

### FLEET News: May 2021

FLEET's mid-term review was held on this month, with the panel impressed by FLEET's performance to date, not only in research, but in communications, outreach, training, and other aspects of what we do. The panel was particularly impressed by our younger researchers' confidence and poise.



I am reminded that building such an inclusive team doesn't happen by accident, and we can always do better. It's important that, if things go wrong, we know about them and can work to fix them. With this in mind, we've fine-tuned our processes for reporting inappropriate behaviour – more on this below.

FLEET acknowledges the Aboriginal and Torres Strait Islander peoples and their important contributions to our culture and knowledge as the first Australians. We have developed a policy to help members acknowledge the traditional custodians of the land at FLEET meetings and events – see more on this below as well.

Regards,  
Prof Michael Fuhrer  
Director, FLEET

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#### In this edition:

- **Liquid metal spin-off** (UNSW, RMIT)
- **Acknowledging traditional owners**
- **Thermoelectric Linkage** (UOW)

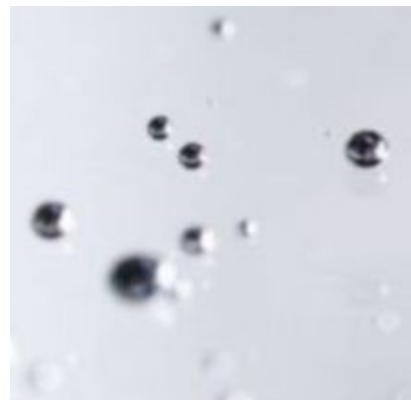
- **Topological patents** (Monash)
- **Reporting inappropriate behaviour**
- **Welcome to the FLEET family Elodie Sando and Axel Karel** (UNSW, Monash)
- **Melbourne Knowledge Week** (SUT, RMIT, Monash)
- **Women in STEM, FLEET talk next week**
- **New Tools of the Trade articles** (ANU, Monash)
- **Welcome new Honours students** (ANU, RMIT, UNSW)
- **Congratulations Susan Coppersmith Academy Fellow** (UNSW)
- **Jared Cole NZ fellowship** (RMIT)
- **Low-energy electrodynamics conference**
- **Industry news**
- **Congratulations to our ECR authors**
- **Alum spotlight: Hareem Khan**
- **ECR women writing workshop** (ANU)
- **Development opportunities**

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## Liquid metal spinoff

The Liquid-metals spin-off company Liquid Metal Plus (LM+) initiated in 2020 with FLEET investigators Kourosh Kalantar-Zadeh (UNSW) and Dr Torben Daeneke (RMIT), together with Dorna Esrafilzadeh (UNSW), was launched in April.

The company's two areas of focus, unified by liquid-metal technologies are two dimensional (2D) 'printed' semiconductors and CO<sub>2</sub> capture. [Read more about the new spin-off online.](#)



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## Acknowledging traditional owners

FLEET values the contributions of our diverse members, spanning 27 cultural backgrounds. In particular, acknowledging the Aboriginal and Torres Strait Islander peoples as First Australians.

FLEET members are being encouraged to acknowledge the traditional custodians of Country at the beginning of formal functions, meetings and forums, including Zoom sessions and online events, and members are being invited to share thoughts on our new acknowledgement guidelines.

It's **National Reconciliation Week**, so perhaps a good time to give this a first go (it can feel a little forced the first time you try, but it gets easier with practice). Some readers might find [this relevant article](#) useful.

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## Thermoelectric industry-researchers' Linkage

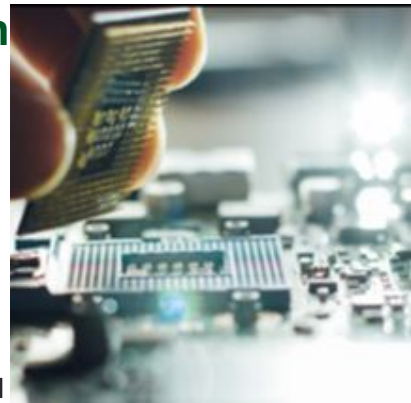
Advanced materials can sustainably convert waste heat into useful forms of energy to benefit Australia. New research will be undertaken as part of an ARC Linkage Project awarded to a team led by FLEET's Xiaolin Wang and Zengji Yu (UOW), with FLEET PI Kirrily Rule at partner organisation ANSTO. Linkage projects promote partnerships between researchers and business and industry. [Read more online.](#)



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## Topological patents reinforce position as world leader

Two patent applications, one filed in 2020, reinforce FLEET's position as a world leader in topological transistors. The patents cover work in the 'switching' of topological material, to facilitate creation of a functioning topological transistor – and reinforce demonstration that topological transistors can overcome Boltzmann's tyranny to switch at lower energies, and topological insulator devices' recognition in the 2020 IEEE Roadmap. [Read more online.](#)



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## Reporting inappropriate behaviour

We have been asking our members: would you know how to report inappropriate behaviour, if you experienced or observed it within FLEET?

