



THE UNIVERSITY OF  
SYDNEY

# The University of Sydney *Nano Institute*

2024-2028 Strategy

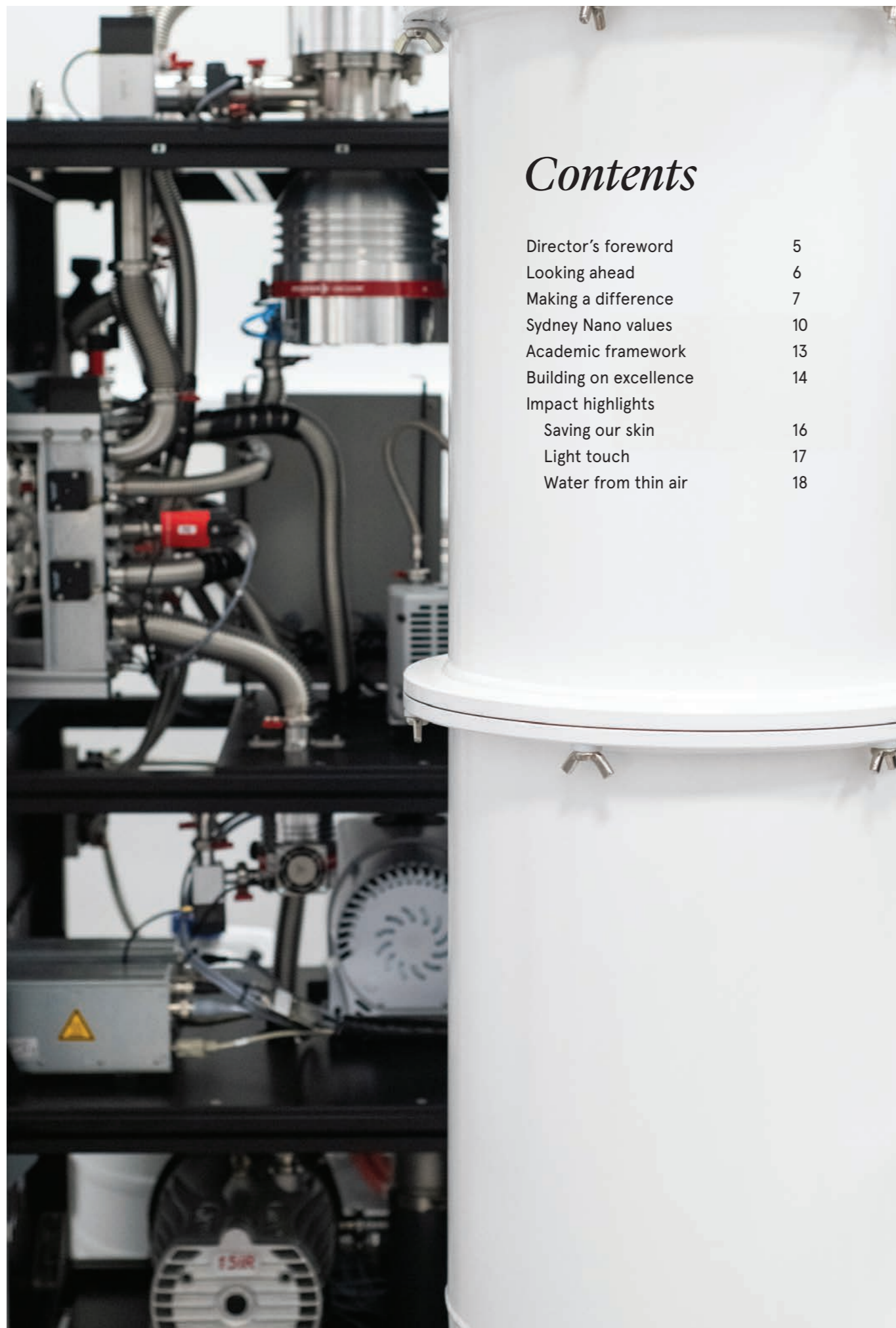


# The next giant leap is *seriously small.*

Sydney Nano takes a start-up approach to supercharging research and innovation. We support agile, multidisciplinary teams to ambitiously solve big challenges in critical and emerging technologies.

#### Acknowledgement of Country

We recognise and pay respect to the Elders and communities – past, present, and emerging – of the lands that the University of Sydney’s campuses stand on. For thousands of years they have shared and exchanged knowledges across innumerable generations for the benefit of all.



