentations from clinical researchers and industry scientists throughout the day, followed by a panel discussion featuring Dr. Tushar Kumeria (UNSW), Dr. Joanneke Maitz (ANZAC Research Institute), Prof. Kalantar Zadeh (USyd), Dr. Robert Utama (Inventia Life Sciences), and Dr. Pandzic (UNSW MWAC). The day was a huge success, coordinated masterfully by the organising committee: Vina Putra, Ayad Saeed, Ganesh Kokil, Prakiti Siwakoti, and Sylvia Ganda. There were awards for best oral presentation (Rakib Sheikh, Wich lab) and best poster presentation (Kang Lin, Kilian lab). The event was captured by our resident photographer, Women in STEM Champion and superstar ECR Dr. Giulia Silvani.

Polymer Research in Therapeutics (PRinT) group – led by A/Prof. Damia Mawad

Laboratory for Advanced Biomaterials & Matrix Engineering (LAB&ME) – led by Prof. Kris Kilian

Novel Engineered Materials for Conventional and Advanced Technologies (NEMCAT) group – led by Prof. Charles Sorrell and A/Prof. Pramod Koshy

Laboratory for Advanced Porous Nano-Biomaterials – led by A/Prof. Tushar Kumeria

Electron Imaging for Advanced Materials (EIAM) group – led by A/Prof. Shery Chang

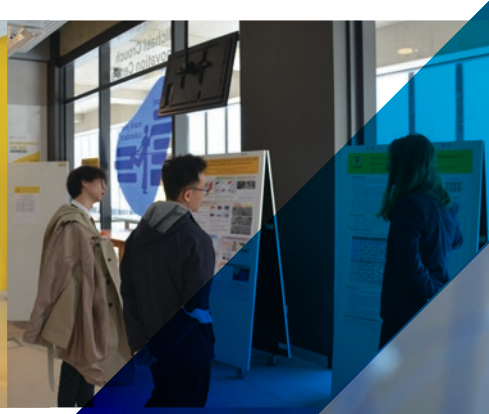
Comupational Granular Materials (CGM) group - led by A/Prof. Runyu Yang

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 endeavors.

The School's Energy & Environment (E&E) Theme Team hosted the first E&E Research Theme Mini Symposium. The symposium provided an invaluable platform for Higher Degree Research (HDR) students and Early Career Researchers (ECRs) to connect with senior researchers beyond their own teams, gaining insight into the diverse research efforts at UNSW and beyond. The event was attended by approximately 50 participants, including HDR students, ECRs, mid-career researchers (MCRs), and esteemed senior researchers from UNSW and other institutions. Participants presented their latest findings on materials and processes aimed at advancing energy and environmental solutions.

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 example, their collaborative efforts have also paved the way for organizing national and international events, strengthening industry connections, and promoting knowledge transfer. The EE theme's proactive approach has not only contributed to impactful research outcomes but also fostered an inspiring environment for the growth of both emerging and experienced researchers. The research groups within the EE theme have demonstrated remarkable productivity, collectively publishing over 80 journal papers, with the majority appearing in top-tier journals. Additionally, they have filed patents that contribute to the translational research outcomes of UNSW, highlighting their commitment to impactful research that bridges the gap between scientific discovery and practical application.



electronics & communications

In 2023, the Electronics and Communications team achieved significant milestones with competitive grants, impactful publications, and extensive international collaborations.

They secured 2 new ARC Research Hub/Training centres as key CIs and 1 ARC Discovery grant in energy storage devices, alongside publishing over 100 peer-reviewed papers.

The team have expanded the theme with over 20 new HDR students and ECRs. Additionally, the team welcomed Dr. Chun-ho Lin as an ARC DECRA Fellow, focusing on perovskite materials for electronic devices.

Gas sensors play a crucial role in portable and miniaturized sensing technologies, from air quality monitoring to explosive detection and medical diagnostics. Current chemiresistive NO2 sensors face challenges such as poor sensitivity, high operating temperature, and slow recovery.

Prof. Wu's team reported here on high-performance NO2 sensors based on all-inorganic perovskite nanocrystals (PNCs), operating at room temperature with ultra-fast response and recovery times.

By optimizing the halide composition, our CsPbI2Br PNC sensors achieved superior sensitivity (≈67 at 8 ppm NO2) and can detect levels as low as 2 ppb, surpassing other nanomaterial-based NO2 sensors. Furthermore, the exceptional optoelectronic properties of PNCs enable dual-mode operation—chemiresistive and chemioptical sensing—providing a versatile platform for advanced, high-performance, point-of-care NO2 detection technologies.

The team also successfully organized the Nanomaterials and Nanodevices for Sustainable Environment (NNSE) 2023 Workshop on September 7, 2023. Over 60 HDR/ECR/MCR researchers from across NSW participated, focusing on nanomaterials for IoT devices, energy conversion/storage, and biodevices.

This event has gather most of the active NSW researchers in this field and presented an excellent platform for potential collaboration between our school and other universities.

SMaRT executive summary

In 2023, the SMaRT Centre started two multi-year agreements within the TRaCE (Trailblazer) program. The first is with existing partner Kandui Technologies (trading as Noveco Surfaces) on commercialising Green Ceramics. The second is with a new partner, Jamestrong Packaging, commercialising Green Aluminium. Both projects are for the life of TRaCE and the Centre has successfully met the ambitious milestones of year 1.

In May 2023, SMaRT was awarded funding for the new ARC Industry Laureate for Green Metals, a new research program working with industry partners to develop novel approaches to use electronic and solar PV waste as a resource – enabling the recovery of valuable metal alloys, rare earth elements and other critical materials which have high market values.

In 2023, SMaRT successfully delivered the third-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.

In 2023, SMaRT successfully hosted for the third 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 2023, 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 2023, 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.

In 2023, SMaRT secured numerous publications and gave dozens of presentations across a wide range of stakeholders. This was supported by 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.

impact

(commercialisation, communications, engagement, awards)

SMaRT advanced its research commercialisation efforts, and continued to implement a comprehensive communications program covering website and digital channels, media engagement, other stakeholder engagements including public speaking and advocacy.

This has involved undertaking many reputation building activities, achieving extensive media coverage, public speaking opportunities, and government and industry engagements including attending many government and industry advisory committees, as well as the development and submission of various public policy submissions.

SMaRT continued in 2023 to implement its evolving narrative through its comprehensive stakeholder engagement/collaboration effort to enhance outcomes of its future research strategy. This is activated via knowledge and impact transfer and concerted communications initiatives to support SMaRT's operational objectives to deliver optimised impact and outcomes in relation to attracting funding, partners and industry.

This involves ongoing stakeholder engagement supported by operational and promotional communications across all stakeholder groups, importantly including industry, government and research partners, and stepping up efforts in advocacy and wider community engagement to help create global impact for UNSW and the Science Faculty and School for Materials Science and Engineering.

commercialisation

Throughout 2023 (and ongoing), SMaRT continued to work hard on developing commercialisation opportunities for its range of technologies and products. Green Steel continued to enjoy strong commercial licensing and "next gen" research in collaboration with industry partner Molycop and other collaborators.

Most exciting was the commercialisation advances made in relation to a range of MICROfactorieTM Technologies:

- Green Ceramics – head licensee Kandui Technologies is now operating MICROfactoriesTM in Nowra and selling products under its Noveco Surfaces trading brand.
- Green Aluminium – worked closely with industry partner Jamestrong to create a licensing arrangement for the aluminium can manufacturer to plan to acquire and implement the technology
- Plastic filaments – advanced collaboration with industry partner Renew IT to create a licensing arrangement for the aluminium can manufacturer to plan to acquire and implement the technology

Work continued to further develop and seek commercialisation partners for other technologies under SMaRT's Green Metals research:

- Battery waste
- E-waste

communications

Around 300 media stories, interviews, podcasts etc were published in the calendar year involving SMaRT. Some brief highlights:

- Acclaimed singer and songwriter Paul Kelly has given the thumbs up to a guitar made by the UNSW SMaRT Centre from recycled wastes https://www.smart.unsw.edu.au/news-events/news/songwriter-paul-kelly-tries-smart-centres-guitar-made-waste
- UNSW SMaRT Centre technologies feature in this new film by media company, Never too Small, funded by Screen Australia https://www.smart.unsw.edu.au/news-events/news/smart-tech-new-docufilm
- Various UNSW SMaRT Centre technologies, feature in a new four-part documentary series by the ABC https://www.smart.unsw.edu.au/news-events/news/smart-tech-documentary
- UNSW SMaRT Centre's Director, Professor Veena Sahajwalla, and Head of MICROfactorieTM Technologies, Anirban Ghose, have won two of the four 2023 Engineers Australia Excellence Awards (People & Projects Sydney) https://www.smart.unsw.edu.au/news-events/news/smart-leaders-win-two-four-top-engineering-awards
- UNSW SMaRT Centre's Director, Professor Veena Sahajwalla, has won Good Design Australia's 2023 Women in Design Award https://www.smart.unsw.edu.au/news-events/news/smart-director-wins-2023-women-design-award
- Indian Prime Minister Narendra Modi and Australian Prime Minister Anthony Albanese mentioned the India-Australia Industry and Research Collaboration for Reducing Plastic Waste that SMaRT is involved in as part of their joint bilateral statement https://www.smart.unsw.edu.au/news-events/news/update-india-australia-collaboration-reducing-plastic-waste

engagement

In 2023 SMaRT members participated as keynote speaker, invited speaker and panellists in over 100 conferences, workshops and webinars. Below contains some highlights only:

