FLEET

ARC CENTRE OF EXCELLENCE IN FUTURE LOW-ENERGY ELECTRONICS TECHNOLOGIES

FLEET News: November 2022

We're looking forward to next week's FLEET's strategic meeting at RMIT, and online. Our ECR workshop will be running alongside the meeting, and we've got some fun social engagements to see out the year.

In the meantime, read on for research news, achievements for FLEET members in outreach and academic recognition, a new quantum alliance, and FLEET's input to Australia's quantum strategy.

Michael Fuhrer
Director, FLEET

In this edition of FLEET News:

Chemical reaction that's good as gold

New study led by PhD candidate Ben Lowe (Monash) finds gold atoms could be key to unlocking organic reactions, potential building blocks in constructing materials with electronic properties useful in energy-efficient future technologies. **Read more online**.

See coverage at **Phys.org** / **Nanowerk** / **Science Daily**

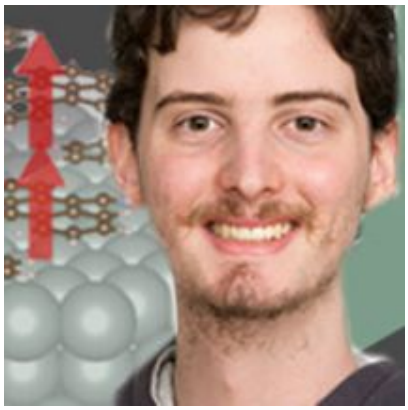
Karen Livesey Superstar of STEM

Theoretical physicist and FLEET AI Karen Livesey (University of Newcastle) has been announced as one of Australia's newest Superstars of STEM, one of 60 diverse, brilliant scientists, technologists, engineers and mathematicians who want to step into the media spotlight as STEM experts. **Read more online**.

FLEET Translation program: Zinc batteries cheaper safer better

FLEET Translation funding is progressing zinc-ion battery technology, which offers decreased costs, safety, and improved environmental outcomes. The aqueous zinc-ion battery technology, invented by Priyank Kumar, Dipan Kundu and Yuan Shang at UNSW, boasts improved safety (no toxic or flammable components), low-cost manufacturing, and recyclability. **Read more online**.

Magnetism or no magnetism



Tuneable electronic properties (via charge, strain or hybridisation) allow 'switching' of phases such as magnetism off and on, with applications in future energy-efficient electronics. A new theoretical study led by PhD candidate Bernard Field (Monash) illustrates substrates' affect on electronic interactions in 2D metal-organic frameworks (MOFs). **Read more online**.

44 See coverage at **Phys.org** / **Nanotechnology World Assoc** / **Monash Engineering**

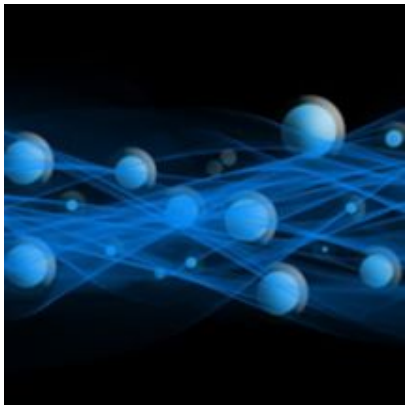
ColdQuanta / Swinburne alliance

An exciting new partnership links Chris Vale's cold-atoms lab and other Swinburne quantum experts with an international quantum technologies firm, with Victorian government funding for ColdQuanta towards scientific discoveries with commercial potential including quantum computing, quantum sensing, and quantum timing. **Read more online**.

Kourosh and Stefan in Top 1%

Congratulations to FLEET's Kourosh Kalantar-zadeh (UNSW) and Stefan Maier (Monash), named in the top 1% by citations in their fields, recognised by Clarivate Analytics.
Read more online.

FLEET's input to Australia's quantum future



Australia's **national quantum strategy** will directly affect the future careers of many FLEET ECRs, impacting research funding, research infrastructure, training and career pathways and international partnerships. FLEET's submission to a review of the strategy covered: a wide definition of quantum technologies, support for both short- and long-term research, the role of quantum materials, necessity for major research infrastructure, function of a diverse, equitable, inclusive research environment, and training a 'quantum-ready' workforce: funding & visas. **Read the Centre's submission here**, and let us know your thoughts.