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## Director's foreword

We're redefining how fundamental research, emerging technologies and novel innovation come together to deliver transformative impact.

Over the past decade, Sydney Nano has established an excellent track record of ground-breaking multidisciplinary research and innovation in nanoscale science and technology. Equally crucial, we have gained invaluable insights into supercharging research and innovation, unlocking potential with our collaborators and partners to pursue the challenges that are most important to them and society.

We have also significantly advanced our goal to engage widely across the University, understanding and building our capabilities and areas of expertise.

With 2024 comes new opportunities. Critical and emerging technologies at the nanoscale are recognised as essential for addressing the urgent, systemic challenges the world faces – across health and medicine; computing, communications and security; and manufacturing, energy and the environment.

We are now working to sharpen how we amplify the impact of Sydney Nano research, taking a startup-inspired approach to maximise the translation of our research into industry, defence, policy, entrepreneurship, and our contribution to the UN Sustainable Development Goals.

The focus of our Sydney Nano 2024-2028 Strategy is to establish an environment that blends flexible, outcome-focused initiatives with an entrepreneurial culture, backed by world-class infrastructure and strong partnerships. We will create agile teams – Ventures – to pursue opportunities of national and international significance, such as Centres of Excellence.



We remain dedicated to supporting the professional development of our researchers, particularly EMCRs, by investing in a range of support and mentorship programmes to enable an environment where researchers and teams can flourish and the next generation of leaders can emerge.

With a strong track record of forming strong and impactful partnerships – including with Microsoft through the single biggest investment in quantum computing research in Australia – we are well positioned to work with current and potential entrepreneurs to facilitate better translation and commercialisation of research.

Tackling society's massive, systemic challenges requires solutions that are seriously small.

At Sydney Nano, we are committed to driving transformative outcomes – uniting unparalleled expertise, innovative technologies and strategic partnerships, to advance world-class innovation and outcomes in critical and emerging technologies at the nanoscale.

**Professor Stephen Bartlett**

## *Looking ahead*

### *Our vision*

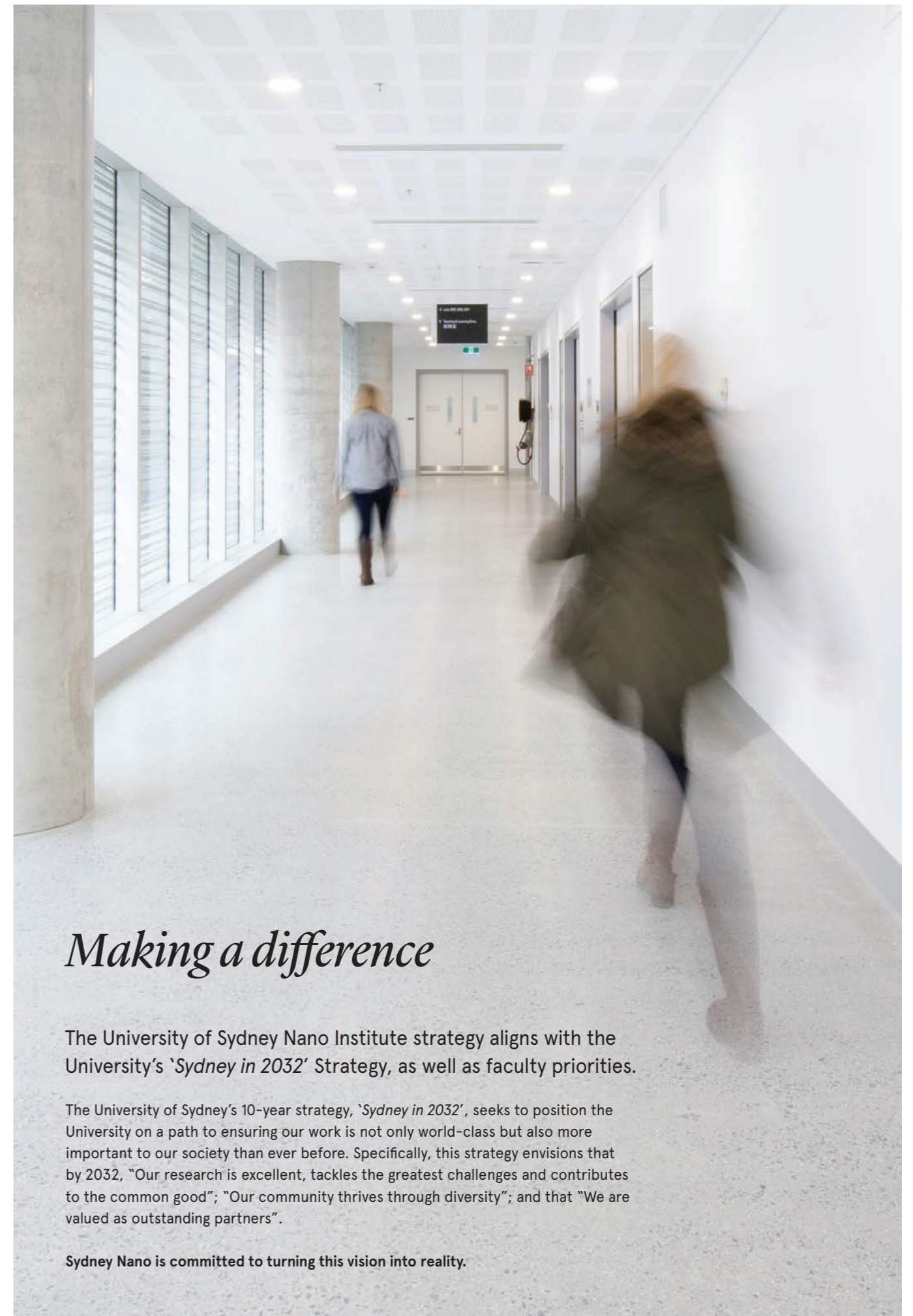
To drive transformative outcomes in critical and emerging technologies at the nanoscale.