- In 2023, SMaRT Centre continued to build engagement and collaborative networks with different industrial partners such Kandui Technologies, Shoalhaven City Council, Renew IT, Jamestrong and many others to help translate research to commercial application, thus helping to deliver economic, social and environmental benefits.
- SMaRT and Veena were also part of other networks such as MECLA and other collaborative forums.
- SMaRT made various government consultation submissions including:
- NSW 'going circular in clean energy' issues paper
- SMaRT's 2023 submission to the Department of Climate Change, Energy, the Environment and Water's regulation of e-products 'Wired for Change' discussion paper
- SMaRT formally partnered with and supported dozens of government and community awareness initiatives.
- On 8th of March 2023, Dr Samane Maroufi from SMaRT Centre organised a seminar for IWD where we invited two speakers (PhD student, woman) to talk about their experience of being as a woman in science. The aim of the seminar was to acknowledge the critical role women play in society and to promote equal access and participation for women in science and to increase awareness to the issues such as gender equality
- SMaRT member, Professor Sahajwalla has contributed to advisory committees and bodies, including:
  - Engineers Australia Chemical College Advisory Board
  - EPA Victoria Science, Engineering and Health Committee and Governing Board
  - AAS Australia Academy of Science Council Member
  - Editorial Advisory Panel (EAP) Member for Nature Sustainability (International)
  - Associate Editor Resources, Conservation & Recycling (International)

SMaRT Major research program summaries

Australian Trailblazer for Recycling and Clean Energy

The UNSW SMaRT Centre is the recycling stream lead for the $277 million Trailblazer for Recycling and Clean Energy (TRaCE) Program.

Hosted by UNSW and in partnership with the University of Newcastle and many industry partners, the TRaCE Program runs for four years from 2023 to help Australia and the world transition to sustainable recycling and clean energy solutions and systems.

In 2023, SMaRT started two projects with its partners to accelerate commercialisation of several of its recycling MICROfactorie™ and other technologies. One involved the launching of the Commercial Green Ceramics MICROfactorie™ at Shoalhaven City Council's waste and recycling facility, adjacent to a landfill site.

The facility has attracted ministerial attention culminating in a visit by NSW Minister for Climate Change, Energy and Environment, Penny Sharpe (pictured above with a green ceramic tile and with Veena). The other involved new partner Jamestrong to launch (pictured right) commercialisation of SMaRT's Green Aluminium MICROfactorie™ Technology: see UNSW announcement New partnership to spearhead advance in aluminium manufacturing.

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 Microrecycling 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. In April 2023 the Hub was officially launched:

www.smart.unsw.edu.au/news-events/news/official-launch-arc-microrecycling-research-hub

Here is a video highlight: **hwww.youtu.be/DLreSsuwqsw**

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 SteelTM 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 announcement: The next phase of the commercialisation of UNSW SMaRT Centre's Green Steel™ Polymer Injection Technology has been announced. And see these media stores: Nine publications on our green steel advances; Green Steel announcement

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). SMaRT Centre also designed, developed and operated a demonstration battery recycling MICROfactorieTM (pictured right) at the 2023 ecologiQ Greener Infrastructure Conference in Melbourne.

mmfi

Materials & Manufacturing Futures Institute

The Materials and Manufacturing Futures Institute (MMFI) – Research & Industry Collaboration to Advance the Frontiers of Materials Sciences

The Materials and Manufacturing Futures Institute (MMFI) continues to engage with scientific and industry leaders at the intersection of materials science and advanced manufacturing to deliver real-world benefit driven by the needs of industry. MMFI are proud of another busy year of working to translate and commercialise its fundamental research findings into solutions in the pathway towards a more sustainable energy future. Here are some of the highlights from the past 12 months.

MMFI has fostered an innovative collaboration between UNSW and JA Solar, a global leader in the photovoltaic (PV) industry. The UNSW-JA Solar Collaboration Laboratory (Collaboration Lab) aims to merge UNSW's academic and research prowess with JA Solar's industrial strengths to further cement JA Solar's position as a leader in PV innovation, energy storage, and management, revolutionising solar energy manufacturing and innovation worldwide. From its inception, MMFI has facilitated this collaboration, acting as the primary link between JA Solar and UNSW stakeholders. This partnership has resulted in industry funding from JA Solar, which will be distributed through multiple rounds of 'Green to Global' grants for research projects. The first round has already received considerable interest, with 46 applications from 3 faculties and 8 schools, including a wide range of academic levels from postdoctoral researchers to professors.

UNSW-JA Solar Collaboration Laboratory Signing Ceremony, with delegates from UNSW & JA Solar

MMFI joined forces with MicroTau, an Australian manufacturer, through the Innovation Connection Grant. MicroTau specialises in creating microscopic patterns inspired by nature, designed to reduce drag and provide additional benefits such as anti-fouling, anti-bacterial, and hydrophobic properties. This collaborative project aims to refine and scale up the fabrication of thin-film materials featuring these microstructures and utilising MMFI's cutting-edge roll-to-roll UV nanoimprint technology. The successful completion of this project will establish a new industry standard for MicroTau's manufacturing processes.

MMFI is proud to be spearheading a landmark materials characterisation facility. This advanced analysis suite will be established at UNSW as a result of a successful application to the Linkage Infrastructure, Equipment and Facilities funding from the ARC. Bringing together world-class researchers from 4 universities and 3 industry leaders with multidisciplinary expertise, the project will strengthen Australian research activities in the development of advanced materials for energy, defence and space, and advanced manufacturing technologies through the establishment of a high temperature, high pressure and high force thermomechanical property analysis suite for materials under extreme environments.

Indeed, it is an exciting time in the fields of materials science and advanced manufacturing, and MMFI are proud to be working within such a dynamic and interdisciplinary ecosystem. Thanks to the School of Materials Science & Engineering for their support and all the best to all researchers and innovators for another year of progress and discovery.

Achievements

1. **Dr Caitlin Healy** was selected, through a competitive admissions process, as one of only two UNSW staff to become new members of the Australasian Association for Engineering Education Academy of Early Career Engineering Educators (AECEE). The AAEE Academy is an innovative leadership program with a primary focus on early career education focused (EF) academics. The Academy aims to inspire, motivate and educate EF academics about the opportunities available for employment and leadership in engineering education.
2. **Dr Nima Haghdadi** accepted a Senior Lecturership (tenure track) in the Department of Materials at Imperial College London.
3. **Professor Jan Seidel** was elected as a member of the 2024 Australian Research Council (ARC) College of Experts.
4. **A/Prof. Damia Mawad** was awarded a National Health and Medical Research Council (NHMRC) Ideas Grant.

Awards

- **Australian Research Council Future Fellowship** - Dr Wenxian Li
- **Australian Research Council DECRA Fellowship** - Dr Chun-Ho Lin
- **Grande Medalllion** - Emeritus Professor David Young
- **2023 Engineers Australia Excellence Awards**
  - **Emerging Professional of the Year Accolade** - Anirban Ghose
  - **College of Chemical Engineers Achievement Award** - Scientia Professor Veena Sahajwalla

Promotions

Samane Maroufi was promoted to **Senior Lecturer** for her outstanding contributions across the three University pillars: Teaching, Research and Social Engagement, Global Impact & Leadership!

Kris Kilian was promoted to **Professor** in recognition of his exceptional contributions to research, teaching, service, and leadership!

Rumana Hossein, Rasoul Nekouei and **Ji Zhang** were promoted to Level B (Lecturer)

staff awards & achievements

ARC Linkage Grants

1. **Pramod Koshy, Chris Sorrell** & **Sajjad Mofarah**: Electrodeposited Cathodes with Tunable Stoichiometry for Alkaline Batteries ($508,000 from ARC + industry cash support).
2. **Kevin Laws, Michael Ferry** & **Warren McKenzie** (PI): Next-Generation Advanced Ammunition Alloy Production Technologies ($269,000 from ARC + industry cash support).
3. Patrick Burr, Ed Obbard, Bernd Gludovatz & **Kevin Laws**: Advanced shield materials for compact fusion energy ($665,000 from ARC + industry cash support).

ARC Fellowships

1. **Scientia Professor Veena Sahajwalla** was awarded a highly prestigious **Australian Research Council (ARC) Industry Laureate Fellowship.** Veena's 5-year fellowship is entitled '*Recycling Innovations to Transform Electronic Waste into Green Metals*'. The ARC has provided $3.51M, and Veena's industry partners will contribute the equivalent in cash and in-kind for the project.
2. **Professor Dewei Chu** was awarded a prestigious Australian Research Council Mid-Career Industry Fellowship! Dewei's 4-year fellowship is entitled '**Bio-inspired Sustainable Materials for Self-powered Environmental Sensing'**. The ARC has provided $1,020K and Dewei's industry partners will contribute 800K in cash for the project.

