



ARC CENTRE OF EXCELLENCE IN  
FUTURE LOW-ENERGY  
ELECTRONICS TECHNOLOGIES

### FLEET News: November 2020

Another month has flown by! And a lot has changed, as Australians cautiously exhale and eye a return to "covid normal".

Congratulations to Priyank, Matthias, and Kourosh (see below), and a big congratulations to FLEET advisor Cathy Foley on her appointment as Australia's next Chief Scientist—Australia's science policy is in good hands.



Regards,  
Michael Fuhrer  
FLEET Director

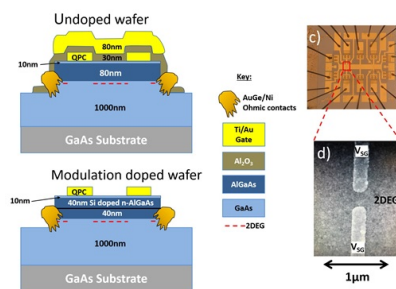
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#### In this edition:

- **Removing random doping (UNSW)**
- **'Remote control' outreach: hands-on and COVID-safe**
- **New expertise on FLEET Advisory Committees**
- **Ground-breaking thermoelectrics (UOW)**
- **Congratulations Priyank Kumar (UNSW)**
- **Congratulations Matthias Wurdack (ANU)**
- **Cathy Foley: new Chief Scientist**
- **ECR authors in November**
- **Kourosh Kalantar-zadeh Clarivate recognition (UNSW)**
- **LGBTSTEM Day and equity/diversity resources**
- **Condensed-matter / FLEET seminar**

## Removing random doping for better quantum devices

UNSW's Ashwin Srinivasan led a collaboration that found removing random doping in quantum electronic devices dramatically improves their reproducibility – a key requirement for future applications such as quantum-information processing and spintronics. [Read more online.](#)



## Remote outreach wows students

A multi-node outreach effort led by UNSW's Cecilia Bloise introduced students at a Victorian Primary school to electricity through a hands-on, COVID-safe learning exercise. The kids' hands-on experiments were guided on-screen by FLEET members, using instructions written from FLEET's comprehensive Home Science library. [Read more online.](#)



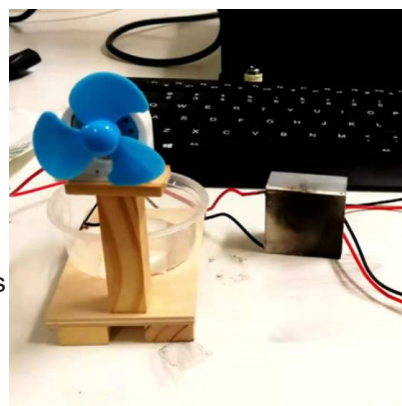
## Adding expertise with new Centre advisors

FLEET has significantly added to the expertise available to guide Centre policy and science, with the latest additions to the FLEET Advisory Committee and International Scientific Advisory Committee. Welcome to new Centre advisors Rebekah Brown (Monash University), Esther Levy (Wiley), Francois Peeters (University of Antwerp) and Joanna Batstone (ex IBM). [Meet FLEET's new Advisors online.](#)



## Ground-breaking thermoelectrics

UOW PhD student Guangsai Yang led a study identifying breakthrough improvements in thermoelectric materials, which convert heat into electricity and vice versa, seeing efficiency improved by over 60%, with potential for new heat harvesting applications, including powering small personal devices such as wristwatches from the body's own heat. [Read more online](#)



## Congratulations Priyank

Congratulations to Priyank Kumar who received a Discovery Early Career Researcher Award (DECRA) this month. Priyank's project, receiving one of only 200 awarded in this round, is working towards an efficient plasmonic photocatalyst, providing insight into atomic-level reactions steps involved and developing catalyst design principles to guide experiments.

[Read more online.](#)



## Congratulations Matthias

Congratulations to ANU's Matthias Wurdack on winning the AIP NSW Postgraduate Award this month for his presentation "Towards future low-energy transistor technologies with exciton-polariton superfluids in atomically-thin semiconductors." [Read more online.](#)



## Cathy Foley new Chief Scientist

CSIRO Chief Scientist Dr Cathy Foley has been named as Australia's next Chief Scientist. FLEET is very fortunate to have the benefit of Dr Foley's advice on the Centre's Advisory Committee.

[Read more online](#)



## Congratulations to our ECR authors this month

Congratulations to all the PhD students and other ECRs who are first or second authors in **our recent publications**: Fan Ji, Pankaj Sharma, Gaurav Vats, Zengji Yue, Weiyao Zhao, Younsu

Nahas and Sergei Prokhorenko.



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## Congratulations Kourosh

FLEET Chief Investigator Kourosh Kalantar-zadeh (UNSW) has been named in the top 1% by citations in his field for the third year running in the Clarivate Analytics list. The citation identifies influential researchers as determined by their peers around the globe. [Read more online.](#)



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## Equity/diversity resources

FLEET and EQUUS members combined this month to mark LGBTSTEM Day with a panel sharing some of the challenges faced, and suggestions of what colleagues can do to support each other. Useful resources coming out of the discussion were shared afterwards on the FLEET intranet.