### *Our mission*

To bring together the people, knowledge, infrastructure and partnerships needed for world-class innovation in critical and emerging technologies at the nanoscale.

### *Our purpose*

To enable, facilitate and promote transformational activities and translational outcomes in critical and emerging technologies at the nanoscale that would otherwise not be possible through existing faculty and university structures.



## *Making a difference*

The University of Sydney Nano Institute strategy aligns with the University's 'Sydney in 2032' Strategy, as well as faculty priorities.

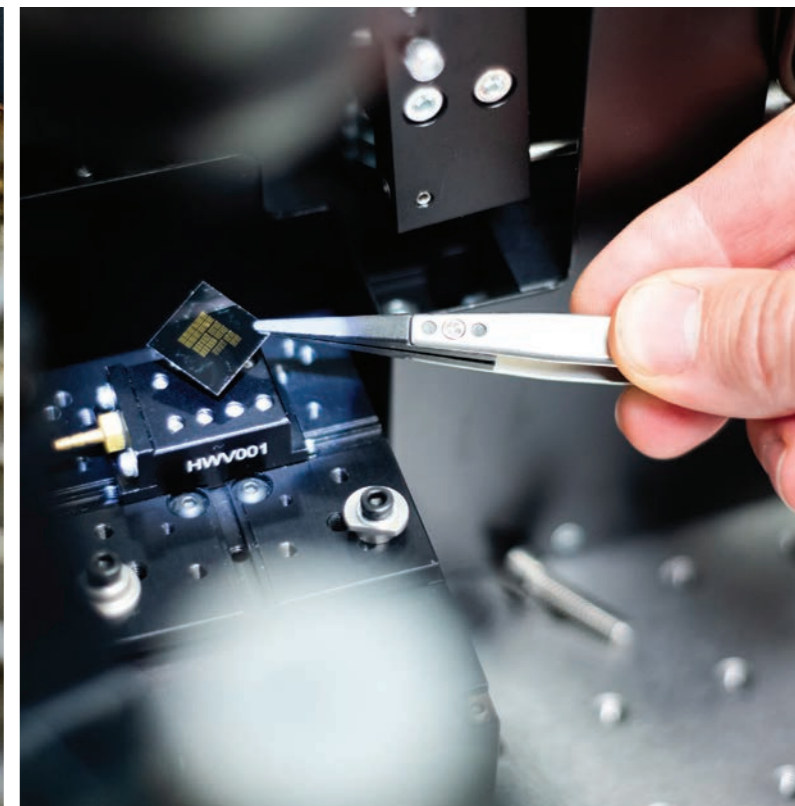
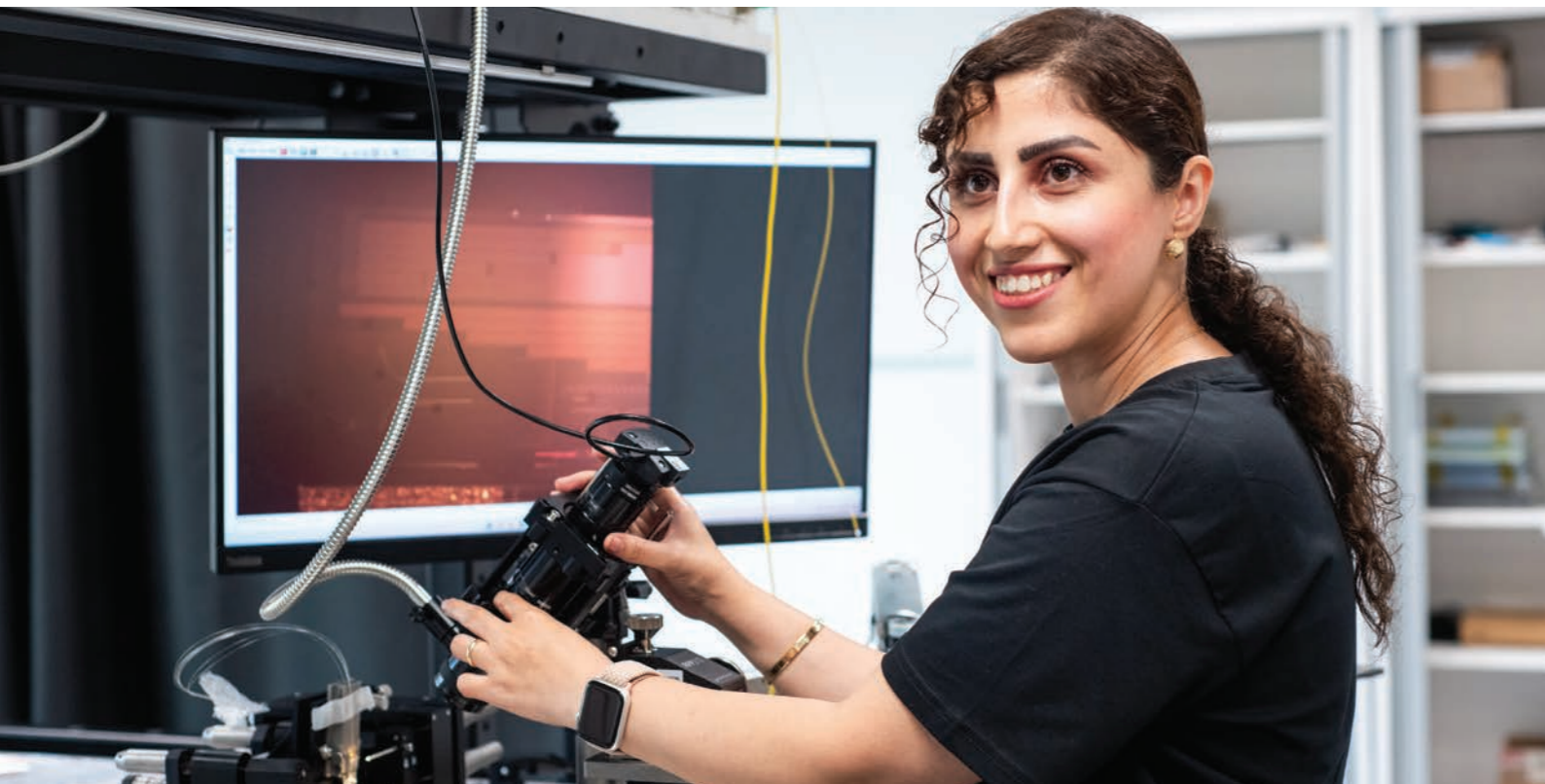
The University of Sydney's 10-year strategy, 'Sydney in 2032', seeks to position the University on a path to ensuring our work is not only world-class but also more important to our society than ever before. Specifically, this strategy envisions that by 2032, "Our research is excellent, tackles the greatest challenges and contributes to the common good"; "Our community thrives through diversity"; and that "We are valued as outstanding partners".