ARC Discovery Grants 2024

DP GRANT	CHIEF INVESTIGATORS	GRANT TITLE	AMOUNT
DP240100238	**Jan Seidel** (UNSW), Pankaj Sharma (Flinders)	Engineered topological nanostructures – a new frontier in materials design	$600,044
DP240102177	Dan Liu (Deakin, **Dewei Chu** (UNSW), Zhiyu Wang (Deakin)	Two-dimensional nanomaterials for wearable zinc ion battery	$498,199

ARC Linkage Infrastructure, Equipment and Facilities Grant Equipment housed at UNSW in either MS&E or other labs:

LIEF GRANT	MS&E CHIEF INVESTIGATORS	GRANT TITLE	AMOUNT	HOUSED
LE240100092	**Jan Seidel (Lead CI)**	Quantum microscopy facility for ultrasensitive nanoscale magnetic imaging	$1,100,000	MS&E
LE240100130	**Sean Li (Lead CI), Chris Sorrell, Jianqiang Zhang, Danyang Wang, Jack Yang**	Thermophysical Property Analysers for Materials under Extreme Environments	$1,300,000	MS&E
LE240100036	**Paul Munroe, Sophie Primig, Shery Chang**	Ultra-fast structure-property characterisation of materials	$754,700	MECH ENG / EMU
LE240100015	**Dewei Chu**	Integrated Tip-Enabled Nanofabrication and Characterisation at Atomic Scale	$523,899	CHEM ENG

Equipment housed at other institutions:

LIEF GRANT	MS&E CHIEF INVESTIGATORS	GRANT TITLE	AMOUNT	HOUSED
LE240100086	**Dewei Chu**	Integrated multimodal microscopy facility for single molecule analysis	$510,000	Macquarie University
LE240100060	**Shery Chang**	High speed multi modal in-situ Transmission Electron Microscopy platform	$638,853	QUT
LE240100091	**Kris Kilian**	Deep imaging for understanding molecular processes in complex organisms	$1,000,000	USYD

Linkage Grants 2024

Prof. Sophie Primig was awarded an ARC LP grant entitled 'Sustainable and robust Australian Ni-based superalloy manufacturing'. The ARC value of the grant is $479,527 (excluding generous industry support), and is in conjunction with Western Australia Specialty Alloys. Sophie's partner investigator at WASA is **Dr Steven Street**, who is also an Adjunct Lecturer in the School.

Publications

1. **Dali Ji** (PhD student + first author), **Tobias Foller** (PhD student at the time of submission + corresponding author) and **Rakesh Joshi** (UNSW Graphene Team Leader + corresponding author) have just published a paper titled "***Angstrom-Confined Electrochemical Synthesis of Sub-Unit-Cell Non-Van Der Waals 2D Metal Oxides***" in **Advanced Materials**, one of the premier journals in the world for materials science. The work was carried out in collaboration with Rakesh's long-time colleague, Prof. Sir Kostya Novoselov, who won the 2010 Nobel Prize for Physics for his pioneering work on graphene.
2. **Associate Professor John Daniels** and **Associate Professor Danyang Wang** were co-authors on a paper published in **Science** which is one of the most prestigious journals in the entire world titled ***"Lead zirconate titanate ceramics with aligned crystallite grains"***.

staff story

Dr. Yue Jiang, leader of the catalytic materials development program with Ms. Fenglin Zhou, testing the novel catalyst in the Vecor laboratories at UNSW

The Australian **Trailblazer for Recyling and Clean Energy** (TRaCE) program was established in mid-2023 by the Australian Department of Education to build new research capabilities and drive translation and commercialisation in priority areas identified in the Modern Manufacturing Strategy. The program is a joint effort between UNSW and University of Newcastle and numerous industry partners, with a total funding of $280 million.

The Novel Engineered Materials for Conventional and Advanced Technologies (NEMCAT) Group in partnership with our industry partner Vecor Technologies Pty. Ltd. occupies an integral and major part of this program owing to its unique role in funding critical research encompassing both recycling and clean energy themes. The NEMCAT-Vecor research partnership through TRaCE is focussed on three aspects, namely transformation of fly ash into value-added products, development of novel Na-ion battery materials, and development of catalysts for splitting of seawater to hydrogen. The research partnership at UNSW is led by A/Prof. Pramod Koshy, Professor Charles Sorrell, and Dr. Sajjad Mofarah at the School of Materials Science and Engineering. The commitment of Vecor towards the success of the projects is evident from its significant investment in establishing dedicated research laboratories to conduct the technical innovation and product development in these programs.

industrial by-products to advanced ceramic products

Photo: Dr. Sajjad Mofarah (centre), leader of the battery and energy materials development research program with Ph.D. students Mr. Jeffrey Zheng (left) and Mr. Saman Mostafapoor (right), showcasing the novel Na-ion rechargeable coin cell battery

Fly ash is the industrial by-product that arises from coal combustion in power-stations and is used mostly in the construction industry as an additive to cement. Of the estimated 400 million tonnes of fly ash stockpiled globally in landfill and tailing ponds, only 15% has been utilised, with almost half of this fraction going to the cement and concrete industries and the rest to geotechnical applications.

A/Prof. Koshy started working with Vecor in 2009 on projects to convert fly ash into advanced products with Prof. Sorrell joining the project in 2010. Prior research was focussed on using fly ash as a raw material for high-temperature applications, including refractories and as cement-replacement materials (geopolymers). Through the Trailblazer program, the potential for using fly ash as a low-cost additive for structural, thermal, chemical, and optical applications for use in numerous high-value and high-volume applications is now being investigated.

Vecor's goal is to show how fly ash can be engineered in precise directions for a wide range of unexpected applications. Vecor CEO Mark Ramsey stated that, "We are now exploring the modification of fly ash to facilitate expansion into new areas of high-value products. In reality fly ash is a ceramic raw material with unique chemical and physical characteristics.

The team's vision is to show how this low-cost, waste material can be used as the basis for a range of new products for use in a host of high-performance products for which it has never been considered or trialled. These include using fly ash as a feedstock for high performance additives for paints, powder coatings, polymer matrix composites, and ceramic matrix composites. These applications will involve partial or complete replacement of existing more expensive fillers, thereby enhancing the environmental and economic benefits to these industries. The success of this project is evident through the synthesis of a processed ceramic powder through a patented process, which demonstrates excellent properties when used in paints, including excellent hiding power as well as superior UV and wet scrub resistance.

A/Prof. Koshy said that. "Each application has very specific demands placed on both the raw materials and their processing and this demands a highly iterative approach to problem-solving".

Novel Na-ion rechargeable battery systems

The lithium-ion (Li-ion) battery (LIB) is the predominant commercial rechargeable battery; however, the costs are impacted by the availability of critical minerals such as lithium, cobalt and nickel, while there are increasing safety concerns from overheating (fires) and damage at high voltages. To address these shortcomings, the NEMCAT group and Vecor have embarked on the development of cost-effective, efficient rechargeable batteries with alternative materials to expensive and strategically sensitive lithium. The substantial funding by Vecor to establish dedicated research laboratories at UNSW is complemented by major product development efforts led by Dr. Mofarah, A/Prof. Koshy, and Prof. Sorrell with patented technologies developed by the UNSW team opening up globally competitive commercial opportunities.

Vecor CEO Mark Ramsey stated, "As a company we concentrate on using recycled and commonly available materials to reduce environmental impacts and reduce supply chain risks in key industries. We are particularly interested in exploring how to effectively utilize sodium, instead of lithium, in batteries, as it can be extracted without significant environmental consequences,"

Dr. Mofarah's work in this area has led to a completely new technology that has been patented, as well as the creation of a second novel fabrication strategy for battery materials, with the relevant patent application submitted. The latter work led to the successful development of a groundbreaking class of rechargeable Na-ion rich cathode electrodes by applying a room-temperature, aqueous-based, cost-effective, and environmentally-friendly electrochemical method; this innovation marks a pivotal advancement in sustainable battery technology.

The new one-step fabrication of Na-ion cathodes has the potential to revolutionize battery manufacturing, offering green approaches with zero carbon emissions and toxicity while the scalability of the promising Na-ion battery technology is a testament to its practical viability.

Dr. Mofarah said, "The technique we developed leverages a counter-intuitive strategy for the electrochemical generation of specific, hybrid materials in often-unique forms; further, this approach enables precise control over the chemistry, morphology, and topography of the cathodes, demonstrating mastery of electrochemical and aqueous chemistry principles,"

The newly developed cathode exhibits exceptional performance with improved energy and power densities while eliminating the use of toxic and hazardous materials during battery assembly.

Recently, the research team have initiated steps to scale up operations from coin cell to pouch cell batteries by extending their advanced battery development facilities based at UNSW Sydney.

Further, the NEMCAT Group has solidified its reputation through extensive research in electrochemistry and energy storage. The contribution is underscored by recent publications in prestigious journals such as Nature Communications, Advanced Materials, and Chemical Society Reviews.

Novel catalysts for seawater splitting

Green hydrogen—produced through renewable resources such as solar and wind—holds significant promise in meeting the world's future energy demands while reducing greenhouse gas emissions. However present methods of water splitting are energy-intensive and involve multiple steps to ensure the process safety. Moreover, conventional methods of producing hydrogen involve splitting freshwater; however, with limited freshwater resources (3% globally), there is a need for expensive water purification operations prior to hydrogen production.

The NEMCAT group in partnership with Vecor through Trailblazer have developed novel catalytic materials which are capable of seawater splitting over long timeframes whiles maintaining efficiency. This program is led by Dr. Yue Jiang, Dr. Mofarah, Prof. Sorrell, and A/Prof. Koshy. Dr Jiang said, "One of the major disincentives for research into seawater splitting is the potential for the formation of chlorine gas as a by-product which is highly toxic and corrosive. However, we have been able to design our process to enable seawater splitting without chlorine being generated."

Moreover, oxygen forms an explosive mixture with hydrogen and must be separated from hydrogen before the fuel can be used and the novel catalysts have been engineered such that that oxygen generation is avoided altogether, providing a safer means of production.

"With the demand for hydrogen as a clean-burning energy resource growing exponentially, developing a competitive technical solution to seawater splitting will benefit the environment while creating jobs and investment opportunities for Australian and international energy providers," said CEO Mark Ramsey.