The current review of the Australian Research Council is seeking input, and taking public submissions until 14 December. **See consultation paper and review guidelines online**.

Listen: Michael Fuhrer 100 Climate Conversations

Catch FLEET's Michael Fuhrer discussing ICT energy use in server farms, new ultra-efficient future 2D/topological materials transistor technologies, and creativity in science—with the ABC's Craig Reucassel, part of the Powerhouse Museum's 100ClimateConversations campaign. **Listen at 100climateconversations**

Nanotechnology World article

The first edition of a new Nanotechnology World magazine focuses on nanotech solutions for semiconductor industry, and features an article by FLEET's Michael Fuhrer and Abigail Goff (RMIT) on liquid-metal technologies, with examples drawn from around the Centre. **Read the article online** (and share in your networks).

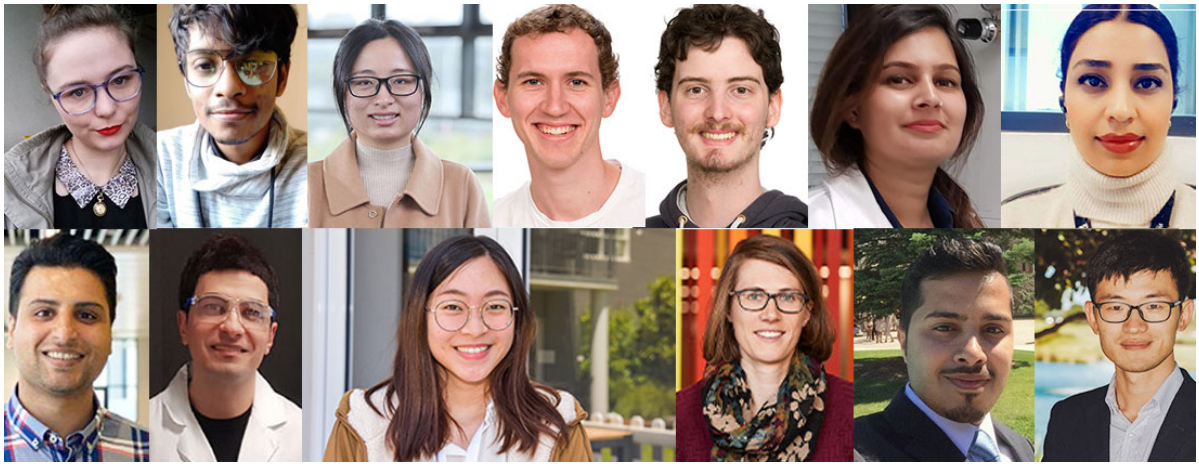
This will be great exposure to nanotechnology, materials and semiconductor communities (estimated 150k audience).

Industry news

A new series of articles at AU Manufacturing aims to introduce semiconductor technology to a wider audience, beginning with **a semiconductor explainer**, including **the impact of the chip**

ECR authors in November

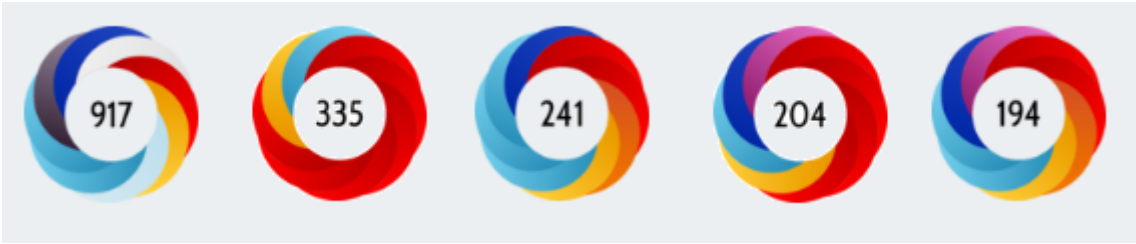
Congratulations to FLEET's early-career researchers who were first, second or third authors on papers published this month: Abigail Goff, Abhikbrata Sarkar, Baoyue Zhang, Benjamin Lowe, Bernard Field, Hareem Khan, Maedehsadat Mousavi, Mohammad Ghasemian, Mohannad Mayyas, Patjaree Aukarasereenont, Peggy Schoenherr, Turki Alkathiri and Weiyao Zhao. See more in **FLEET publications**.



