



# FLEET

ARC CENTRE OF EXCELLENCE IN  
FUTURE LOW-ENERGY  
ELECTRONICS TECHNOLOGIES

*Developing a new generation of ultra-low energy electronic devices*

*To secure a sustainable future for computing*

## The challenge

FLEET addresses a grand challenge: reducing the energy used in information technology.

Information Technology already accounts for 8% of global electricity consumption – a staggering amount of energy that's doubling every decade.

And it's going to get worse. The current, silicon-based, CMOS technology will stop becoming more efficient in the next decade as **Moore's law comes to an end**.

Future technologies such as **self-drive cars**, **artificial intelligence** and the **internet of things** will drive this energy demand even higher.

Within a decade, the financial and environmental cost of electricity use will begin to limit the growth of computing.

FLEET is developing a solution to this huge challenge: a new generation of ultra-low energy electronics.

## Join the search for future computing

Join FLEET, seeking future-electronics solutions via quantum materials.

- **Perform** high impact research
- **Build** the future of electronics
- **Train** to be a future science leader
- **Benefit** from mentoring, professional development, science-outreach opportunities
- **Have fun** travelling to (family-friendly) conferences and partner labs

PhD applications are always open, for talented students in **Physics, Materials Science, Chemistry, Nanotechnology, Electronic Engineering**. Positions are offered across FLEET's seven nodes in Melbourne, Sydney, Canberra and Brisbane.

Generous financial support is available, including **Fellowships for women and other groups under-represented in science** – including gender-diverse, indigenous, and others.

If this sounds like it would suit you or someone you know, direct them to [FLEET.org.au/PhD](https://www.fleet.org.au/PhD)

**DID YOU KNOW** You may not think a smartphone uses much electricity...

But the massive data centres connecting your phone to Google-maps, video streaming and online banking are very, very power hungry.

Largely because of those data centres, the climate-change contribution of computing is now the same as the entire (pre-Covid) aviation industry.



innovate | collaborate | engage

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## The science

FLEET will develop devices in which electrical current can flow without resistance, building upon the science of two-dimensional (2D) 'atomically thin' materials and nanofabrication.

In normal computer chips, electrons scatter and consume energy. But we will use these 2D materials to carry electricity along paths with very, very low, dissipation of energy using three broad research approaches:



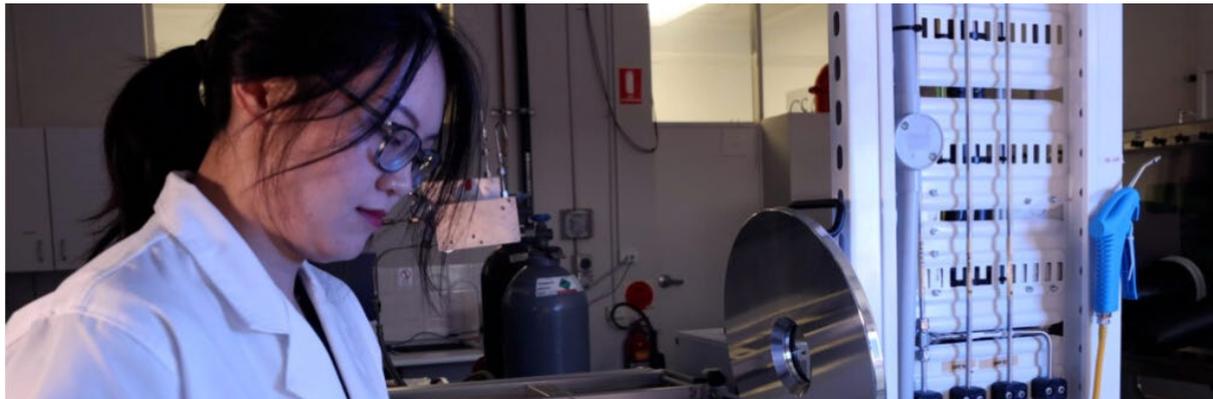
**Topological insulators** are novel quantum materials whose edges conduct electricity along one-dimensional paths that do not allow for electron scattering and thus have ultra-low resistance.



**Exciton superfluids** in which hybrid particles (bound electrons and holes) flow without resistance at room temperature. Exciton transistors will switch off and on just like conventional transistors, but without dissipating energy.



**Light-switched materials** which can be temporarily 'switched' to become topological insulators, or forced into a superfluid state.



## Partnerships

FLEET is a collaboration between researchers from seven Australian universities and 18 Australian and international science partners [FLEET.org.au/partners](https://fleet.org.au/partners)

FLEET's member universities are: Monash University, the Australian National University, RMIT University, Swinburne University of Technology, UNSW Sydney, the University of Queensland, and the University of Wollongong [FLEET.org.au/nodes](https://fleet.org.au/nodes)



## More information about FLEET

- **Search** for information on working with us at [FLEET.org.au/jobs](https://fleet.org.au/jobs)
- **Watch** FLEET's [search for a sustainable computing future](#)
- **Sign up** for monthly news updates at [FLEET.org.au/news](https://fleet.org.au/news)
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