



ARC CENTRE OF EXCELLENCE IN  
FUTURE LOW-ENERGY  
ELECTRONICS TECHNOLOGIES

## FLEET News: February 2022

We're all watching events unfolding in Ukraine with a sense of dread, and my thoughts are with the people of Ukraine and with all those who have friends and family there. We have a number of members from Ukraine and neighbouring countries, including many amongst our international partners.



Back home, it is great to see students returning to in-person learning on Australian campuses, and I look forward (fingers crossed) to in-person meetings later this year such as the Semiconductor conference in Sydney (see below), and our FLEET Annual Workshop in Wollongong, NSW, in July.

Read on for fascinating science from around the Centre, including sci-fi liquid metal robots, superfluid vortices, and the Romance of the Three Kingdoms

Michael Fuhrer  
Director, FLEET

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FLEET has a number of members from Ukraine and neighbouring countries, and our thoughts are with all of them right now. FLEET's Oleh Klochan, who is from Ukraine, and whose family are there now, has helped compile a few options for anyone wanting to contribute material aid towards the humanitarian crisis: the **Ukraine Crisis Appeal**, the **Red Cross** and **Unicef**.



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### In this edition of FLEET News:

- **Beyond scifi fluid circuits** (UOW)
  - **Superfluid vortices** (UQ)
  - **Liquid metal surface patterns** (UNSW)
  - **Catch up with FLEET alum Carlos Kuhn**
  - **Best posters at AusColloids** (RMIT)
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## Beyond scifi at UOW

Inspired by Terminator 2's shape-shifting, liquid metal robot, a team led by Yahua He and Xiaolin Wang at UOW has manipulated liquid-metal electrical conductors in mid-air without contact, working with other FLEET researchers at UNSW. The liquid wires can be controlled to move in any direction, and manipulated into unique, levitated shapes such as loops and squares using a small triggering voltage and a magnet. Potential applications include advanced manufacturing and dynamic electronic structures. [See more at UOW Research.](#)

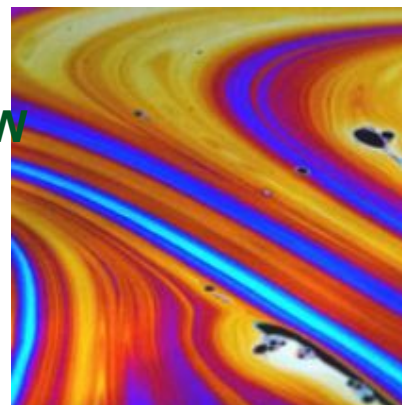


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## Superfluid vortices

A new EQUS/FLEET study led by Matt Reeves at UQ studies emergence of equilibrium states of superfluid vortices, confirming that large vortices would form out of a turbulent flow. The team found theory predicted exceptionally well giant vortex structures emerging from multiple turbulent vortices with applications to turbulence theory, as well as future superfluid-based technology. [Read more at EQUS.](#)

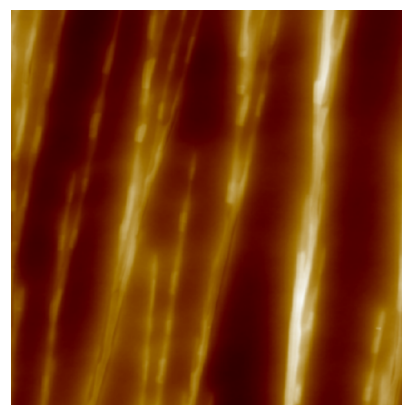
## Beyond scifi at UOW



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## Surface patterns and the Romance of the Three Kingdoms

Diverging and converging patterns forming on the surface of solidifying liquid metals resemble plotlines in a complex historical novel. Jianbo Trang and Kourosh Kalantar-zadeh at UNSW led this international study towards future applications in sensing, high-efficiency electronics. [Read more online.](#)



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## Where are they now? FLEET alum Carlos Kuhn

From cold-atoms research to defence industry consultancy: Another FLEET alumni spotlight: from postdoc research with FLEET at Swinburne, Carlos Kuhn moved to government policy, then to building a science/tech capability at software engineering company 12th Level. [Read more about Carlos's post-FLEET journey so far.](#)



## Best poster and video explainer

Congratulations to FLEET's Patjaree Aukarasereenont and Abigail Goff (RMIT) winning best poster and best poster mineral processing and material science at AusColloids student conference this month, explaining synthesis of 2D materials using liquid metals. Watch (and share) the accompanying video explainer at [Linkedin](#).



## Ferenc Krausz wins Wolf Prize

Congratulations to FLEET PI Ferenc Krausz (MPQ), winning the 2021 Wolf Prize in Physics for his work on attosecond physics. Prof Krausz works with Agustin Schiffrin in FLEET's theme 3, using ultrashort waveform-controlled laser pulses to trigger, probe and control transient topological phases of materials. [Read more online](#).



## Congratulations to our ECR authors this month

Congratulations to the following FLEET students and ECRs who are the first, second or third author in our **most recent publications**: Aydin Keser, Guangsai Yang, Harley Scammel, Jack Muir, Jiong Yang, Lina Sang, Mitchell Conway, Oliver Paull, Qile Li, Wafa Afzal, Yonatan Ashlea-Alava and Zeb Krix.