Which are FLEET's most-shared papers?

'Altmetric' scores indicate a research paper's impact across a wider range of outputs than purely academic, for example picking up media mentions, blogs, social media and Wikipedia citations.

See FLEET's Altmetric report here, currently reporting over 4000 mentions from 460+ papers (and find out which papers are the Centre's top five - shown below).



Conferences

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 nanotechology 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). **FLEET will support in-person attendance for all presenting ECRs/students.**

Catch up on past talks

If you missed any recent FLEET seminars or other talks, you can catch up on YouTube, or via the **FLEET intranet presentations page**:

- Peggy Zhang (UNSW) **Stability of ferroelectric bubble domains**
- Jennifer Cano (Stony Brook) **Engineering topological phases with a superlattice potential**
- Semonti Bhattacharyya (Leiden) **Dirac fermions at interfaces**
- Rafael Fernandes (Minnesota) **Intertwined electronic phases in quantum materials**

Grants and opportunities

CSIRO Alumni Scholarship in Physics funds travel costs up to $600 for postgrad research interstate or overseas. Applications close 2 December.

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**.

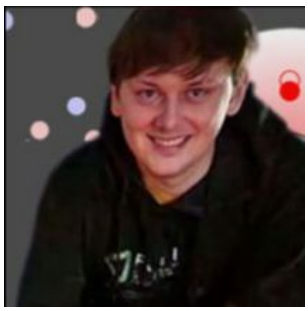
Interested in an **industry internship**? See active positions at **APR Interns**.

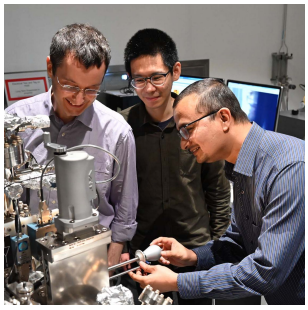
Previous news

Engineering a quantum box A study led by Matthias Wurdach (ANU) 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**.

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**. Diversity in FLEET Fellowships are open to individuals from any group that is under-represented in Australian STEM, or who have experienced uncommon hardship.

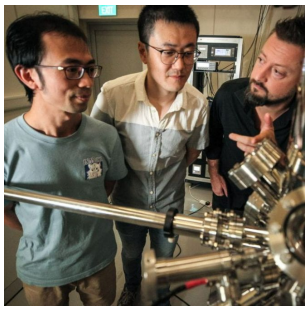
A drop in the (polaron) seas Jack Muir and team at Swinburne provided the first measurement of interactions between Fermi polarons in a 2D semiconductor, using ultrafast spectroscopy to locate exciton-polaron interaction signatures. Theoretical modelling by FLEET collaborators (Monash, ANU and RMIT)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





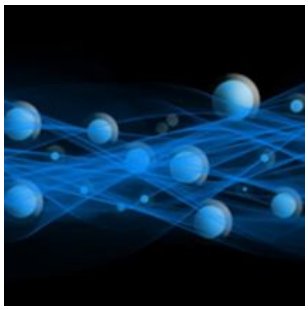
Reviewing 2D ferroelectrics Dawei Zhang, Jan Seidel and team at UNSW reviewed the emerging field of 2D ferroelectrics with layered vdW crystal structures. This novel class of materials is highly interesting for future nanoelectronics, ultra-low energy electronics, non-volatile data-storage, optoelectronics,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

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**.



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**.

Critical technologies FLEET's submission to review of Australia's 'critical technologies' review recommended 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**.



Industry news If you missed September'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.

Participating organisations