

Designing Pico-Materials for Superconducting Quantum Devices

Who can apply?

- Australian Citizens & Permanent Residents
- New Zealand Citizens
- Citizens of countries within the Five Eyes Alliance (FVEY).

Industry partner and funding body

- [Silanna](#)
- [Defence Trailblazer](#)

Program of study available

- Doctor of Philosophy (PhD)
- Master of Philosophy (MPhil)

Total annual stipend amount

- A base scholarship of \$40,000pa plus \$10,000 top-up scholarship

Start date

- Plan for a start no later than 31/03/2024

About the project

Designing materials with advanced functionalities is the focus of contemporary quantum materials science. In this sense, one of the most fascinating goals in the field is the search for novel materials able to perform as to conventional low critical temperature superconductors but that manifest the exceptional properties of a superconductor at much higher temperatures. The reason for this is clear: higher critical temperatures implies superconductivity properties at much higher temperatures and hence being able to handle, measure and access a macroscopic quantum mechanical state without the limitations associated with extreme complicated cryogenics systems. Interestingly, although the current research in superconductor design is dominated by conventional (phonon-mediated) superconductors, there seems to be a widespread consensus that achieving higher critical temperature of operation may require the introduction of different pairing mechanisms. These two-facts combined are telling us that superconductors with higher critical current would not only pave the road for a wide range of technological applications, affecting strategic areas, such as quantum sensing for defence and medical applications, that in present times limits the use of superconductors due to their very hard conditions of access, but this will also open exciting avenues for fundamental physics.

Eligibility criteria

- Australian citizens and defence industry professionals are encouraged to apply. It is expected that this project will require the candidate to have a security clearance which will likely limit applicants to Australian Citizens or citizens of countries within the Five Eyes Alliance (FVEY).
- Applicants with strong experimental and numerical skills in computational physics, electromagnetic and/or quantum mechanics, particularly in condensed matter and solid state physics will be considered favourably.
- Excellent students who hold a Bachelor of Computational Physics or a double degree with Electronics and Electrical Engineering (EEE) or equivalent would be especially suitable and encouraged to apply.
- Applicants with well-developed written and verbal communication skills will be considered favourably.
- Be willing to provide your personal details by way of a Student Deed Poll.

Benefits

- Work closely with skilled experts on defence industry led projects
- Translate research into a tangible solution for Defence
- \$50,000pa tax-free* stipend (pro-rated for eligible part-time students). Conditions apply
- No tuition fees apply
- Acquire a unique set of skills and expertise
- Enhance your employability skills sought after by industry; graduates are highly regarded by employers
- Opportunities for local and international travel
- Work alongside world-leading researchers
- Gain industry experience and grow your networks
- Solve real life problems through industry engaged projects
- Publish your contributions
- Become an expert and make a real impact
- Access paid annual, parental and personal leave

How to apply

- Complete an [expression of interest](#)
- The primary supervisor will assess your eligibility, and if successful, will prompt your application for admission via the University of Adelaide.

More about Defence Trailblazer

The Defence Trailblazer for Concept to Sovereign Capability is a once in a generation opportunity to strengthen the collaboration between defence, academia and industry whilst accelerating research and commercialisation.

In partnership with the University of Adelaide (UoA), the University of New South Wales (UNSW), industry partners and supported by the Australian Government, the initiative will skill the workforce of the future, support defence-focussed innovation, and play a leading role in accelerating the delivery of sovereign capabilities for the nation's security and prosperity...at-speed and at-scale.

Learn more: <https://dtb.solutions/>

Industry Research Program

All students supported under the Defence Trailblazer initiative will participate in the Defence Trailblazer Industry Research Program (IRP).

Candidates will be located on-site at both university and industry offices for at least 60 FTE days (pro-rated for eligible Masters candidates), to enable professional development opportunities in an industry setting.

Defence Research Capability

Academics participating in the Defence Trailblazer IRP are leaders in their fields.

UNSW adds a critical dimension to preparing defence forces across areas as diverse as Autonomous Systems, Hypersonics, Sensors and Space. The UNSW Defence Capability Portfolio showcases UNSW's excellence in defence research and technology and highlights work across academia, government and industry, as well as with global policy makers, to create a hub of defence-related knowledge. The vision is to translate this knowledge into impact which can transform Australian and global societies.

There's no greater reassurance for our community than knowing we're well prepared to prevent or avert threats to our security. UoA researchers support this in very domain: on land and online; in space, the air and at sea, working extensively with the [Department of Defence](#) and defence-related organisations in a variety of ways—as an advisor, research partner and producer of high-quality, career-ready graduates equipped to make our world a better and more secure place.

[Find out more](#) about defence research at the University of Adelaide.

Further information

For a confidential discussion contact:

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Defence Trailblazer, together with UoA and UNSW, are actively working to support equity groups. We strongly encourage applications from people with a disability, veterans and women interested in working in non-traditional work settings

University of Adelaide CRICOS Number 00123M