The further intention of the project is to optimize the efficiency and stability of catalyst to higher levels and development of a portable prototype which is scheduled to occur by the end of 2024.

Additionally, the NEMCAT group have published their findings in high-impact journals such as Nano Energy, Journal of Materials Chemistry A, ACS sustainable Chemistry & Engineering.

PhD student Shahrzad Shaddel processing fly ash from the power station.

student awards

& achievements

Major student achievements

Sherie Xue	The Cochlear Prize
Fenglin Zhuo	The Max Hatherly Prize
Candy Leung	The Perfect Engineering Prize
Thong DatPham	1ST Industrial Training Presentation
David Taheri	2ND Industrial Training Presentation
Aiden Yap	3RD Industrial Training Presentation
Calvin Hoang	The Perfect Engineering Prize
Scott Jones	The Hugh Muir Prize

Deans Award for Outstanding PhD Theses

- **Dr Jonathon Hopkins** (supervised by Damia Mawad & Claudio Cazorla)
- **Dr Tobias Foller** (supervised by Rakesh Joshi & Veena Sahajwalla)
- **Dr Maxwell Moyle** (supervised by Sophie Primig & Nima Haghdadi)
- **Dr Vitor Vieira Rielli** (supervised by Sophie Primig & Paul Munroe)

University Medal Recipients

- **Marcus Miljak**
- **Fiona Chen**

The University medal is extremely prestigious and awarded only for the highest level of academic excellence throughout an entire degree program. Not only did Marcus and Fiona progress through their programs achieving exceptional grades and numerous academic awards, they also contributed immensely to both the School and community in so many important ways.

Postgraduate Poster Competition

The 2023 postgraduate poster competition added an academic dimension, attracting those interested in our School's research endeavours and highlighting our students' exceptional research.

1st place award: Michael Lord - Magnetism in thin films of the high entropy oxide $La(Cr_{0.2}Mn_{0.2}Fe_{0.2}Co_{0.2}Ni_{0.2})O_3$ (Supervisor: Nagy Valanoor).

2nd place award: Xinyue (Sunny) Fan - Designing Carbon Nitride Nanostructures for Effective Hydrogen Storage (Supervisors: Pramod Koshy & Sam Chan).

3rd place award: Michael Haines - Investigation of site-specific phase evolution in 17-4PH stainless steel under laser powder bed fusion additive manufacturing (Supervisors: Sophie Primig & Nima Haghdadi).

Audience choice award 1: Xiaoran (Jeffrey) Zheng - Roadmap of Designing High-Entropy Oxides for Next-Generation Batteries (Supervisors: Pramod Koshy, Sajjad Mofarah & Chris Sorrell).

Audience choice award 2: Ming Luo - In-situ grain boundary engineering during laser powder bed fusion of stainless steel 316L (Supervisors: Sophie Primig & Nima Haghdadi).

Materials Australia NSW Branch Student Presentation Competition

This year, thirteen students from UNSW Sydney, the University of Sydney, Western Sydney University, University of Wollongong, and University of Newcastle participated in this competition. The event featured both oral and poster presentation formats and was sponsored by industry and academic collaborators, including United Steel, SOTO, Gravitas Technologies, and ANSTO.

- First Prize Oral Presentation of $600, sponsored by Gravitas Technologies, was awarded to **Ally Bradly** of UNSW Materials for her presentation on "Microstructural evolution in unique geometries of additively manufactured Ni-based superalloy Inconel 718".
- Third Prize Oral Presentation of $400, sponsored by United Steel, was awarded to **Fredrick Zhang** of UNSW Materials for his presentation on "Dissolution Mechanisms of Calcium Perovskite (CaTi03) for SYNROC Wasteforms".
- The 4th Prize Oral presentation of $300 was awarded to **Ratan Venkatesan** of UNSW Materials for his presentation on "Pyrochlore Wasteforms for Immobilising Fluoride-Containing Nuclear Waste".

ARC Club of the Year Award Ceremony

PGSOC and MATSOC jointly won the **Arc Club of the Year 2023 - Development Program Award** for organising the highly successful event "Forge Your Future-Materials Industry Networking Night".

International Nanofluidic Symposium

Mr. Xinyue (William) Wen, won the poster ward (silver) sponsored by Nature Water at the International Nanofluidic Symposium in Singapore. Nobel Laureate Prof. Andre Geim presented the award.

Maths & Science Champions Program

Ms Yongxin Lyu and Dr Giulia Silvani was selected for the 2023 Maths and Science Champions program in the Faculty of Science! Yongxin was selected as our PhD Champion and is currently carrying out her PhD under the supervision of Professors Tom Wu and Dewei Chu. Giulia was selected as our Early Career Scientist Champion and is currently working as a research fellow under the supervision of A/Prof. Kris Kilian.

Flash Talk Award

Mr Yu-Chieh Kuo received an outstanding flash talk award at the 1st Australian Conference on Green and Sustainable Chemistry and Engineering held in Cairns last week.

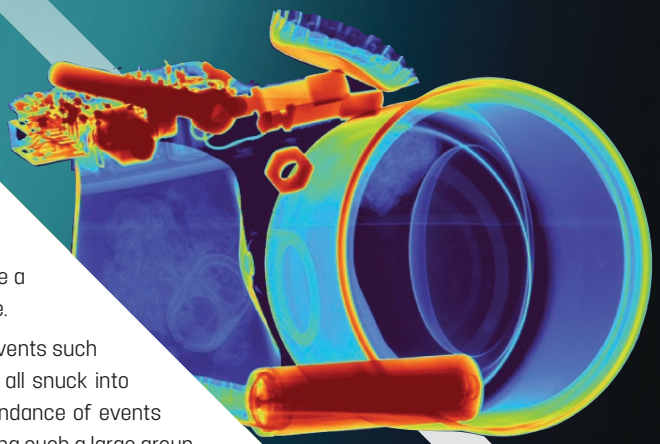
Yu-Chieh is currently carrying out his PhD under the supervision of Prof. Dewei Chu, and his presentation was entitled 'Developing High-Performance Cu@Ag Core-Shell Nanowires through Solution Process for Flexible Transparent Electronics'.

Undergraduate Student Industry Training (IT) Presentation

1st	David Pham	163 (/180)
2nd	David Taheri	155 (/180)
3rd	Aiden Yap	149 (/180)

Louise McGuiggan

student story



My decision to study materials science and engineering was unexpected. I knew in high school that I wanted to study engineering, but, like most students - I had no idea which discipline to choose.

Luckily, I had some fantastic teachers who had encouraged me to pursue year long major works as part of my HSC for science extension and design and technology. For these I would spend the year running a "miniature thesis" and producing a design portfolio. Unknowingly, the projects I selected would lead me to experiment with shape memory alloys, 3D printed plastics, and surface coatings.

This is when I fell in love with the world of materials science.

Studying materials science and engineering at UNSW has been a fantastic experience. The degree has been incredibly rewarding to study, with great courses that have guided me through the different specialities of materials science. The school community has been especially amazing, with incredible staff that have made a huge impact on my education, and peers that have made university life so memorable.

During my first year, I was fortunate to meet some of my future best friends during events such as the MATS1192 trivia, ANSTO site visit, and a chemical engineering event that we all snuck into to steal free food (thanks CEUS!). As someone not from Sydney, having such an abundance of events tailored for first years really helped me settle in, something I am very grateful for. Having such a large group of friends early in my degree was so valuable. We were able to support each other through the transition from high school to university, study together for our courses, and most importantly rant about groupmates for assignments. Other events throughout the year such as first-year camp, the Brickworks site visit, and a road trip with 9 other materials science students really cemented first year as one of my favourite years of university.

Second year was even more exciting, as COVID was (mostly) over and I could begin studying more materials science focused courses. During my second year I would finally move to Sydney (previously, a 2 ½ hour commute), join MATSOC as 2nd year representative, and begin my internship at the CSIRO in Lucas Heights under the supervision of Dr. Ben James and Dr. Yi Liu. As an intern within the Mineral Resources' Sensing and Sorting unit, I would learn to operate x-ray tubes and detectors to perform micro-CT scans. To work with such exciting equipment and learn so much about X-ray physics, coding, and image processing was incredible. Pursuing an internship so early in my degree has been invaluable to my education and really helped develop my confidence as an engineer. I have been very lucky to continue working with the CSIRO, with subsequent placements and an honours project allowing me to have worked on 4 projects so far.

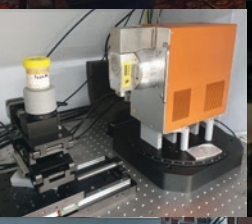
My third year of university was the most dense as I would begin taking more specialised materials science courses and become the president of MATSOC. Leading such a phenomenal executive team was a great privilege, and something I am very proud of. We tried incredibly hard to deliver great events, and I hope the school community enjoyed them. There are a few events I am particularly proud of such as our collaborations with lab manager George Yang, Coffee Catchups, Alumni BBQ, and the Forge Your Future: Materials Industrial Networking Night. These were new events we introduced in 2023 and something I hope will be continued for more years to come.

Finally, as a fourth-year student currently undertaking their honours, I cannot yet comment on this year. However, I can say with confidence that any time I spend in this school will be just as fantastic as the last few years.