**Sydney Nano is committed to turning this vision into reality.**



“Sydney Nano’s facilities and infrastructure are state-of-the-art, and support research discoveries that have positive impacts on industry and society.”

**Professor Xiaoke Yi**  
Director, Photonics Research Group  
Associate Head of School (Research Head)  
School of Electrical and Computer Engineering, Faculty of Engineering



## Sydney Nano *values*

### Culture

**Collaboration and diversity will be our superpowers.**

Collaboration is at the core of everything we do. We recognise that addressing the world's most pressing needs requires a radically new approach to innovation – one that's underpinned by agile and multidisciplinary teams equipped to thrive in dynamic, ambiguous environments.

Embracing equity, diversity and inclusion is pivotal to our success. We recognise the significant diversity challenges, particularly in gender and culture, within many of our disciplines and are committed to actively improving this reality. We embrace diversity in all forms, welcoming researchers at any career stage, with interests ranging from fundamental research to commercialisation and entrepreneurship.

We believe we can improve equitable access to critical and emerging technologies, ensuring shared benefits for everyone.

### External engagement

**Innovation travels at the speed of trust.**

Building an engaged community of champions, both inside and outside Sydney Nano, is foundational to our success. Impactful solutions cannot be built in silos – and cannot be successful in the real world without public support. Innovation travels at the speed of trust, which is built through close, collaborative and mutually beneficial partnerships. Developing and maintaining reciprocal partnerships based on trust is critically important to our mission.

Recognising the vital role of external partners and collaborators, Sydney Nano takes a collaborative approach that's rooted in our team-focused mindset and mission. We work with a broad range of partners – including industry collaborators and investors, government agencies and defence, philanthropists, and key international partners – to nurture research and transform ideas into innovations that deliver real-world impact.

### 10X not 10% change

**A laser focus on transformative impact.**

At Sydney Nano, we reject incrementalism, striving instead for bold solutions that promise transformative impact on today's most pressing challenges. With our vision, capacity and infrastructure – and a track record of success that includes more than \$30M in annual external revenue – we are uniquely positioned to deliver transformative change. Although we work on the nanoscale, our ambition is enormous.

### Experimentation

**Experimentation is the engine of innovation.**

Thomas Edison famously said: "I have not failed. I've just found 10,000 ways that won't work."

All great scientific and technological breakthroughs are the culmination of experimentation and learning from failure. The pursuit of groundbreaking solutions requires embracing risk and uncertainty. Too frequently, incremental ideas are rewarded as "safe bets", leading to single-issue solutions that fall short of the kind of impact we strive for.

At Sydney Nano, we champion bold ambition. We provide a protected space for experimentation and iteration, encouraging researchers to take calculated risks that lead to high-value outcomes.

Our approach is designed to foster systematised serendipity, allowing our diverse community of researchers to engage in interdisciplinary exploration. We enable innovative applications of technology, often beyond their original intent, paving the way for transformative change.



## Academic framework: *created for impact*

Sydney Nano offers a unique environment that merges flexible, outcome-focused initiatives with an entrepreneurial, startup-inspired culture, backed by world-class infrastructure and institutional support.

Our researchers, excelling in their diverse disciplines, share a collective vision: to make a profound impact on the world's toughest challenges.

We are a magnet for researchers, partners and collaborators, from social science to quantum science, from new medicines to new markets. Our projects range from fundamental research and emerging technologies through to commercialisation and deployment, all within an academic framework that promotes agility and responsiveness to both immediate and long-term challenges and opportunities.

Central to our academic framework are Sydney Nano Ventures in high-priority areas, anchored to translational outcomes such as information technologies of the future, improved health outcomes, and a sustainable built environment.

Dynamic and collaborative, these Ventures enable multidisciplinary teams to pursue and develop high-impact projects in critical and emerging technologies, streamlining cross-University collaboration and fostering close partnerships between Faculties and Schools.

Designed for transformative impact, our Ventures combine deep expertise in fundamental research and engineering innovation with critical expertise across economic, regulatory, geopolitical, ethical and societal contexts to deliver comprehensive solutions.

Embracing a startup-inspired approach, a Sydney Nano Venture will form around an opportunity of national or global significance, such as an externally-funded centre or an industry-academic consortium, an ambitious vision for commercialisation of an emerging technology, or a key major partnership with industry, government, or defence. We welcome researchers and academics with

interests from fundamental research to commercialisation and entrepreneurship, investing extensively in their futures through developmental initiatives, support programmes, introductions to key networks and more.

