



ARC CENTRE OF EXCELLENCE IN  
FUTURE LOW-ENERGY  
ELECTRONICS TECHNOLOGIES

FLEET News: January 2022

Happy new year. I hope everyone has had some down time to relax, reflect, and recharge. Here is some FLEET news to inspire you and get your science juices flowing again. Read on for cool science, exciting upcoming events in 2022, and links to some great talks from last year you might have missed.

Congratulations to Kourosh Kalantar-zadeh, named a fellow of the AAAS this week.

Michael Fuhrer  
Director, FLEET



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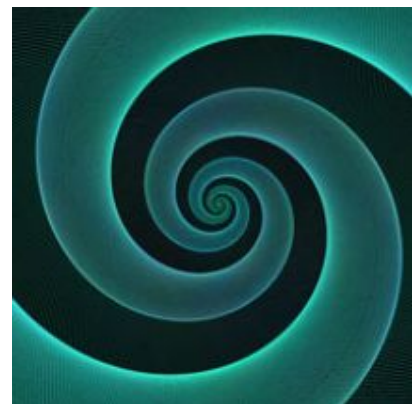
#### In this edition:

- **Trapping vortices in thin superfluid films** (UQ)
- **Keeping ferroelectric bubbles intact** (Arkansas, UNSW)
- **AAAS Fellow Kourosh Kalantar-zadeh** (UNSW)
- **FLEET alumni spotlight: Jesse Vaitkus** (ex RMIT)
- **Carbon capture advance** (RMIT)
- **Congratulations to our ECR authors**
- **Semiconductor industry news**
- **Talks, conferences and other opportunities**

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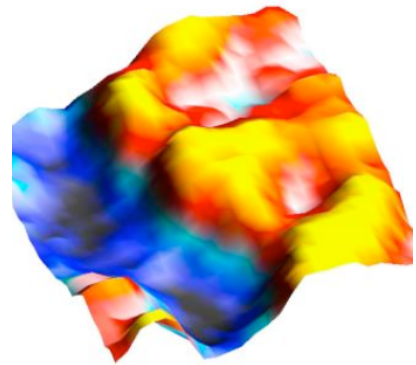
## Trapping vortices in thin superfluid films

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 off heterostructure thin films containing electrical bubbles from an underlying material, while keeping them fully intact. [Read more at ANL.](#)



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## Congratulations Kourosch

Congratulations to FLEET CI Kourosch Kalantar-zadeh (UNSW), recognised this week 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.](#)



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## Where are they now? FLEET alum Jesse Vaitkus

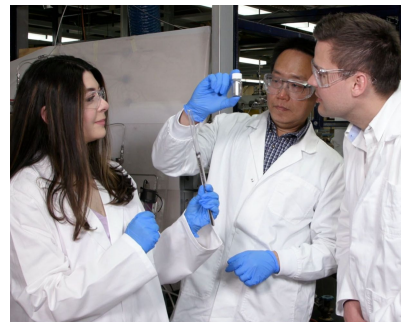
After finishing his PhD at RMIT, FLEET's Jesse Vaitkus moved across the world to Germany, joining a company that provides software for material scientists in the chemical industry and academia. Read about Jesse's move, the work, the job-finding process and advice for other PhD candidates, [online.](#)



## Carbon capture advance

Carbon-capture technology, building on previous liquid-metal catalysis, developed by FLEET AI 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.](#)



## 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**: Guangyao Li, Matt Reeves, Oliver Stockdale, Peggy Zhang, Vivasha Govinden and Yuefeng Yin.



## Semiconductor news

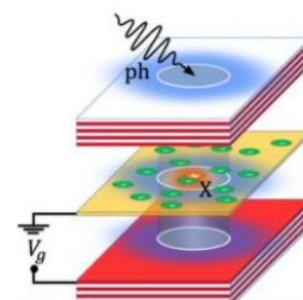
Non-volatile Magneto-Electric Spin-Orbit (MESO) transistors demonstrated at IEEE International Electron Devices Meeting could be 10-30x more efficient than existing CMOS tech, using three classes of information carriers: electronics, magneto-electronics, and spintronics.

[Read more about Intel's new MESO transistor.](#)



## FermiPolar Workshop

**The FermiPolar Workshop** (online) Feb 7-18 will unite Fermi polaron researchers across the fields of ultracold atomic gases and 2D semiconductor physics. FLEET's Jesper Levinsen and Meera Parish are on the organising committee.





## Quantum Australia

**Quantum Australia Conference and Careers Fair 2022** (in person and online) Feb 23-25 will bring together world-leading quantum researchers, businesses, government decision-makers, start-ups, and big tech. FLEET is co-sponsoring the event.