The Women & Leadership Australia ([WLA](#)) leadership program for early career female talents is now receiving applications for scholarships which support the increased presence of women in leadership roles across key industries.

[A Diversity Council of Australia \(DCA\) talk coming up this month](#) explores men's experience in the workplace, including self image and stereotypes.

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## Condensed-matter / FLEET seminar

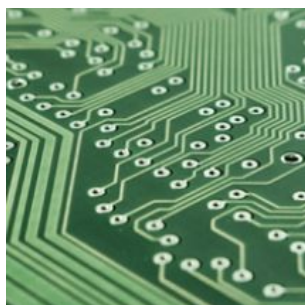
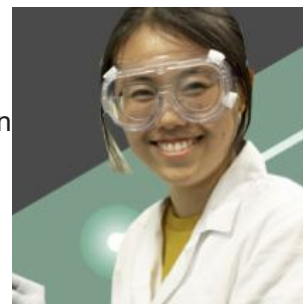
Prof Yuanbo Zhang (Fudan University) will host the next FLEET-wide streamed seminar: "Opportunities in Two-Dimensional Material Research", on December 17. Hear about current work at Fudan University (China) on the observation of the Quantum anomalous Hall effect in the intrinsic magnetic topological insulator  $\text{MnBi}_2\text{Te}_4$ , and the recent breakthrough of exfoliating high temperature superconductors down to the monolayer limit. [See details online.](#)



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## Previous news

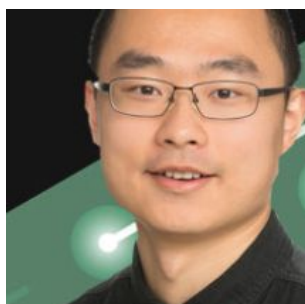
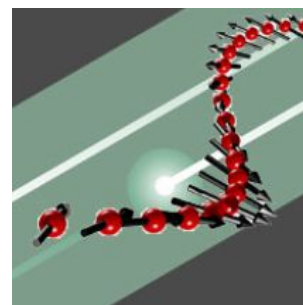
**Liquid metals to the rescue** FLEET PhD student Yifang Wang published a significant study on the synthesis of atomically-thin  $\text{MoS}_2$  using liquid metals. The article reports on the self-deposition of ultra-thin molybdenum-disulfide that is large and grain-boundary-free. The deposition method 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 was reviewed in a paper from FLEET collaborators at UOW and RMIT, and covered in an article in *IEEE Spectrum*. [Read](#)

[more online](#)

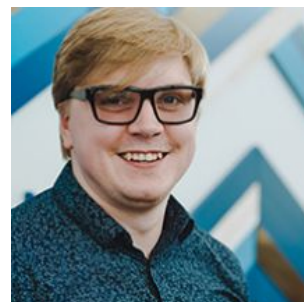
**Reviewing multiferroics at UNSW** A study led by Stuart Burns and Oliver Paull (UNSW) reviewed the use of the multiferroic material bismuth-ferrite, which allows for low-energy switching in data-storage devices and could be applied in a future generation of ultra-low-energy electronics. [Read more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



**Thermodynamics in quantum impurity** What role does heat play in quantum impurity studies? A theoretical study led by Weizhe Liu at Monash advanced 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

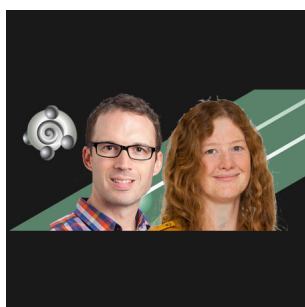
bed' study of quantum correlations. [Read more online](#)

**Congratulations Jesse Vaitkus** RMIT/FLEET PhD candidate Jesse Vaitkus was awarded the University's **Ian Snook prize** last 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 last 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.

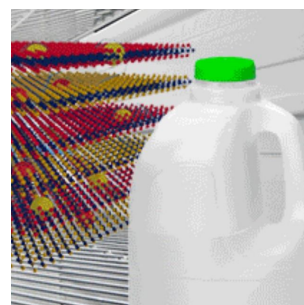
**Highlighting diversity of research in ARC Centres: video series** Three Centre researchers last month appeared in the FLEET episode of an ongoing, weekly series of videos spotlighting researchers within ARC Centres of Excellence. Thanks to our video stars Nuriyah Aloufi (RMIT), Golrokh Akhgar (Monash) 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](#).



**MacDiarmid funding** FLEET partner organisation the MacDiarmid Institute (NZ) 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](#)





**Research commercialisation** FLEET co-hosted a discussion led by Professor Andrew Dzurak (UNSW), who shared his insights on commercialisation of university research, based on his significant experience at the ANFF, UNSW, and CQC<sup>2</sup>T. The discussion was co-presented by FLEET and CASLEO (Centre for Advanced Solid and Liquid based Electronics and Optics) at UNSW.

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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.



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