



ARC CENTRE OF EXCELLENCE IN
FUTURE LOW-ENERGY
ELECTRONICS TECHNOLOGIES

FLEET News: March 2022

The **FLEET 2021 Annual Report** is out, and I hope you will all take a moment to peruse it, and join me in taking pride in what we have accomplished as a Centre.

The FLEET Annual Workshop will be held this July in Wollongong and we look forward to resuming face-to-face meetings.

Michael Fuhrer
Director, FLEET



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FLEET Annual Report 2021

The FLEET Annual Report outlining activities, outcomes and research highlights for 2021 has been submitted to the ARC. Despite a second year of pandemic conditions and restricted research capabilities, the Centre has again reported a great year, meeting or exceeding the majority of key performance indicators. As would be expected, the ones not met were those linked with travel or outreach and out of our control. **You can read the full report online**



Bonding exercise: quantifying biexciton binding energy

A rare spectroscopy technique at Swinburne University directly quantifies the energy required to bind two excitons together.

The experiment, led by PhD student Mitch Conway, harnessed interactions between real and virtual states to switch the electronic state of an atomically-thin (2D) material. As well as improving fundamental understanding of biexciton dynamics and exotic new quantum materials, the study aids work towards biexciton-based devices and future low-energy topological electronics. [Read more online.](#)



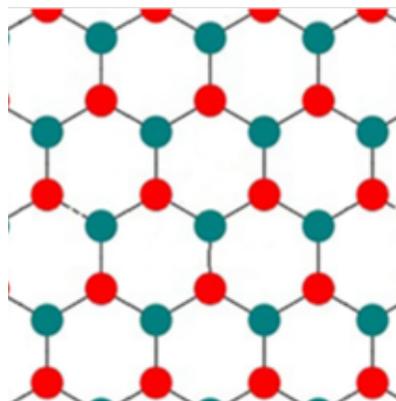
Where are they now? FLEET alum Shilpa Sanwlani

"I've gone from designing experimental techniques and establishing optical systems, to designing and delivering anti-money laundering detection solutions!" Catch up with FLEET alum Shilpa Sanwlani, who is now applying skills learned running 2D system spectroscopy experiments at Swinburne University as her new role as a Senior Data Analyst in ANZ's Financial Crime Threat Management team. [Read more online.](#)



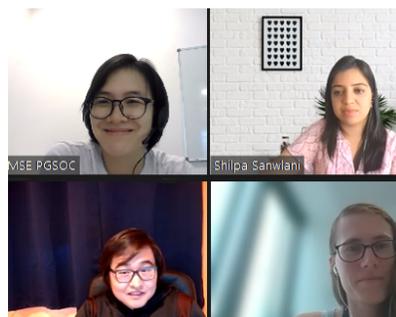
Zigzag Xenes could be topological switching key

A multi-node study led by Muhammad Nadeem at UOW confirms potential of zigzag-Xene-nanoribbons to switch future topological electronics, with a low threshold voltage required for switching between gapless and gapped edge states reducing as the width of the material decreases, without any fundamental lower limit. [Read more online.](#)



Hien Nguyen assembles expert careers advice panel

An expert panel ran through issues of importance to PhD and Masters graduates at UNSW this month, answering the questions at top of mind for ECRs towards the end of study, as they prepare to start looking for graduate positions for the first



experts, including drawing on FLEET expertise and alumni, to share their employment and job-hunting experiences. [Read more online.](#)

Jesper Levinsen outstanding referee

Congratulations to FLEET's Jesper Levinsen (Monash) whose exceptional work as referee of peer-reviewed papers has been recognised by the Outstanding Referee Awards by APS Physics. [Read more online.](#)



Profiling five FLEET scientists for IWD

FLEET profiled a quintet of scientists for International Women's Day, exploring their varied paths into science and asking questions about bias and diversity. See profiles on the FLEET website for [Meera Parish](#) (Monash), [Patjaree Aukarasereenont](#) (RMIT), [Maede Mousavi](#) (UNSW), [Peggy Schoenherr](#) (UNSW) and [Golrokh Akhgar](#) (Monash).