## International Conference on the Physics of Semiconductors

**The International Conference on the Physics of Semiconductors** in Sydney 27-30 June Includes, in addition to four days of talks on electronic, structural, optical, magnetic and transport properties, the conference also includes an expert panel of editors from international journals, and scientific writing workshop aimed at PhD students and ECRs. New registrations now open. Abstracts still open for submission or revision until 15 February.

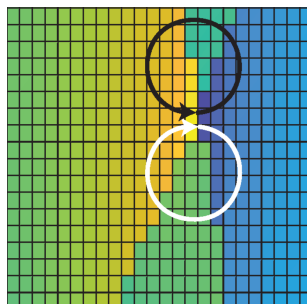


## Catch up on past talks

- Michael Fuhrer (FLEET Monash) **Negative capacitance in topological transistors**
- David Snoke (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**

## Previous news

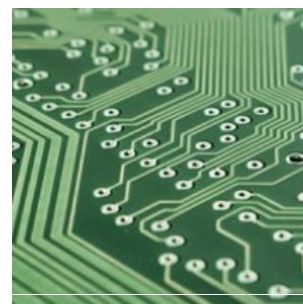
**FLEET2021** FLEET2021 in December saw 136 attendees over the three days, with five theme updates, 79 posters and 21 awards (see the list of recipients online). The physical catch-ups at Sydney and Melbourne were also a welcome chance for some to reconnect face-to-face. [More details and images online.](#)

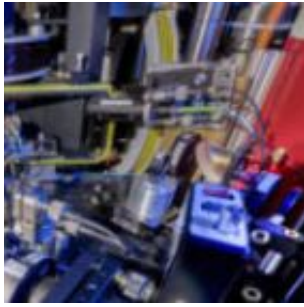


**Generating topology from loss** Losses—eg friction/electrical resistance—are generally detrimental. For example electrical resistance causes heat, limits efficiency. But a study led by Eliezer Estrecho (ANU) with Rui Su (NTU Singapore) has shown that non-Hermitian physics can lead to striking effects, with novel topology arising from losses in hybrid exciton-polaritons introducing a new avenue to topology. [Read the article online.](#)

### Negative capacitance reduces loss in topological electronics

Negative-capacitance ferroelectrics could lower the switching energy of future topological electronics. A FLEET study spanning Monash, UNSW, RMIT and UOW showed that using a ferroelectric material to act as a negative capacitor can make topological transistors switch at lower voltage, potentially reducing energy losses by a factor of ten or more. [Read the article \(and watch Michael's presentation\) online.](#)





**Ultracold quantum review** December's edition of *Nature Physics* was dedicated to ultracold quantum technologies, including a review of spectroscopic probes of quantum gases by FLEET's Chris Vale (Swinburne), with Martin Zwierlein (MIT). Ultracold gases are a laboratory for precision, many-body physics – delivering a wealth of insights into collective quantum phenomena, with direct implications for nuclear and condensed-matter physics. [Read the article online.](#)

### **FLEET's new translation program to help accelerate members' research towards wider impact**

A new FLEET program, with expert advice, resources and industry connections aims to develop Centre research into prototypes and technical demonstrations, helping translate FLEET members' research outcomes into wider societal impact, and developing members' key translation skills. FLEET's new Program Manager Dr Michael Harvey (right) explained at December's workshop how the new program will guide FLEET members through the process of identifying promising projects for translation to industry, and shepherding them through the process of establishing linkages. See [FLEET.org.au/translation](https://fleet.org.au/translation) for more.

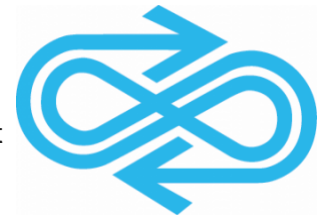


**Congratulations Bao Yue** Congratulations to FLEET Research Fellow Bao Yue Zhang, who received the prestigious 2021 RMIT Vice-

Chancellor's Prize for Research Excellence-HDR, recognised for outstanding research and contributions to novel sensing materials and applications in early cancer diagnosis.

### **A feast of FLEET physics at the AIP**

**summer meeting** A feast of FLEET physics was on show at the Australian Institute of Physics Summer Meeting last month, held at QUT in Brisbane with parallel online delivery. As well as plenary and keynote talks by FLEET's Michael Fuhrer, Dimi Culcer and Kirrily Rule, a total of 36 FLEET members presented talks and posters. FLEET sponsored the meeting's poster session. [See the full list of FLEET speakers online.](#) Congratulations to Karen Bayros (RMIT University) who won best poster (online) for 'Modelling Josephson effects in superconducting nanoscale devices'.



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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.



**Australian Government**  
**Australian Research Council**