Thank you,

Louise McGuiggan


UNSW
School of Materials Science and Engineering
Nelson Tear
The Max Hatherly Prize
UNSW
School of Materials Science and Engineering
Louise McGuigan
The High Mat Prize
UNSW
School of Materials Science and Engineering
Ryder Tuck
The First Place in the Industrial Training Presentation



MATSOC

MATSOC 2023 Team

Louise McGuiggan – President
Mohammed Mohammed Ali – Vice President Internal Affairs
David Worton – Vice President External Relations
Anthony Lu - Social Director
Wendy Zhuo - Marketing Director
Siranjeev Suresh Balan - Assistant Marketing Director, 3rd Year Representative
Jessica Degeling – Arc Delegate
Eleana Fairbairn - Treasurer
Andrew Lu - Secretary
David Pham - International Representative
Lovina Chen - Fourth Year Representative
Ryan Chiu - Third Year Representative
Nelson Tear - Second Year Representative
Joshua Sales - First Year Representative
Jesse Muya - First Year Representative

MATSOC had an amazing year in 2023. With a return to in-person teaching, campus was bubbling with life and so too were our events! Our events calendar had some of the highest attendances we have ever recorded, and we owe it all to our fantastic school community.

The team's goal for 2023 was to introduce lots of new events and collaborations to spice up the yearly calendar. In total, we ran 31 events in 2023, with an event breakdown of:

21 social events
6 educational events
4 networking events
6 society collaborations
25 industry collaborations

A major highlight this year was the return of first year camp! After being cancelled three years in a row due to flooding and the COVID-19 pandemic, we were so excited to bring back this fantastic annual event. Held in collaboration with the Chemical Engineering Undergraduate Society (CEUS), Renewable Engineering Society (RESOC), and Food Science Association (FSA), the weekend retreat to the Hawkesbury River was an amazing break from university. This year's camp was focused on providing the best environment for our first years to make friends and relax after a stressful first set of university midterms. This included activities such as team building exercises, sports, BBQs, and a St. Patrick's Day party on the final night. Our students also got to elect their first-year representatives on their final day at camp – with Joshua Sales and Jesse Muya elected.

Term two held another major event for us, with the Alumni BBQ run next to the recently opened Village Green. This event was particularly special for us as it was sponsored by 4 alumni – Holstein Wong, Michael Gow, Claire Dwyer, and Daniel Baxter. With over 100 attendees from the undergraduate and postgraduate cohorts, staff, and alumni, the atmosphere was electric! Thank you to all that attended, the event was a fantastic display of our wonderful materials science and engineering community.

Finally, in term three we held the largest networking event in MATSOC's history, The Forge Your Future: Materials Industrial Networking Night, in collaboration with our postgraduate society (PGSOC). With an attendance of over 270 people, 22 companies/associations, and guest speaker Saul Griffith, the night was certainly one to remember! Held on campus at The Roundhouse, the space was filled with company stalls and PhD posters to cater to those interested in both industry and academia. After a period of networking, talks were also given by alumni Michael Thien (Infrabuild) and Saul Griffith (Otherlab), followed by a Q&A session with 8 members of industry. Our team was very passionate about running a dedicated materials science and engineering networking event and we were so glad to hear that students were able to get internships and graduate opportunities from the night.

A special thank you to all involved in the event including both society teams, faculty staff, and event sponsors Brickworks, Infrabuild, LMATS, and Zeiss!

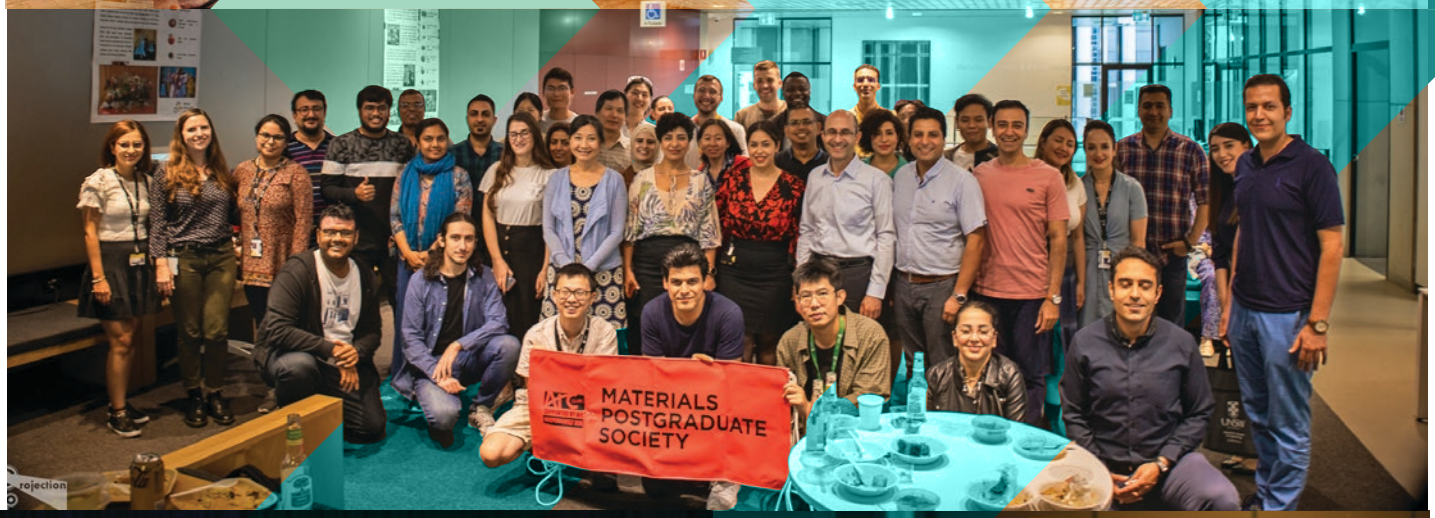
We sincerely thank our major sponsors for this year Cochlear, Brickworks, and of course The School of Materials Science and Engineering. These events are made possible by your support, and we greatly appreciate it. A special shout out to our entire executive team and subcommittee as well, you were all amazing to work with and ran some fantastic events. Best of luck to the team for 2024!!

Louise McGuiggan

2023 President

other notable events run this year include:

0-week Stall (our first ever!)
Barbie Movie Viewing at The Ritz, Randwick w/ RESOC
VIVID Cruise Party w/ CEUS, RESOC, and FSA
Brickworks Picnic
End of Term Study Sessions
Pottery Emporium w/ George and Lucy
End of Year Ball w/ CEUS, RESOC, and FSA
And more!


MATERIALS
POSTGRADUATE
SOCIETY


Development
Program


Viridian

PGSOC

In 2023, PGSOC's impact extended beyond our school grounds to shine brightly within the broader UNSW community. It was a year marked by vibrancy and accomplishment as PGSOC organized a diverse array of events, ranging from cultural festivities to outdoor excursions and professional development opportunities.

Throughout the year, PGSOC embraced the rich tapestry of cultural diversity within our school community by celebrating the Lunar New Year, Persian New Year, Eid-ul-Fitr, Diwali, and Christmas. These events not only fostered a sense of belonging and friendship but also served as platforms for cross-cultural exchange and understanding.

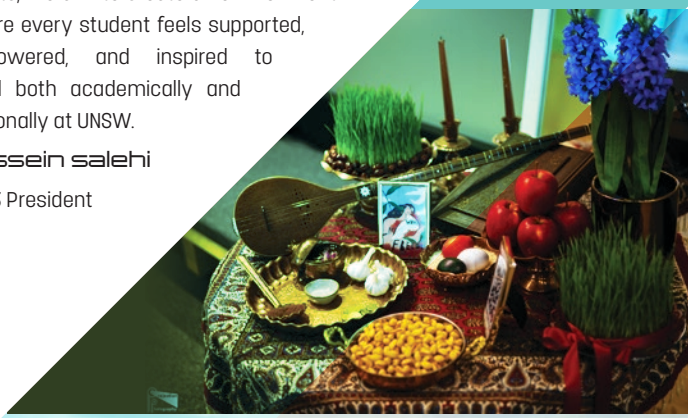
PGSOC also organized memorable outdoor adventures that provided students with opportunities for relaxation and exploration. Day trips to the Jamberoo waterpark, Sea Cliff Bridge, Bald Hill Lookout, Minnamurra Rainforest, and Illawarra Fly Treetop Adventures offered students a chance to unwind, connect with nature, and forge lasting friendships. Not to be forgotten, our Peer Mentoring Welcome BBQ remained a beloved tradition, serving as a warm and inviting introduction to new students and a chance for returning members to reconnect.

A significant highlight of the year was the collaborative effort between PGSOC and MATSOC to organize 'Forge Your Future' – an industrial networking night that achieved a resounding success. Bringing together nearly 300 attendees from students, staff, alumni, and industry professionals from over 20 industries, the event provided invaluable insights into career opportunities and the future of materials science and engineering. The event's success was featured in the Faculty of Science newsletter, and further underscored by its recognition with the UNSW Arc Development Program Award of the Year, a testament to the dedication and hard work of all involved.

Looking ahead, PGSOC remains committed to promoting inclusivity, diversity, and professional development within our school community. Through continued collaboration and the organization of impactful events, we aim to create an environment where every student feels supported, empowered, and inspired to excel both academically and personally at UNSW.

Hossein Salehi

2023 President



work health & safety

WHS committee members:

The members of the School WHS Committee in 2023 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 Linghui Meng (postgraduate student representative).

