

FLEET News: October 2020

A couple items this month are worth a celebratory pause:

Victoria's success in reducing coronavirus cases from a peak of 700 per day down to single digits is now a model for the world, and a credit to the hard work of Victorians during months of lockdown.

And our partner organization the MacDiarmid Institute, the premiere materials science research body in New Zealand, has been refunded for seven and a half years.

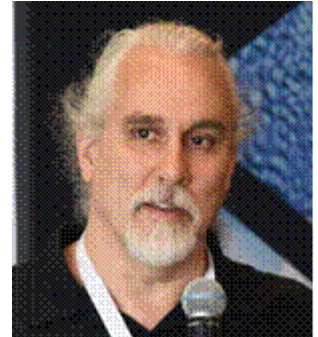
Congratulations are also due to Jesse and David (see below), and to all the ECR authors publishing papers.

I hope you will join me in raising a glass to our Victorian members, our partners across the ditch, Jesse, David and our other ECRs and all of our FLEET family who have hung together and kept bringing the successes in this most difficult year. Well done all!

Regards,

Professor Michael Fuhrer

FLEET Director



[Catch up on previous editions of FLEET News](#)

Liquid metals to the rescue

FLEET PhD student Yifang Wang published a significant study in *Advanced Functional Materials* on the synthesis of atomically-thin MoS₂ using liquid metals. The article reports on the self-deposition of ultra-thin molybdenum-disulfide that is large and grain-boundary-free. The deposition method will significantly impact the future of semiconductors in optoelectronics.

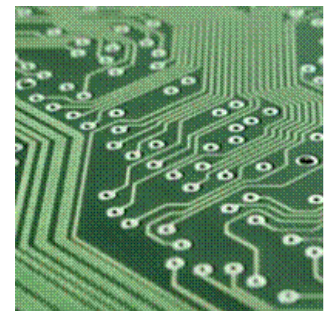
[Read more online](#)



Beyond binary

Next-generation 'multi-state' memory offers a highly energy efficient, low-cost, fast-access solution: stepping 'beyond binary' to store more data than just zeros and ones. The technology has been reviewed in a new paper from FLEET collaborators at UOW and RMIT.

[Read more online](#)

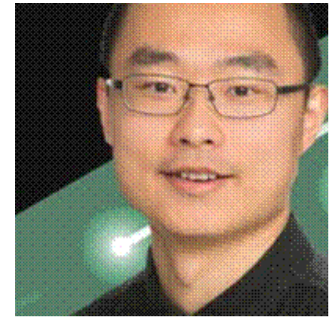


Reviewing multiferroics at UNSW

A new study led by Stuart Burns and Oliver Paull (UNSW) reviews the use of the multiferroic material bismuth-ferrite, which allows for low-energy switching in data-storage devices and could be applied in a future generation of ultra-low-energy electronics. [Read more online](#)

Thermodynamics in quantum impurity

What role does heat play in quantum impurity studies? A new theoretical study led by Weizhe Liu at Monash advances our understanding of the role of thermodynamics in the 'quantum impurity' problem, which studies the behaviour of deliberately introduced atoms that behave as particularly 'clean' quasiparticles within a background atomic gas, allowing a controllable 'perfect test bed' study of quantum correlations. [Read more online](#)



Congratulations Jesse Vaitkus

RMIT/FLEET PhD candidate Jesse Vaitkus was awarded the University's [Ian Snook prize](#) this month, which each year recognises the highest-achieving applied physics PhD student. Jesse recently submitted his PhD thesis, studying electron transport in nanodevices using non-equilibrium Greens-function within FLEET's research theme 1, with Jared Cole.



