



# FLEET

ARC CENTRE OF EXCELLENCE IN  
FUTURE LOW-ENERGY  
ELECTRONICS TECHNOLOGIES

## FLEET News: October 2022

This month's newsletter investigates quantum boxes at ANU, polarons at Swinburne, ferroelectrics at UNSW and electron flow at NTU, Singapore. Plus new Fellows and a new CI.

Michael Fuhrer  
Director, FLEET



### In this edition of FLEET News:

- **Engineering a quantum box** (ANU)
- **Welcoming four new Fellows** (UQ, UNSW, Monash)
- **Understanding polarons** (Swinburne, Monash, ANU, RMIT)
- **Reviewing 2D ferroelectrics** (UNSW)
- **Electron liquids on the cutting edge** (NTU)
- **New CI Priyank Kumar** (UNSW)
- **Critical technologies submission**
- **Having an input to Australia's quantum future**
- **Industry news**
- **Congratulations to our ECR authors this month**
- **Conferences, past talks and opportunities**

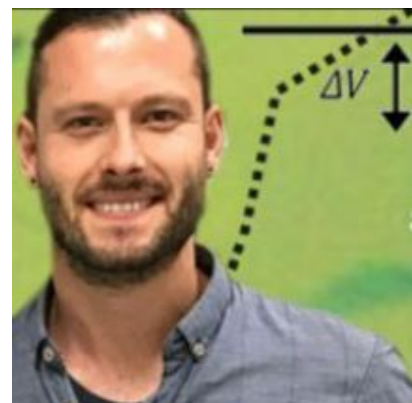
## Engineering a quantum box

A study led by Matthias Wurdach (ANU) has achieved high polariton densities and a partially coherent quantum state in an engineered quantum box, opening up possible access to striking collective quantum phenomena in future technologies.

**Read more online.**



See coverage at [Phys.org](#) / [AZO Nano](#) / [World Nano Assoc](#) / [Electronics Weekly](#) / [Science Daily](#)



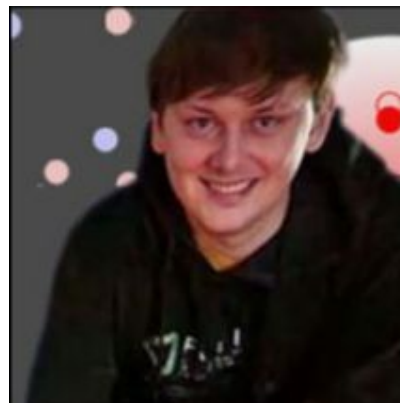
## Welcoming four new Fellows

Welcome to four new FLEET Fellows, funded under Women in FLEET and Diversity in FLEET: Emma Laird (UQ), Yoni Ashlea Alava (UNSW), Mengting Zhao (Monash) and Grace Causer (also Monash). [Read more about them and their research online.](#)



## A drop in the (polaron) seas

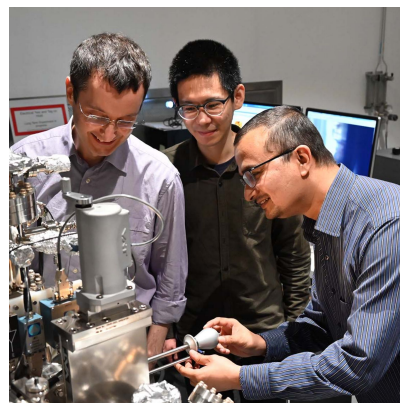
Jack Muir and team at Swinburne provided the first measurement of interactions between Fermi polarons in a 2D semiconductor, using ultrafast spectroscopy to locate exciton-polaron interaction signatures. Theoretical modelling by FLEET collaborators (Monash, ANU and RMIT) identified repulsive (long-range) and attractive (short) interactions. [Read online](#)



See coverage at [Phys.org](#) / [Science Daily](#) / [EurekaAlert](#) / [Nanowerk](#)

## Reviewing 2D ferroelectrics

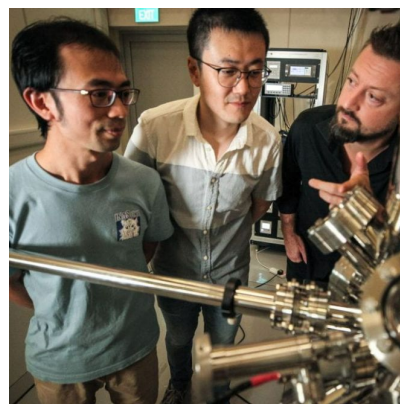
Dawei Zhang, Jan Seidel and team at UNSW have reviewed the emerging field of 2D ferroelectrics with layered vdW crystal structures. This novel class of materials is highly interesting for future nanoelectronics, ultra-low energy electronics, non-volatile data-storage, optoelectronics, and flexible (energy-harvesting or wearable) electronics. [Read more online](#)