## Semiconductor news: the CHIPS act

The US has recently passed the 'CHIPS' act (Creating Helpful Incentives to Produce Semiconductors), including \$52 billion for domestic semiconductor production, responding to the chips shortage of 2020-21, and roll-on effect on the economy, as well as sovereign risks. The investment may be the biggest government intervention of its kind, three times bigger than Operation Warp Speed that fostered the Covid19 vaccines. [Read more about CHIPS online](#).



**The International Conference on the Physics of Semiconductors** in Sydney 27-30 June will cover electronic, structural, optical, magnetic and transport properties of materials, plus an expert panel of editors from international journals, and scientific writing workshop aimed at PhD students and ECRs. FLEET is a sponsor of the ICPS, with Director

Michael Fuhrer, Al Sue Coppersmith, PI Allan MacDonald and Centre advisor Francois Peeters all involved on committees or as plenary/invited speakers, along with other Centre speakers.



## Catch up on past talks

- Ehud Altman (Berkeley) **Phase transitions and critical states of monitored quantum systems**
- Michael Fuhrer (FLEET Monash) **Negative capacitance in topological transistors**
- David Snoko (Pittsburgh) **Superfluids of light**
- Michael Fuhrer (FLEET Monash) **Topological transistors**
- Ceri Brenner (ANSTO) **ANSTO-FLEET seminar on accelerator science**
- Susan Coppersmith (FLEET UNSW) **Quantum stochastic resonance**

An interesting event coming up next week (9 March) from the ARC Centre of Excellence in Exciton Science will include a panel discussion on closing the gender gap in STEM, with a focus on encouraging girls towards science at high school, undergrad and postgraduate. Hybrid in-person in Melbourne ([register at eventbrite](#)) and online ([register at zoom](#)).

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## Grants and opportunities

**The Australian Science Policy Fellowship Program** offers 12-month policy-officer positions for ECR/MCR scientists with on-the-job training to bring scientific expertise into government functions. Applications open in March.

**L'Oréal Fellowships for Women in Science** provide \$25,000 to support female ECR scientists in undertaking scientific research in their chosen fields. 2022 Fellowship applications close 7 March.

Australia's **Pint of Science** are currently seeking volunteers or presenters to help with this year's festival..

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

A number of **CSIRO jobs** open for application could be interesting for Australian graduates or ECRs, including **2D materials for quantum devices**, **quantum device fabrication**, **quantum/superconducting devices**, **superconductor/CM theoretician**, and **magnetics theory and measurement**.

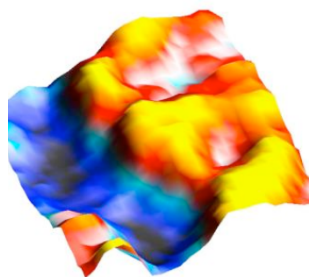
Interested in an **industry internship**? See active positions at Australia's **APR Interns**.

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## Previous news

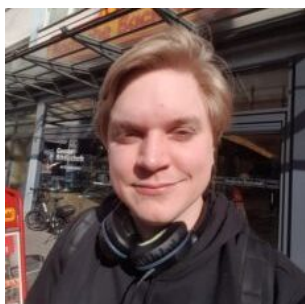
**Trapping vortices in thin superfluid films** The UQ FLEET team has shed light on vortices sticking to obstacles in superfluids, with the team led by Oliver Stockdale, revealing how the vortices that support dissipationless flow are pinned to superfluid defects. Once confirmed in experiments in ultracold systems, extension to room-temperature would aid vortex control in future, ultra-energy-efficient superfluid electronics.

[Read more online.](#)



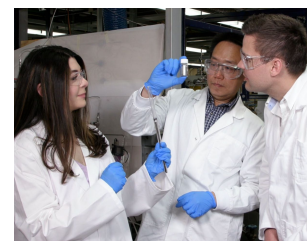
**Ferroelectric bubbles in tablecloth trick** US Energy Argonne National Laboratory, with FLEET researchers at University of Arkansas (Sergei Prokhorenko, Yousra Nahas and Laurent Bellaiche) and UNSW (Peggy Qi Zhang and Nagy Valanoor), perfected an atomic-scale version of 'the tablecloth trick' by peeling off heterostructure thin films containing electrical bubbles from an underlying material, while keeping them fully intact. [Read more at ANL.](#)

**Congratulations Kouros** Congratulations to Kouros Kalantar-zadeh, recognised last month as a Fellow of the American Association for the Advancement of Science for contributions to sensors, electronics, analytical chemistry, 2D semiconductors, ingestible sensors & liquid metals. [Read more online.](#)



**Where are they now? FLEET alum Jesse Vaitkus** After finishing his PhD at RMIT, FLEET's Jesse Vaitkus moved across the world to Germany, joining a company that provides software for material scientists in the chemical industry and academia. Read about Jesse's move, the work, the job-finding process and advice for other PhD candidates, [online.](#)

**Carbon capture advance** Carbon-capture technology, building on previous liquid-metal catalysis, developed by Torben Daeneke and team at RMIT, Melbourne and Deakin, offers smoother integration into standard industrial processes: "simpler to scale up, radically more efficient, and can break down CO<sub>2</sub> to carbon in an instant. [See more 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.