Neutron scattering award for David Cortie

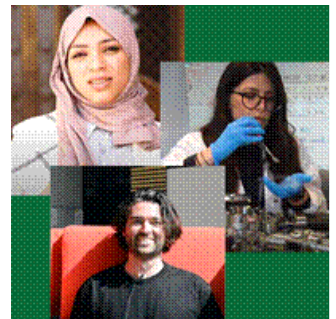
Congratulations to FLEET AI David Cortie, who received the ANBUG Young Scientist Award for 2020 this month, recognising achievements in neutron scattering in the first 10 years post-PhD. The prize recognises David's use of neutron techniques to study materials' structure-function relationship, in particular interface phenomena in ultra-thin magnetic films. David was the first person in Australia to use some of the more advanced techniques, such as polarized neutrons, and is one of few physicists applying neutron-scattering to nanostructures, quantum materials, and 2D materials.



Highlighting diversity of research in ARC Centres: video series

Three Centre researchers appeared in the FLEET episode of an ongoing, weekly series of videos spotlighting researchers within ARC Centres of Excellence. Thanks to our video stars Nuriyah Aloufi (RMIT), Golrokh Akhgar (Monash) and Harley Scammell (UNSW).

Watch the video on [FLEET's youtube account](#), and see the full series of videos (including eight COEs so far, and counting) on the [ARC's youtube playlist](#).



FLEET strategic workshop: virtual meeting space

FLEET's strategic workshop was held this month in an experimental 'virtual meeting space', using the new Australian-developed online meeting/learning platform, iSee.

Watch a quick video of the virtual space



MacDiarmid funding

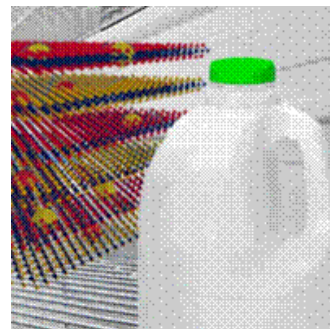
FLEET partner organisation the MacDiarmid Institute (NZ) has had funding confirmed through to the end of 2028 by the NZ government, recognising the Institute's research excellence and contributions to the community for the fourth time. MacDiarmid's focus on sustainability is considered fertile ground for discovery and future enterprise.

[Read more at MacDiarmid](#) and read about the [FLEET-MacDiarmid partnership](#) on the FLEET website.

Kitchen-temperature supercurrents

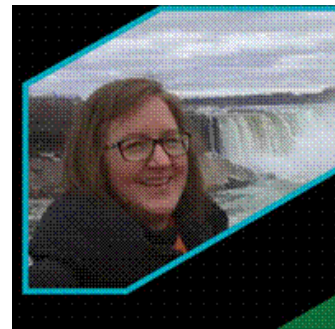
Could a stack of 2D materials allow for supercurrents at ground-breakingly warm temperatures, easily achievable in the household kitchen? A UNSW collaboration with Centre partners University of Camerino has demonstrated viable 'fridge temperature' supercurrents in a superlattice of stacked 2D materials.

[Read more online](#)



FLEET-wide talk coming up: Karen Livesey

The next FLEET streamed seminar (**18 November**) will be by the University of Newcastle's Karen Livesey, who will explain the emerging use of asymmetric interactions in thin magnetic films towards low-energy electronics, improved signal processing and other applications. This talk will be co-presented by the University of Newcastle School of Mathematical and Physical Sciences and FLEET. [Register online](#).