In addition to our Ventures, we will continue to support our research community with funding opportunities including a re-imagined Kickstarter scheme; successful researcher development initiatives such as NanoPitch; international partnerships and strong links to industry; and a new program, Amplify, designed to propel multidisciplinary research teams towards larger, more impactful opportunities both nationally and internationally. We will offer new programs to directly tackle the diversity challenges we face, fostering greater inclusivity and representation.

**“Sydney Nano offers fantastic leadership opportunities for early and mid-career researchers and gives unique freedom to try new ideas in a format resembling a startup incubator, with similar levels of energy and drive.”**

**Dr Maria Rumyantseva**  
Discipline of Strategy, Innovation  
and Entrepreneurship,  
Sydney Business School

# Building on excellence: *designed to evolve*

To achieve our bold ambitions, we know we need the right support, in the right places, at the right time. We need ways of identifying opportunities to increase investment and when to scale back or adapt.

Underpinning all our Sydney Nano programs are five Strategic Pillars designed to provide the comprehensive support required to deliver impact.

## Research excellence

### Strategic objectives

- Foster research with the strongest potential to deliver excellence;
- Create opportunities for research to meet its potential for delivering excellence through multidisciplinary problem solving;
- Translate knowledge into beneficial public and/or commercial impact;
- Create an environment that attracts and supports the best researchers.

## Researcher development

### Strategic objectives

- Equip researchers with insights into how multidisciplinary research can amplify the impact of their work;
- Mentor researchers in the skills required to build and lead multidisciplinary teams;
- Encourage a culture of research excellence and impact that celebrates success in teams and collective leadership.

## Translation + commercialisation

### Strategic objectives

- Support researchers on the translation of their research outcomes into measurable benefit for society;
- Nurture the creation of new business and commercial opportunities that can accelerate the translation of our research;
- Be the trusted and recognised experts for industry partners looking for nano-based solutions.