A brief summary of 2023 WHS Activities "Think Safe Be Safe Home Safe".

building

- Updated to current Life Safety System gas sensor servicing
- Updated Hilmer building EC10 and First aid officers, and new assembly area which is Alumni Lawn
- Reviewed Budling access by Faculty/ School new Afterhours time implemented
- Updated Schneider electric Building management System (BMS), new interface and access
- Completed annual checks for RCD, and fume cupboards
- Continuation of good neighbors meeting with staff in Hilmer, SEB and F10

compliance

- Implemented Safe Zone App
- Implemented speak up cards (Physical yellow cards)
- Implementation of the new University safety program SALUS, SAI360
- New Inspection reporting, Hazards and incident reporting via Salus 360
- Implemented School Risk Register into Salus
- Updated MSE Chemicals in JAGGAER chemical inventory
- Schedule 14 Health Monitoring program for lead & chromium work
- Changes in UNSW RECS, in particular Lasers/ laser training
- Decommissioning SafeSys which is our previous safety program
- Completed psychosocial Risk Assessment for the School
- Completed annual Evac/ Lockdown drill within the building
- Completed quarterly level 3 Safety committee meetings
- Updated all high-risk safe work procedures (SWPs) in the School

inspections

- Completed monthly Senior leadership tours done by our head of School/ Faculty
- Faculty Deans safety visit
- Faculty WHS Safety business partner audits
- WHS Safety BP audited our Lead Labs
- Inspected staff and student office areas
- Building visits by the UNSW safety central team
- Completion of annual electrical test and tagging for the year
- Quarterly workplace/laboratory safety inspections and completion of corrective actions

Training

- Held multiple Salus Sessions for the whole School (had 10 sessions)
- Ccompleted Safety and Health Awareness Course and Ergonomics & Manual Tasks (refresh) Course
- Staff attended Mental health first aid training (MHFA)
- Updated warden and first aid training
- Completed Laser Training and Laser Safety Supervisor courses
- Mandatory School WHS info sessions (~11 per year) for all new staff, postgrad and Honors students
- External company SUPAGAS training for gas and cryogenics for both staff and students
- HF training/ practical for specific research students

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.

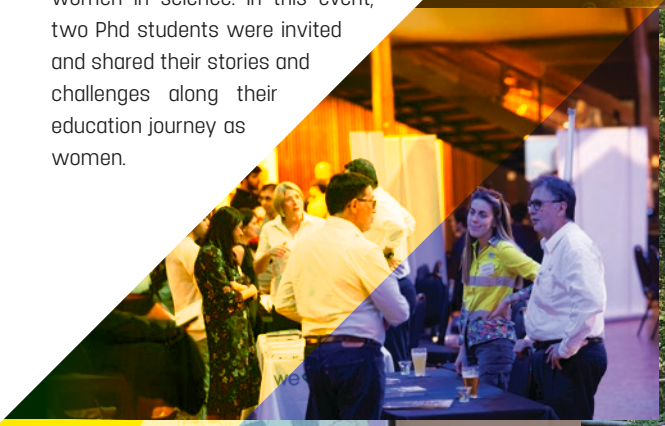
equity, diversity & inclusion

In 2023, the Materials Science and Engineering Postgraduate Society (MSE PGSOC) demonstrated a robust commitment to fostering an inclusive academic environment.

Through culturally enriching events such as Lunar New Year, Persian New Year, Diwali, and Eid-Ul-Fitr celebrations, PGSOC successfully united staff and students from diverse backgrounds. These initiatives not only promoted cross-cultural understanding but also created a sense of appreciation for the rich diversity within the Materials Science and Engineering community.

PGSOC also organized a variety of outdoor events, including a day trip to Minnamurra Rainforest, with an introduction to the Indigenous Australians lands by a knowledgeable tour guide. The experience provided international students insight into Indigenous Australian cultures and fostered a deeper connection to the broader Australian community.

A highlight of the year was the collaboration between PGSOC and MATSOC in organizing 'Forge Your Future - Materials Industry Networking Night.' With a remarkable attendance of nearly 300 individuals from UNSW and representatives from 20 industries, the event addressed a significant gap at UNSW by providing a dedicated platform for industry networking. The concurrent poster competition added an academic dimension, attracting individuals interested in the school's research endeavors, further bridging the gap between academia and industry.



International Women's Day on 8th of March, MSE organised an event to acknowledge the critical role women play in society and to promote equal access and participation for women in science. In this event, two Phd students were invited and shared their stories and challenges along their education journey as women.

Marketing & outreach

Marketing & outreach

2023 was a great year for marketing and outreach for the School of Materials Science and Engineering! Our internal community grew amongst both our students and staff, and we were able to host and engage more with our external community as well – participating in various campus events and hosting various outreach programs.

We executed a lot of amazing ideas that our Marketing team came up with and had a lot of great opportunities to promote the school. We are looking forward to next year and what out school has in store.

Open Day

Open Day was a huge success, with our tent being one of the most popular tents on campus, garnering tonnes of foot traffic! We also want to extend a huge thank you to all our amazing staff and students who helped to run our tent. We had many wonderful demonstrations on display and served over 1000 liquid nitrogen Ice-Creams!

Open Day is one of our biggest engagement events for the school so promoting what we represent and showing the world of Materials Science and Engineering in a fun and informative way is always important in engaging and bringing future students on board. We had plenty of our academic staff at our advisory tent as well to guide prospective students and give them all amazing insight into what we offer at our school and helping them choose the right path for them.

Needless to say an incredibly successful Open Day and a promising sign for the future of Materials Science and Engineering!

Social Media

Social media is one of our biggest platforms for promoting and sharing all the things that happen within our school and amongst its community. This year we tried to push our social media engagement and reach more through increased posting and engagement with students, staff and the community alike. Our main platforms for promotion were Instagram and Facebook although with the rise of other social media platforms like TikTok and X (formerly Twitter) we are hoping we can expand our social media reach and platforms within the future. Be sure to follow us on Instagram **@unswmaterials** and our Facebook page to keep up to date with all the latest that is happening in the School of Materials Science and Engineering.

outreach

In the School of Materials Science and Engineering we are very proactive with our secondary school community and part of this initiative is to engage in as much outreach with as many schools as we can host.

A big shout out goes to Dr. Benjamin Pace and Dr. Caitlin Healy for their continued effort into putting on engaging practical demonstrations and presentations to High School students who want a glimpse into the world of Materials Science and Engineering.

We are looking at continually developing and adapting our program to keep up with the high demand of High Schools wanting to come onto our campus to engage in our outreach, and apart of this plan for the coming year will be to revamp the program and get more academics on board and involved with outreach.

marketing committee

As part of our commitment to the schools presence and ensuring the school is presented in the best way and to maximise engagement we have a dedicated Marketing Committee that meets fortnightly to track progress of tasks, brainstorm ideas and ensure that the schools marketing and outreach ventures run smoothly and productively.

This committee consists of many key figures in our school staff as well as other stakeholders from the Science faculty to ensure a consistent and seamless transition of ideas and integration into the larger UNSW community outside of our Materials Science and Engineering bubble.

events

The school of Materials Science and engineering hosted and engaged in many events this year. We are very close with both out MATSOC and PGSOC societies, so it is always great to collaborate with them on events they want to run to foster our inner community better amongst staff and students. Notable events this year included various welcome events we ran for all our new students, Symposiums for our dedicated research themes, our undergraduate industrial training presentation night, the end of year Christmas party and the extremely successful forge your future networking night hosted in a collaboration with our two amazing societies. We can't wait for next year and all the amazing events we have planned and will continue to run all throughout the year.

Research grants 2023

Amounts provided below are apportioned amounts for 2023

HERDC category 1:
Australian competitive grant research income

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, $123500

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 Wong, Koshy, P; Sorrell, CC; Wong, V, $15000

Australian Research Council / Discovery Early Career Researcher Award (DECRA). Printed Infrared Quantum Dot Photodetectors and Large-scale Image Sensors, Hu, L, $71023

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

Australian Research Council / Discovery Project. Bioinspired Flexible Haptic Memory Materials for Artificial Sensory Nerves, Chu, D; Furlong, TM; Wu, L; PENG, S, $30966

Australian Research Council / Discovery Project. Bioinspired Nanoionic Materials for Watt-scale Nano-Hydroelectric Generator, Chu, D, $172000

Australian Research Council / Discovery Project. Cell Membrane Coated Photonic Crystal to study Receptor-Ligand Interactions, Kumeria, T, $103500

Australian Research Council / Discovery Project. Corrosion of heat resisting alloys in steam/hydrogen-rich environment, Zhang, J; Young, DJ, $150000

Australian Research Council / Discovery Project, Designing a photo-electro-catalysis system for selective organic oxidation, Scott, JA; Amal, R; Hart, J; Valanoor, N, $80791

Australian Research Council / Discovery Project. Ferroelectric bilayer composites with giant electromechanical properties., Valanoor, N; Chang, L; Daniels, JE, $103333

Australian Research Council / Discovery Project. In-situ grain boundary engineering via metal additive manufacturing, Primig, S; Haghdadi, N, $138920

Australian Research Council / Discovery Project, Mixed-Dimensional 2D/0D Heterostructures for Infrared Detection, Wu, T; Chang, L, $92414

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

Australian Research Council / Discovery Project. Nitride materials: In the "bond ionicity Goldilocks zone" for solar energy, Green, M; Hart, J; Patterson, RJ; Suryawanshi, MP, $16042

Australian Research Council / Discovery Project. Topotactic Control of Magnetism in Multiferroic and Skyrmion Materials, Seidel, J, $148000

Australian Research Council / Future Fellowship, Iron-based high-temperature topological superconductors, Li, Z, $206111