See coverage at [Nanowerk](#) / [Phys.org](#) / [Scimex](#)

## Electron liquids on the cutting edge

FLEET AI Bent Weber's team at NTU controlled 1D electron fluid flow to an unprecedented degree, in a rare phase of matter physicists have sought to understand for over 50 years. In 2D QSH insulators, such electrons are spin-locked, forming four-electron parafermions that could provide an edge in fault-tolerant quantum computing. [Read more at NTU.](#)



See coverage at [Phys.org](#) / [Nanowerk](#) / [Vbox](#) / [News Explorer](#) / [Scimex](#) / [ScienMag](#) / [Bioengineer.org](#)

## New CI Priyank Kumar

Congratulations to Priyank Kumar at the School of Chemical Engineering, UNSW, who becomes a new Chief Investigator within FLEET.

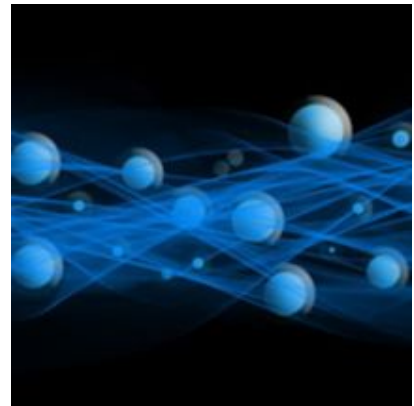
Read more about Priyank's work with new excitonic and topological dissipationless systems online.



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## Critical technologies

FLEET's submission to review of Australia's 'critical technologies' review recommends inclusion of integrated electronics design and fabrication: Beyond CMOS and More than Moore. The review aims to identify current and emerging technologies critical for Australia today and within the next decade, towards competitive advantage, productivity, and well-paying jobs. [Read FLEET's submission online.](#)



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## Having an input to Australia's quantum future

What do **you** think Australia should be doing differently in quantum policy? Interested parties have been encouraged to [make a submission here.](#)

Australia's **national quantum strategy** will directly affect the future careers of many ECRs in our networks, impacting research funding, research infrastructure, training and career pathways and international partnerships. We will share FLEET's submission in a future newsletter.



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## Industry news

If you missed last month's SIA/SRC update on 'More than Moore' advances—semiconductor tech success stories at SRC's nCORE program—you can [catch up online, here](#), hearing success stories from SRC's nCORE program with NSF, NIST and industry partners.

Self-declared "quantum nerd" Australian Science Minister Ed Husic says Australia needs to stay at front of quantum pack, and be "makers, not just consumers", of advanced technologies. [Read his speech online.](#)





## ECR authors in October

Mousavi, Matthias Wurdack, Mitchell Conway, Mohannad Mayyas, Rishab Mishra, Stuart Earl and Yun Suk Eo. See more in [FLEET publications](#).



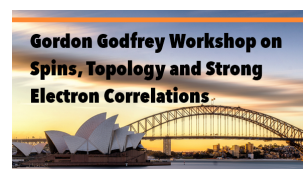
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## Conferences

**Recent Progress of Graphene 2D Materials Research conference** (RPGR2022) in Taipei, Taiwan **13-17 November 2022** will cover the latest developments in graphene and other 2D crystals, and enhance 2D physics, material science and devices.



**The 2022 Gordon Godfrey workshop** on spins, topology and strong electron correlations will be held **21-25 November** at UNSW. An informal poster session for students and ECRs allows for very easy submission: all that's needed is a poster title, which is simply entered into the online registration form.



**The 10th International Conference on Advanced Materials & Nanotechnology** (AMN10) will be held in Rotorua, New Zealand, **6-10 February 2023**. This meeting is sponsored by FLEET partner organisation the MacDiarmid Institute and covers a broad variety of topics in nanotechnology and materials science.



**Wagga Wagga Annual Condensed Matter and Materials Meeting**  
The low-cost, friendly Wagga conference is back **7-10 February 2023**, bringing Australia's condensed matter fraternity together – particularly good for research students to present their work and meet colleagues from other institutions (including potential future employers!)