## Teams + partners

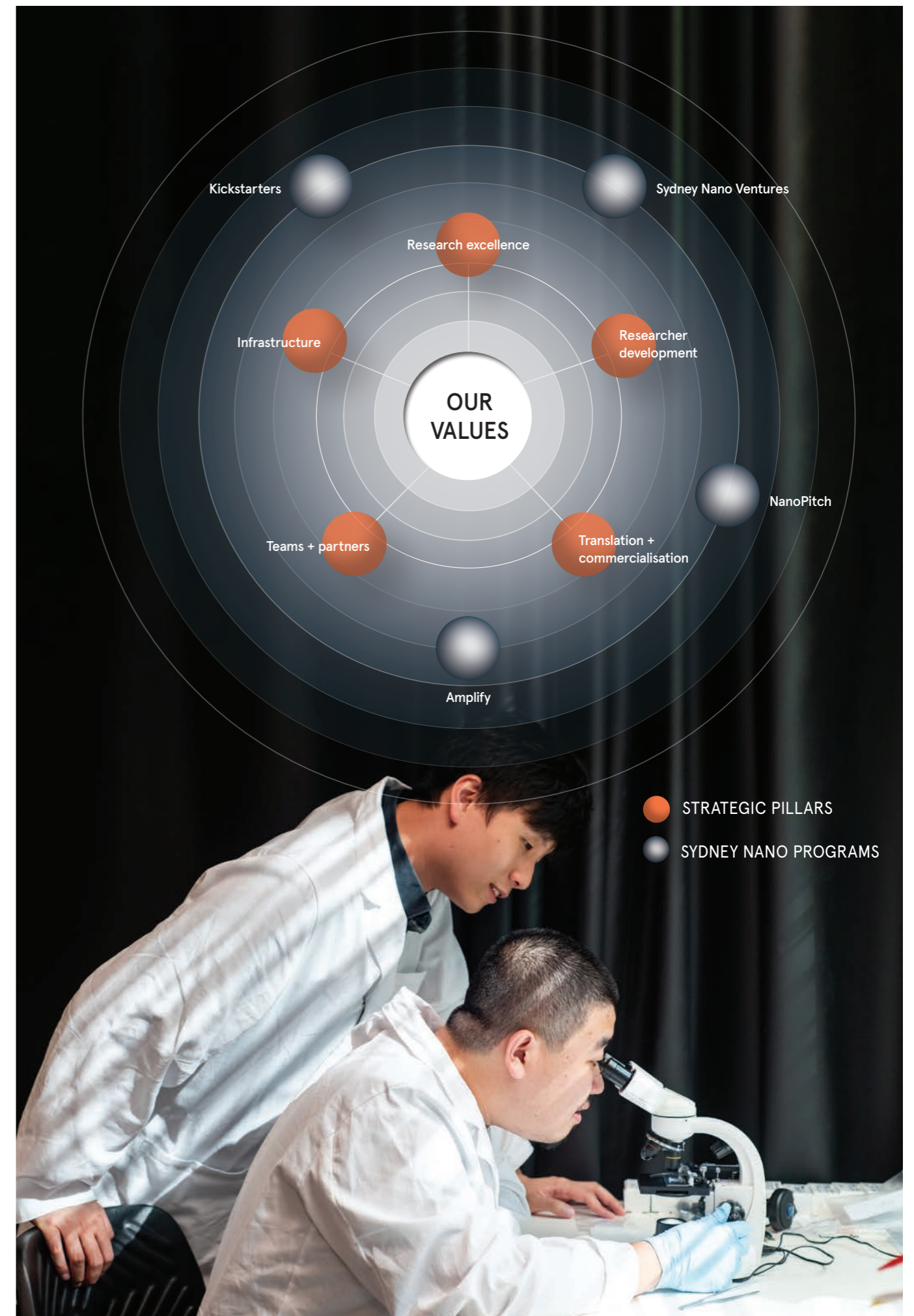
### Strategic objectives

- Leverage our comprehensiveness and partnerships to drive multidisciplinary problem solving;
- Create a culture that values how partnering improves the quality and impact of our research;
- Deliver on our partnership promises;
- Build new and enduring partnerships to realise shared goals;
- Provide high-value opportunities to our partners (internal and external).

## Infrastructure

### Strategic objectives

- Invest in infrastructure and facilities that maximise delivery of research excellence;
- Identify capabilities that will support new, breakthrough research directions and attract and retain the brightest researchers;