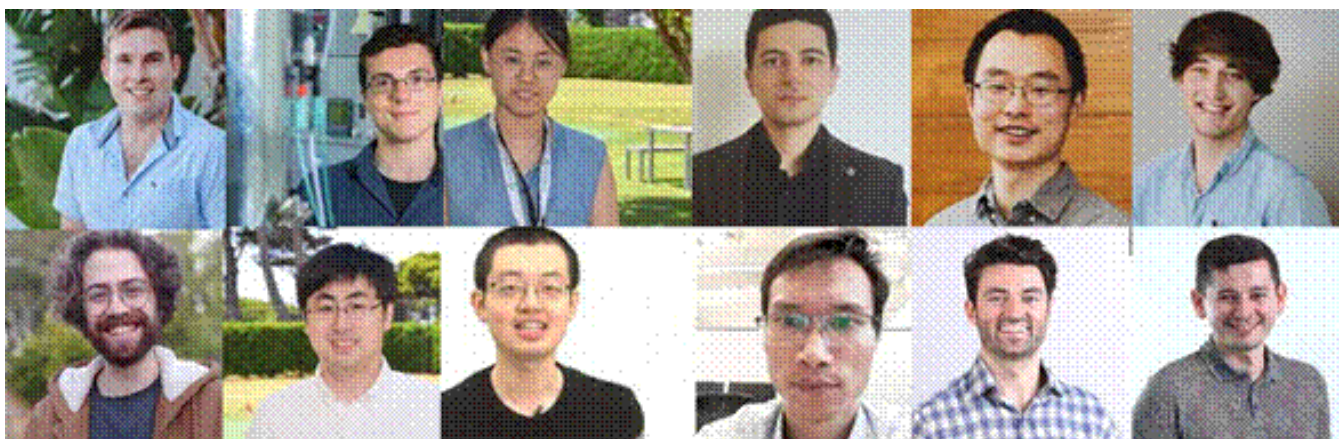
Celebrating LGBTQIA+ in STEM

FLEET and the ARC Centre of Excellence in Engineered Quantum Systems are partnering to mark LGBTSTEM Day in November. The day celebrates LGBTQIA+ people working in STEM, inviting conversations about some of the challenges faced, and what all of us can do to improve things. We'll be gathering on Zoom to hear a few talks by people who work in STEM and identify as LGBTQIA+, followed by a general discussion.

Congratulations to our ECR authors

Congratulations to all the PhD students and other ECRs who are first/second authors in [our recent publications](#):

Yifang Wang, Haydn Adlong, James Collins, Chutian Wang, Frank Yun, Mohannad Mayyas, Gaurav Vats, Guangsai Yang, Harley Scammell, Son Ho, Weizhe Liu, David Cortie, Maedehsadat Mousavi, Oliver Paull and Stuart Burns.



US-Australian condensed-matter and cold-atom physics talks maintain international connections

While COVID19 has temporarily halted the visits that traditionally spark and fuel international research collaborations, we continue to find new ways to connect.

FLEET, with partners JQI and Monash University School of Physics and Astronomy, is running a series of talks alternating between US and Australian researchers, presenting developments in condensed-matter and cold atomic physics, enriching connections between the two physics communities.

[See list of future talks and recordings of past talks online.](#)

Maintaining connections: Centre-wide, live-streamed seminars

The next Centre-wide talk (18 November) will be by Karen Livesey (University of Newcastle), and December will be Iolanda Di Bernardo (Monash).

Neutron scattering ANBUG / symposium

The Australian Neutron Beam Users Group (ANBUG) promotes neutron scattering to the community, especially to students and ECRs. The organisation's newly refreshed website has revitalized membership, and all interested researchers are encouraged to join, particularly in 2020 for up-to-date access information and the ongoing series of online seminars available to members.

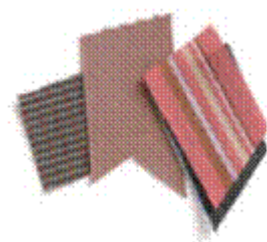
The 2020 virtual [Australian Neutron Scattering Symposium](#) will be held 11-13 November. FLEET is sponsoring the gold package which includes six complimentary student registrations.

Equity/diversity resources

A grant-and-paper writing workshop next month (4–6 November), designed for ECR women, will strengthen scientific writing and critical thinking skills, providing an opportunity to gain inspiration from mentors and likeminded researchers. [See details online.](#)

Upcoming Diversity Council of Australia (DCA) talks include:

- 17 November [Indigenous employment](#)
- 24 November [Understanding domestic violence](#)
- 8 December [Engaging men in gender equality](#)



Eureka finalists

Three FLEET members are on the finalists list for the 2020 Eureka Prizes – the nation's top science awards. Winners will be announced in an online event 24 November, and unlike the usually exclusive dinner event, online dinner tickets are unlimited, so [feel free to register](#) to cheer on our people!