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, NT; Bilston, LE; Stevens, M; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Neff, R; Lord, SR; Yeoh, GH; Parameswaran, S; Foroughi, J; Li, B; Ooi, SM; Phan, H, $125000

Australian Research Council / Industrial Transformation Research Hubs. ARC Research Hub for Fire Resilience Infrastructure, Assets and Safety Advancements (FRIASA) in Urban, Resources, Energy and Renewables Sectors, Yeoh, GH; Canbulat, I; Si, G; Chan, QN; Jing, Y; Boyer, CA; Zhang, C; Dai, L; YUAN, J; Sammut, C; Li, S; Kay, MJ; Zhang, W; Kabir, II; Ghodrat, M; Parameswaran, S, $6211

Australian Research Council / Industrial Transformation Research Hubs. ARC Research Hub for Microrecycling of battery and consumer wastes, Sahajwalla, VH; Pahlevani, F; Joshi, RK; Sharma, N; Maroufi, S, $498000

Australian Research Council / Industry Fellowship - Mid Career. Bio-inspired Sustainable Materials for Self-powered Environmental Sensing, Chu, D, $19152

Australian Research Council / Linkage Projects. Engineering Nanoionic Interfaces towards High Performance Cathode Coatings, Chu, D; Wang, D; Sharma, N, $31563

Australian Research Council / Linkage Projects. High performance metal oxide inks for printable memory arrays, Chu, D; Wu, T, $57170

Australian Research Council / Linkage Projects. New Ceramic: Fully Stabilised Monoclinic Zr02 by Al203 + Si02 Additions, Sorrell, CC; Hart, J; Koshy, P, $71550

Australian Research Council / Linkage Projects. Powering Next Generation Wearable Electronics: Moisture Electric Generator, Chu, D; Wu, T; Joshi, RK; Hart, J, $162215

Australian Research Council / Linkage Projects. Structure-property relationships of next generation aero-engine materials, Primig, S, $190000

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 4-H4T201A, Munroe, PR; Taherymoosavi, S, $383455

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; Ghose, A, $1417250

Department of Education / Trailblazer Universities Program (TRaCE). Mid, Poc and High Impact Fund – Jamestrong, Sahajwalla, VH; Ghose, A, $81203

Department of Education / Trailblazer Universities Program (TRaCE). Mid, Poc and High impact fund – Vecor, Koshy, P; Sorrell, CC; Seifi Mofarah, SS, $380639

Department of Education / Trailblazer Universities Program (TRaCE). Mid,Poc and High impact fund – Kandui, Sahajwalla, VH; Mastio, E, $265038

Monash University / ARC Centres of Excellence Shared Grant. ARC Centre of Excellence in Future Low-Energy Electronics Technologies FLEET, Hamilton, A; Kalantar Zadeh, K; Culcer, DM; Klochan, O; Seidel, J; Sushkov, OP; Valanoor, N, $428241

Monash University / Defence Science & Technology Group (DSTG) - Hazardous Agent Challenge Shared Grant. Porous Photonic Microcavities Enhanced In-field Toxic Chemical Sensors, Kumeria, T, $31648

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, $24956

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; Pahlevani, F, $30000

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

University of Sydney / ARC Linkage Project Shared Grant. Advanced hard metals: microstructure-property-processing relationships, Primig, S, $107375

University of Wollongong / ARC Industrial Transformation Training Centres Shared Grant. ARC Training Centre for Innovative Composites for the Future of Sustainable Mining Equipment, Zhang, J; Si, G, $34627

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) / Australian Synchrotron Access Program. ESRF MA-5625 - Optimising electrical poling processes for single crystal relaxor ferroelectrics, Daniels, JE, $6800

Australian Nuclear Science & Technology Organisation (ANSTO) / Student Project Agreement. Dissolution mechanisms of Perovskite – Student Frederick Zhang, Koshy, P, $4000

Australian Nuclear Science & Technology Organisation (ANSTO) / Student Project Agreement. Glass-Ceramic Wasteforms for Fluoride Salt Immobilization - Honours Student Jessica Degeling, Koshy, P, $2000

Australian Nuclear Science & Technology Organisation (ANSTO) / Student Project Agreement. Investigation of HIPed (Hot Isostatically Pressed) Synroc-C wasteform-canister interaction zone - Zijuan Zhang, Koshy, 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, $47520

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, $100000

CSIRO - Commonwealth Scientific and Industrial Research Organisation / Postgraduate Studentship. Dialysis-MEG Fundamental - PhD Scholarship for Jinbo Wang, Chu, D; Han, Z, $10685

Department of Climate Change Energy the Environment and Water / Commonwealth Government Contract. Sustainable Communities and Waste Hub - Research Support Services NESP, Sahajwalla, VH, $180200

Department of Industry, Science and Resources / Innovation Connections Contract. Effective heat treatment conditions for steel alloys, Pahlevani, F, $25000

Department of Industry, Science and Resources / Innovation Connections Contract. Recycling waste powder coat into new products, Ghose, A; Heriyanto, H, $47602

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, $75000

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, NT; Bilston, LE; Stevens, M; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Foroughi, J; Li, B; Neff, R, $2727

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; Sharma, N; Maroufi, S; Pahlevani, F, $16000

Sydney Water Corporation / State Government Contract. Graphene Oxide-Coated LPG Fibre for Ammonia Sensing in Water, Joshi, RK; Stenzel, M, $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, $145000

HERDC category 3:
Industry and other Funding

AAM Pty Ltd / ARC Industry Fellowship - Mid Career Industry Partner Contribution. Bio-inspired Sustainable Materials for Self-powered Environmental Sensing, Chu, D, $26442

AINSE - Australian Institute of Nuclear Science and Engineering / AINSE Honours Scholarships. Pyrochlore wasteforms for immobilising fluoride-containing nuclear waste - Honours student Ratan Venkatesan, Koshy, P; Bahman Rokh, G, $5000

AINSE - Australian Institute of Nuclear Science and Engineering / Postgraduate Research Award. Investigating Magnetoelectric Effects of a BiFeO3 Resonant Tunnelling Diode - PGR student King-Fa (Gordon) Luo, Valanoor, N, $4500

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, $9227

AINSE - Australian Institute of Nuclear Science and Engineering / Residential Student Scholarship. Pyrochlore Glass-Ceramic Wasteforms for Immobilising Nuclear Waste – Student Joel Abraham, Koshy, P, $12206

AIT Austrian Institute of Technology / The Austrian Research Promotion Agency (FFG) Energy Research. Novel advanced Titanium superalloys for additive manufacturing, Primig, S, $53333

AOTOL Pty Ltd / ARC Linkage Project Industry Partner Contribution. Engineering Nanoionic Interfaces towards High Performance Cathode Coatings, Chu, D; Wang, D; Sharma, N, $7396

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, NT; Bilston, LE; Stevens, M; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Li, B; Neff, R; Ooi, SM; Wang, C; Foroughi, J, $3913

Australian Advanced Materials Pty Ltd / ARC Linkage Partner Contribution. High performance metal oxide inks for printable memory arrays, Chu, D; Wu, T, $35000

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, $119437

Baxter Healthcare Corporation (USA) / International Contract. Graphene based membranes for the removal of chlorine and hardness from water, Joshi, RK, $161124

Bisalloy Steels Pty Ltd / Innovation Connections Contract. Effective heat treatment conditions for steel alloys, Pahlevani, F, $45309

Brickworks Building Products Pty Ltd / Contract Research. Characterisation of Building Products, Koshy, P, $10000

Centered Around You Pty Ltd / COVID-19 TechVoucher Industry Partner Contribution. Development of BheemSense, Li, S; Qu, B, $11981

Commonwealth Steel Company / ARC ITRH Industry Partner Contribution. ARC Research Hub for Microrecycling of battery and consumer wastes, Sahajwalla, VH, $275000

Defence Science & Technology Group (DSTG) / US Department of Defence DASA Omnibus Shared Grant. Digital Engineering Materials for Damage Tolerance, Primig, S; Haghdadi, N, $120000

DMTC Limited / Contract Research. Characterisation of Relaxor Ferroelectric Single Crystals in Support of Crystal Growth, Utilisation and Compositional Development, Daniels, JE, $131473

ElectraLith Pty Ltd / Contract Research. SPS Processing, Li, S; Lin, X, $11804

ExxonMobil / International Contract. Continuous dusting in hydrocarbon mixture, Young, DJ, $41600

Flame Security International 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, NT; Bilston, LE; Stevens, M; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Li, B; Neff, R; Ooi, SM; Foroughi, J; Mao, G, $18187

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, NT; Bilston, LE; Stevens, M; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Li, B; Neff, R; Ooi, SM; Wang, C; Foroughi, J, $6522

research grants 2023

Infinite Water Holdings Pty Ltd / Contract Research. Graphene Oxide Coated Flat Sheet Ceramic Membrane Filtration Prototype Development, Joshi, RK, $93199

Jamestrong Packaging Pty Ltd / TRaCE Trailblazer Partner Contribution. T4.2 Green Aluminium, Sahajwalla, VH; Ghose, A, $200000

Kandui Technologies Pty Ltd / TRaCE Trailblazer Partner Contribution. T4.1 Green Ceramics, Sahajwalla, VH; Ghose, A; Mastio, E, $33333

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; Zlatanova, S; Wang, C; Canbulat, I; Gao, W; Parameswaran, S; Prasad, D; Sammut, C; Zhang, W; Li, B; Shen, X; Barton, J; Clark, SR; Raval, SA; Shahbodaghkhan, B; Vahab, M; Mao, G; Chu, D; Ronagh, HR; Makki Alamdari, M; Mo, H, $9521