- Optimise our facilities to enable both fundamental discovery as well as the translation of our research outcomes to higher TRL;
- Showcase the capabilities of our infrastructure and talent to support industry engagement and new partnerships.







## Impact highlights

### Saving our skin

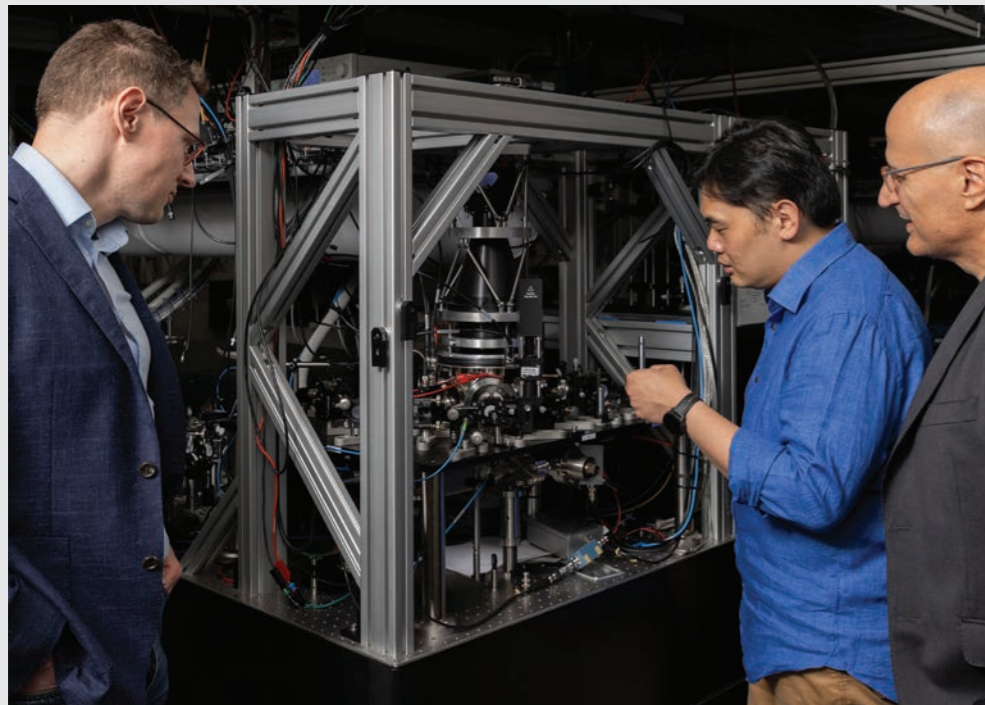
#### Using quantum tech to save our skin: multidisciplinary team wins prestigious health research contract

A Sydney Nano research team has secured a prestigious contract from Wellcome Leap – a global non-profit driving bold health innovations. The opportunity is part of Wellcome’s Quantum for Bio (Q4Bio) program, which is leveraging imminent quantum computing advancements for health breakthroughs.