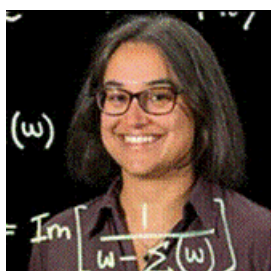
FLEET's Kris Helmersen (Monash) and Matt Davis (UQ) are finalists for the Eureka Prize for Scientific Research, recognising the Australian Quantum Vortex team which provided the first proof of a 70-year-old theory of turbulence. [Read more online](#)

FLEET AI Sumeet Walia (RMIT) is a finalist for the Eureka Prize for an Emerging Leader in Science. [Read more online](#)



Previous news

Growing metallic crystals in liquid metal A study led by FLEET RF Mohannad Mayyas (UNSW) details a new liquid-metal (gallium) technique with potential for future metal and metal-compound nanostructures. [Read more online.](#)

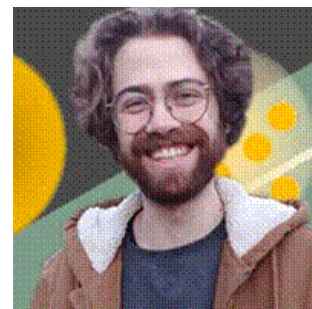


Excitons in Nature Physics FLEET CI Meera Parish (left) has written an explainer on the use of light–matter interactions in quantum material engineering for Nature Physics.

[Read the article online.](#)

Reviewing QAHE materials at UOW UOW PhD student Muhammad Nadeem (right) led a FLEET collaboration comprehensively reviewing quantum anomalous Hall effect (QAHE) materials. [Read more online](#)

What causes quasiparticle death? Quasiparticles die young, lasting far, far less than a second. Why? A Monash study, conducted by FLEET Masters student Haydn Adlong (left), finds a culprit beyond the usual suspect (decay into lower energy states). [Read more online](#)



What happens between the sheets (of graphene)? Adding calcium to graphene creates an extremely-promising superconductor, but where does the calcium go? Monash PhD student Jimmy Kotsakidis (right) led a new study for the first time confirming what actually happens to those calcium atoms. [Read more online.](#)

Diamonds the crown jewel in future electronics Controlling electric charges spinning on a diamond's surface could pave the way for a new type of diamond-powered energy efficient electronic devices, new work by FLEET AI Dongchen Qi at QUT. [Read more online.](#)

Virtual and video outreach at UNSW A team of FLEET PhDs and ECRs at UNSW were able to bridge 2020's COVID restrictions to safely engage a classroom of students with virtual, but hands-on science, with Vivasha Govinden writing that the experience not only had a silver lining in better engagement for the schoolkids, but had unexpected benefits for the scientists too. [Read about the project online.](#)



A collection of videos produced around FLEET recently put Centre science in the limelight:

- A team of FLEET researchers produced a trio of videos spotlighting the impressive UNSW undergrad lab facilities for the university's virtual open day
- FLEET PhD student Yik Lee (RMIT) gave an excellent explanation of transverse magnetic focusing, which can sort electrons by spin at the university's 3-minute-thesis Science finals
- Agustin Schiffrin (Monash) demonstrated the FLEET levitating superconductor track
- FLEET honours student Coco Kennedy (UNSW) produce a sample using pulsed laser deposition in the lab.

Topological explainer A very nice topological materials explainer in September's Physics Today addresses the perennial question "but how are they topological", beyond vague references to coffee cups and donuts, matching 'genus' of 3D shapes to closed surfaces of allowable electron momenta. [Read the article online.](#)



Quantum materials roadmap The new IOP quantum materials roadmap explores current research, future challenges, technical applications, underlying physics in topological insulators, multiferroics, twisted-'magic angle' moiré graphene, superconductors (Cu and TMD), topological semimetals, Majorana states and non-equilibrium phenomena (pewh!) [Read the roadmap online](#)

Participating organisations

FLEET is the Australian Research Council Centre of Excellence in Future Low-Energy Electronics Technologies.

Participating nodes are:

The Australian National University, Monash University, RMIT University, Swinburne University of Technology, the University of New South Wales, the University of Queensland and the University of Wollongong.