Mattress Recycle Australia / ARC ITRH Industry Partner Contribution. ARC Research Hub for Microrecycling of battery and consumer wastes, Sahajwalla, VH, $75000

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, NT; Bilston, LE; Stevens, M; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Li, B; Neff, R; Ooi, SM; Foroughi, J, $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, NT; Bilston, LE; Stevens, M; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Li, B; Neff, R; Ooi, SM; Wang, C; Foroughi, J, $11478

OneSteel Manufacturing Pty Ltd / Contract Research. Advancing Australian steelmaking for next generation construction applications, Primig, S, $15000

Perfect Engineering / Contract Research. Analysis of corroded steels, Munroe, PR, $10000

Planet Ark Environmental Foundation / ARC ITRH Industry Partner Contribution. ARC Research Hub for Microrecycling of battery and consumer wastes, Sahajwalla, VH, $50000

Planex Sales Pty Ltd / Innovation Connections Contract. Recycling waste powder coat into new products, Ghose, A; Heriyanto, H, $47604

POSCO / International Contract. Combustion characteristics of high volatile coal for the blast furnace ironmaking, Koshy, P; Ostrovski, O, $27516

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, NT; Bilston, LE; Stevens, M; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Neff, R; Ooi, SM; Wang, C; Foroughi, J, $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, NT; Bilston, LE; Stevens, M; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Li, B; Neff, R; Ooi, SM; Foroughi, J, $26087

SOL.AR SRL / ARC ITRH Industry Partner Contribution. ARC Research Hub for Microrecycling of battery and consumer wastes, Sahajwalla, VH, $18000

Standard Bio / Norwegian Research Council Shared Grant. Catch&Kill - Sustainable low-cost materials for air and water disinfection, Munroe, PR; Joseph, SD, $75868

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, NT; Bilston, LE; Stevens, M; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Li, B; Neff, R; Ooi, SM; Foroughi, J, $3913

Sydney Water Corporation / ARC ITRH Industry Partner Contribution. ARC Research Hub for Microrecycling of battery and consumer wastes, Sahajwalla, VH, $20000

TES-AMM Australia Pty Ltd / ARC ITRH Industry Partner Contribution. ARC Research Hub for Microrecycling of battery and consumer wastes, Sahajwalla, VH, $8333

Textile Recyclers Australia Pty Ltd / ARC ITRH Industry Partner Contribution. ARC Research Hub for Microrecycling of battery and consumer wastes, Sahajwalla, VH; Pahlevani, F; Joshi, RK; Sharma, N; Maroufi, S, $40000

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, NT; Bilston, LE; Stevens, M; Mao, G; Argha, A; Han, Z; Brodie, AM; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Li, B; Neff, R; Ooi, SM; Wang, C; Foroughi, J, $5217

Tiger Techno Iwindow Pty Ltd / INSF Industry Partner Contribution. Development of cost-effective Ag nanowire electrodes through spray-coating, Chu, D; Wan, T; Li, M, $30000

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, $11113

University of Sydney / ARC Linkage Project - Ceratizit Shared Partner Contribution. Advanced hard metals: microstructure-property-processing relationships, Primig, S, $49628

Vecor Australia / ARC Linkage Project Industry Partner Contribution. New Ceramic: Fully Stabilised Monoclinic ZrO2 by Al2O3 + SiO2 Additions, Sorrell, CC, $50000

Vecor Australia / Contract Research. Vecor Co-Location Agreement, Koshy, P; Sorrell, CC, $1220784

Vecor Australia / TRaCE Trailblazer Partner Contribution. Joint UNSW-Vecor Trailblazer Project into Nanostructured Materials (Universal Precursor Materials and Seawater Splitting) and Transformation of Fly Ash (Ceramic Filler), Koshy, P; Seifi Mofarah, SS; Sorrell, CC, $1000000

Vesi Water Pty Ltd / Contract Research. Graphene Oxide Desiccant Project, Joshi, RK, $101027

voestalpine BOHLER Edelstahl GmbH & Co KG / ARC Linkage Project Industry Partner Contribution. Structure-property relationships of next generation aero-engine materials, Primig, S, $2000

voestalpine BOHLER Edelstahl GmbH & Co KG / International Contract. Processing-structure-property relationships of forged Ni-based superalloys, Primig, S, $124630

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, NT; Bilston, LE; Stevens, M; Mao, G; Argha, A; Han, Z; Mawad, D; Lord, SR; Yeoh, GH; Parameswaran, S; Li, B; Neff, R; Ooi, SM; Wang, C; Foroughi, J, $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, $237295

Western Australian Specialty Alloys Pty Ltd / Contract Research. Advanced thermo-mechanical processing of low Nb grade alloy 718 - student Hubert Lee, Primig, S, $65000

other research funding

Australian Research Council / LIEF. Facility for growth and characterisation of advanced materials and devices, Hamilton, A; Hudson, KL; Sharma, N; Valanoor, N; Rendell, M, $262107

Monash University / ARC Centres of Excellence Subcontract. FLEET Translation Program - Toward practical development of efficient rechargeable aqueous Zn-ion battery technology, Kumar, PV; Valanoor, N; Kundu, D; Musso, T; Shang, Y, $9804

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; Pahlevani, F, $30000

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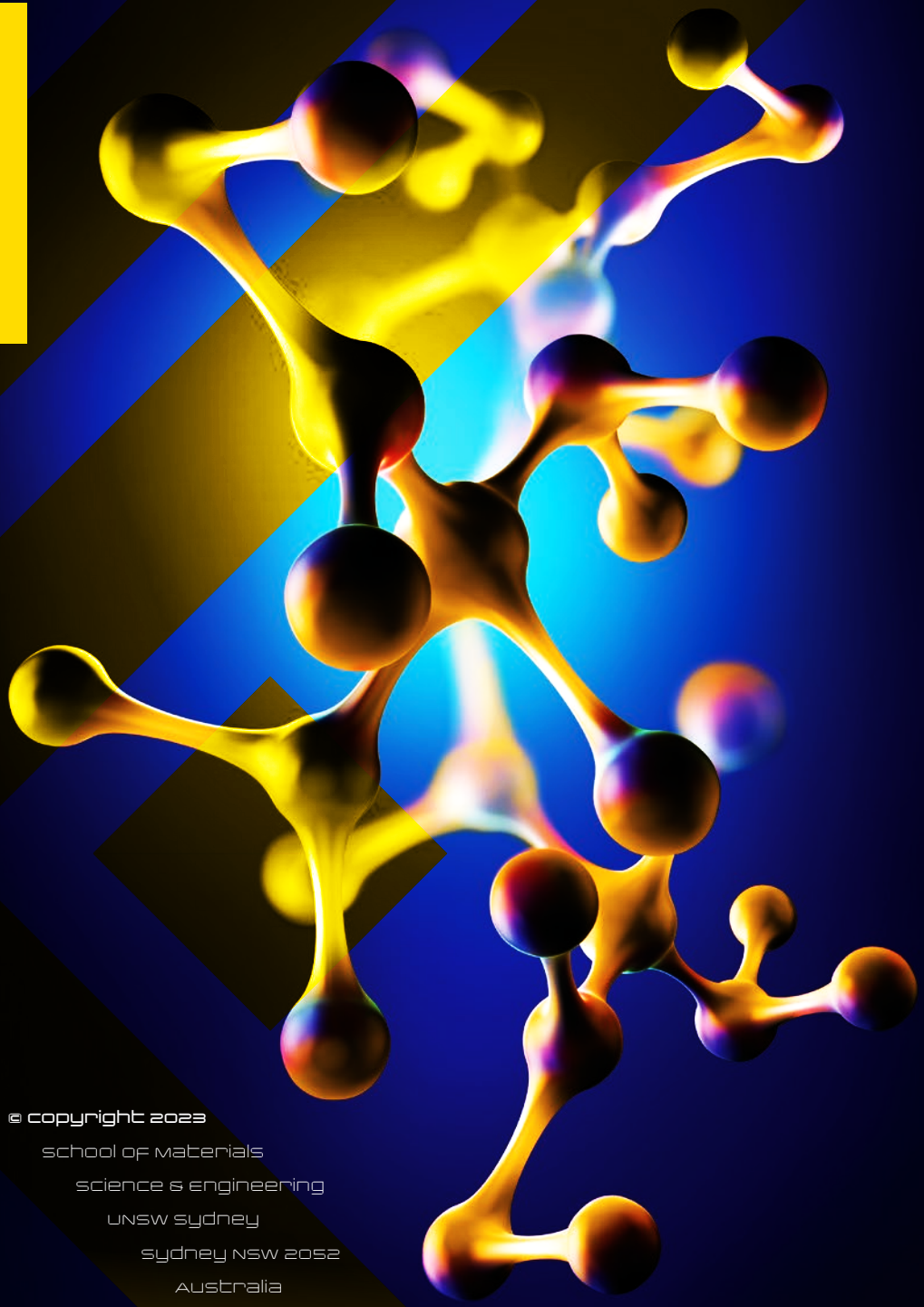

school of materials
science & engineering
UNSW Sydney
Sydney NSW 2052
Australia

enquiries:
phone: +61 (0)2 9385 7298
fax: +61 (0)2 9385 6565
email: enquiries.materials@unsw.edu.au
web: materials.unsw.edu.au
CRICOS provider number: 00098G

project coordinator & editor:
chris seymour

design:
greg hosking
monotron creative
greg@monotron.com