Evolving from a Sydney Nano Grand Challenge, the research collaboration involves Dr Ting Rei Tan (School of Physics), Professor Ivan Kassal (School of Chemistry), and Professor Pablo Fernandez Peñas

(Sydney Medical School). Together, they’re exploring quantum technology to understand molecular dynamics underpinning skin cancer treatments and better sunscreens. “Our joint research could unlock new approaches to treat diseases and design drugs,” says Professor Kassal.

Beyond funding support, Sydney Nano provided the researchers with mentorship and leadership development, laying the supportive foundations that enabled the team to not only embark on their innovative project but also capitalise on this valuable opportunity.



(L to R) Professor Ivan Kassal, Dr Ting Rei Tan, and Professor Pablo Fernandez Peñas



## Impact highlights

### Light touch



(L to R) Dr Shelley Wickham, Professor Marcela Bilek, Associate Professor Anna Waterhouse

#### Merging physics, engineering, chemistry and medical science to develop new materials with promising health applications

A trio of Sydney Nano researchers – Professor Marcela Bilek (School of Biomedical Engineering and School of Physics), Associate Professor Anna Waterhouse (School of Medical Sciences), and Dr Shelley Wickham (School of Chemistry and School of Physics) – are harnessing their diverse expertise in physics, engineering, medical science and chemistry to develop innovative nano-architected materials. Inspired by biological systems, the new materials are engineered with the precision needed to respond to light at the nanoscale – with potential applications in medical devices and drug delivery.

The collaboration between Dr Wickham and Associate Professor Waterhouse was initiated by a Sydney Nano Grand Challenge, awarded in 2019, which grew to include Professor Bilek who brings deep expertise in materials physics and engineering. This support meant they were positioned to

swiftly – and successfully – seize a recent funding opportunity from AUSMURI, a joint program between the US and Australian Departments of Defence that supports fundamental multidisciplinary science in the public domain. Working with other scientists from Australia and the US, the Sydney researchers will now share in up to A\$3 million funding with the possibility of an additional \$2 million funding if their project is extended.

“One of the most exciting parts of this project is the team, we have people from so many different disciplines – material science, nanotechnology, chemistry, physics, medical science and engineering,” says Dr Wickham.

“Bringing these people together will build a unique environment for advances in nanomaterials,” she says.



## Impact highlights

### Water from thin air

#### Capturing water (and commercial success) with promising new nanotech application

In response to the growing challenge of drought – exacerbated by climate change – Sydney Nano researchers Professor Chiara Neto (School of Chemistry) and Professor Martijn de Sterke (School of Physics) have developed a technology that captures water directly from the air. Their project, called Advanced Capture of Water from the Atmosphere (ACWA) was initially funded by a Sydney Nano Grand Challenge awarded in 2019 and involves an innovative nano-material that efficiently condenses atmospheric moisture into fresh drinking water, all without needing energy or chemical inputs.

The Sydney Nano Grand Challenge scheme also encouraged the research duo to focus on entrepreneurship and commercialisation, which aided in the research evolving into a commercial venture. This collaboration led to the establishment of Dewpoint Innovations, which is taking this technology forward by integrating it into paint coatings that simultaneously cool buildings and collect water.

Professor Neto now leads the company's research and development as the Chief Scientific Officer, steering the application of this nanotechnology to tackle real-world water scarcity.



Dewpoint Innovations technology on the Sydney Nanoscience Hub rooftop as part of Sydney Nano Living Lab pilot program

#### Contact us

The University of Sydney Nano Institute  
Sydney Nanoscience Hub (A31)  
Physics Road  
The University of Sydney NSW 2006  
Australia  
+612 9036 9050  
sydney.nano.admin@sydney.edu.au  
sydney.edu.au/nano

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