**Quantum Australia Conference and Careers Fair** in Sydney **21-23 February** will explore building a quantum economy, with Australian and international leaders, and a careers fair providing a platform for potential employers to engage with emerging quantum talent (and vice versa).



## Catch up on past talks

If you missed any recent FLEET seminars or other talks, you can catch up on YouTube:

- Semonti Bhattacharyya (Leiden) **Dirac fermions at interfaces**
- Rafael Fernandes (Minnesota) **Intertwined electronic phases in quantum materials**
- Igor Aharonovich (UTS, TMOS) **Quantum nanophotonics with hBN**
- Sergei Frolov (Pittsburgh) **Superconductors and semiconductors, nanowires and majorana modes**

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## Grants and opportunities

**The Australian Army quantum radar hackathon** (Quantum Next Generation technology challenge) seeks new ways for using quantum sensing in radar – applications by 4 Nov. Quantum Next Generation challenges industry and academia to identify the most disruptive applications of quantum technology.

**STA STEM Ambassadors** serve the country's science community, and develop personal experience in engaging effectively with policymakers. Applications close 7 Nov.

**The Victorian government** will provide \$100 million in pre-seed investment funding to the five state universities over five years to support research commercialisation, with university startups and spinouts to receive up to \$1 million each.

Main Sequence Ventures (CSIRO's investment arm) deep-tech newsletter features over 40 companies with 300+ jobs on offer. **Sign up for the newsletter** to stay informed.

**Nano Letters and ACS's new Seed Grants competition** will provide US\$2500 for high-risk, high-reward nano' research proposal ideas from later-stage graduate students (third year+).

For ongoing outreach/development opportunities see **In2science** mentoring, and **CSIRO STEM Professionals in Schools**.

Interested in an **industry internship**? See active positions at **APR Interns**.

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**From the socials:** FLEET's Jared Cole (RMIT) and Karen Livesey (Newcastle) talking theoretical condensed-matter physics at University of Newcastle



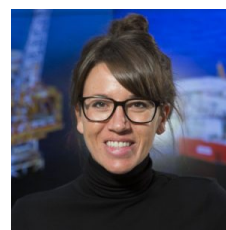
## Previous news

**FLEET Translation Program: automating STM tip-shaping** Monash PhD candidate Julian Ceddia has been awarded FTP funding to develop automation of STMs based on previous work from the group of his supervisor, Agustin Schiffrin. Automating of the tip-shaping of STMs frees up operators' time to concentrate on science. FTP-funded development of tip-shaping automation software will be the first step in taking their project towards commercialisation. [Read more online.](#)



**Eureka Prize for Sumeet Walia** RMIT's Sumeet Walia was awarded the 2022 Eureka Prize for Emerging Leader in Science last month in Sydney. A passionate advocate for diversity and inclusion in STEM, Sumeet's research includes artificial vision technologies, smart window coatings, UV exposure skin sensors and infection prevention platforms.

**Congratulations Julie Karel** FLEET's Julie Karel (Monash) received a Victorian 2022 Young Tall Poppy Science Award, recognising her research in functional amorphous materials for future ultra-low energy electronics, and in science outreach. [Read more about Julie's award, research and outreach efforts online.](#)



### **From Japanese baskets to next-generation electronics**

Congratulations to FLEET AI Mark Edmonds (Monash University) who has received an ARC Future Fellowship towards further study of 2D kagome materials—named after starlike Japanese *kagome* baskets—for faster, more energy-efficient future electronics. [Read more about the project online.](#)

**Jesper Levinsen promotion** FLEET Associate Investigator Jesper Levinsen (Monash School of Physics and Astronomy) has been recognised by the Faculty of Science, as he is prompted to Associate Professor. [Read more online.](#)



**Industry news: quantum and semiconductors** Science Minister Ed Husic last month announced a new advisory committee to drive Australia's National Quantum Strategy, to be chaired by Australia's Chief Scientist Cathy Foley. The coordination of quantum capability across research, industry and government will include access to the \$1bn 'critical technologies fund' (see FLEET's submission above). [Read more online.](#)

Meanwhile in a proposal for an Australian semiconductor 'moonshot' the Australian Strategic Policy Institute proposes to stimulate A\$5bn of semiconductor manufacturing activity through A\$1.5bn government investment and incentives – mirroring the US's recent 'CHIPS' and 'FABS' Acts. [Read the ASPI briefing online.](#)

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## Participating organisations

FLEET is The Australian Research Council Centre of Excellence in Future Low-Energy Electronics Technologies. Read more about our [participating nodes](#) and [partners](#) online.