Congratulations to our Research Fellows

[Bao Yue Zhang](#) (RMIT), has been awarded the RMIT Vice-Chancellor Postdoctoral Fellowship. She will be working on novel metal oxide based semiconductor materials, low-energy driven electronic sensors, and other chemical sensors.

[Semonti Bhattacharyya](#) (Monash), has secured an Assistant Professor role at the Leiden Institute of Physics, The Netherlands. She will be establishing an experimental condensed matter physics groups working on quantum transport in van der Waals Hybrids.

[Peggy Schoenherr](#) (UNSW), has been offered a research position at CSIRO as the prototype Development Magnetic Resonance Scientist, to be based at ANSTO, Wollongong.



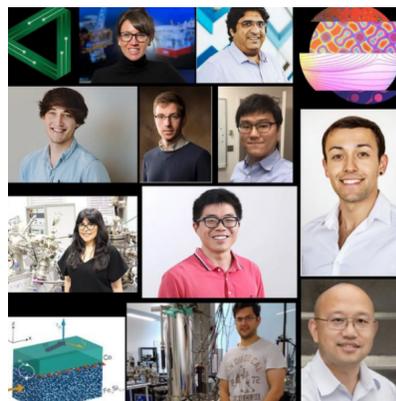
MacDiarmid-FLEET collaboration

A year of disrupted travel plans hasn't stopped Auckland/MacDiarmid PhD student Stephanie Lambie from successfully kick-starting a trans-Tasman collaboration with FLEET, and says a highlight has been working with inspiring women in science. [Read about Stephanie's work](#) with UNSW and other FLEET collaborators at MacDiarmid.



FLEET represents at APS

A large group of FLEET folks and affiliates speaking at the APS Physics March Meeting this month - [see details on their talks online](#).



Congratulations to our ECR authors this month

Congratulations to the following FLEET students and ECRs who are the first or second author in our [most recent publications](#): Iolanda Di Bernardo, James Blyth, Muhammad Nadeem, Qingdong Ou and Yik Kheng Lee.



Semiconductor news

Australian graphene commercialisation company **Ionic Industries** has taken over graphene-coatings company Imagine Intelligent Materials, planning to apply new coatings and sensing IP to energy storage technology (supercapacitors plus supercapacitor/battery hybrids) at Ionic's new Mt Waverly (Melbourne) facility.



International Conference on the Physics of Semiconductors

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, AI Sue Coppersmith, PI Allan MacDonald and Centre advisor Francois Peeters all involved on committees or as plenary/invited speakers, along with other Centre speakers. If you're attending and would like to share twin-accommodation with a male FLEET member, please contact Tich-Lam.



Catch up on past talks

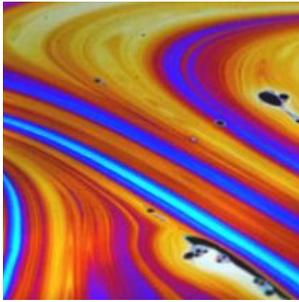
See the Presentations folder on the FLEET intranet for slides and videos from FLEET2021 in December. Also catch up on:

- Ehud Altman (Berkeley) **Phase transitions and critical states of monitored quantum systems**
- 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

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 advanced manufacturing and dynamic electronic structures. See more at UOW Research

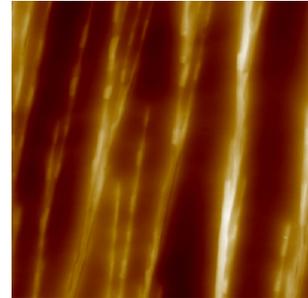




Superfluid vortices A EQUUS/FLEET study led by Matt Reeves at UQ studies emergence of equilibrium states in 2D, chiral vortices, confirming that large vortices would form out of a turbulent flow. The team found theory predicted exceptionally well giant vortex structures emerging from multiple turbulent vortices with applications to turbulence theory, as well as future superfluid-based technology. [Read more at EQUUS.](#)

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.](#)



Where are they now? FLEET alum Carlos

Kuhn From cold-atoms research to defence industry consultancy: Another FLEET alum 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) who won best poster and best poster mineral processing and material science at AusColloids student conference last month, explaining synthesis of 2D materials using liquid metals. The prizes were nicely timed, as Patjaree (right) and Abby were first and second authors on a tutorial review paper the same month. [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.](#)

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



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