Our member universities all have their own internal mechanisms, but we're making sure our people know that FLEET is also available to help. Members can choose whether to make a report (anonymous if they like), access information on the resources and procedures at your node, or simply engage in a discussion and/or seek advice about an incident or behaviour that they aren't sure about.

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## Welcome Elodie Luna Sando and Axel Karel

Congratulations to UNSW's Dan Sando and partner Candice, who welcomed Elodie Luna to the world on April 22. Dan reports that Mum and Elodie are both well, and thrilled!



And congratulations also to Julie Karel and partner Trent, who welcomed Axel Karel last Friday, slightly earlier than planned and unexpectedly for two parents that had planned to set up the baby room over the weekend.

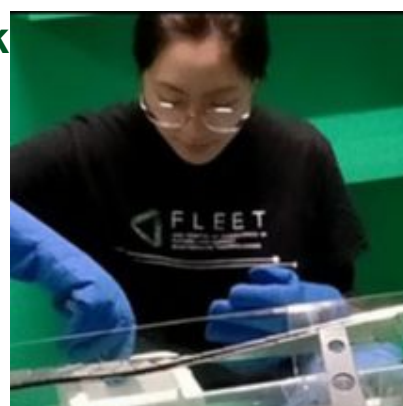
Julie reports: "Trent and I learned our first important lesson in parenting - it doesn't matter what your plans are, the baby has their own plans."



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## FLEET at Melbourne Knowledge Week

Melbourne Knowledge Week was an opportunity for FLEET to engage with the public about the exciting future of computing, and a large cohort of Centre members from the three Victorian unis staffed the superconducting Mobius strip and talked to public about a sustainable future for computing. [Read more online.](#)



## What makes women in STEM strong in what they do?

FLEET Research Fellow, Dr Peggy Schoenherr, is presenting this special event featuring five women in FLEET with five very different STEM career experiences.

From a range of backgrounds including theoretical physics, experimental physics, chemistry and materials science, speakers will share the journeys that had lead them to their current roles in academia, government, research management and industry.



All welcome. Please share with friends and colleagues. [Register online](#).

### Other FLEET talks

In FLEET's June seminar next week (3 June), Michael Barson (Monash) will discuss the new, emerging platform of quantum microscopy, and his work performing nanoscale vector electric field imaging with sensitivity sufficient to measure single charges. All welcome. [See details online](#).

Catch up on these FLEET talks from the last month:

- Brian LeRoy (U. Arizona) [Designer states in vdW heterostructures](#)
- Dimi Culcer (UNSW/FLEET) [Anomalous Hall effect in non-mag. conductors](#)
- Eugene Demler (Harvard) [Quantum simulators](#).
- Aydin Keser (UNSW/FLEET) [Strong nonlinearity in Dirac materials](#)
- Erol Harvey (Bionics Inst.) [Research commercialisation](#)

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## Tools of the Trade from Eli and Iolanda

In two more articles for *Nature Reviews Physics*' "Tools of the Trade" series, [Eli Estrecho \(ANU\)](#) describes laser trapping and manipulation of exciton-polariton quantum fluids, while [Iolanda Di Bernadro \(Monash\)](#) describes non-disruptive techniques for depth profiling in photoemission spectroscopy. The new series, spotlighting experimental and theoretical/ computational methods, will feature a few other FLEET personnel in the coming months (also see Zenjgi's article from last month, [below](#)).





## Welcome three new Honours students

Please join us in welcoming FLEET's three new Women in FLEET Honours students: Kyla Rutherford (RMIT), Olivia Kong (UNSW) and Robin Hu (ANU), who have all received Women in FLEET Honours Scholarships.

[Read more about them, and their work, online.](#)



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## Susan Coppersmith AAAS Fellow

Congratulations to Susan Coppersmith (UNSW), announced this week as a new Fellow of the Australian Academy of Science. FLEET is fortunate to have the benefit of Prof Coppersmith's expertise in theoretical condensed-matter physics, specifically semiconductor technology towards advanced quantum-coherent nanodevices, including novel strategies to achieve artificially-engineered topological materials.



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## Jared Cole Royal Society of NZ Fellowship

Congratulations also to FLEET's Jared Cole (RMIT) who has received a Royal Society of New Zealand international leader fellowship to work with FLEET partners the MacDiarmid Institute in Wellington. A great chance to help build up trans-Tasman skills in device modelling and advanced materials simulation.



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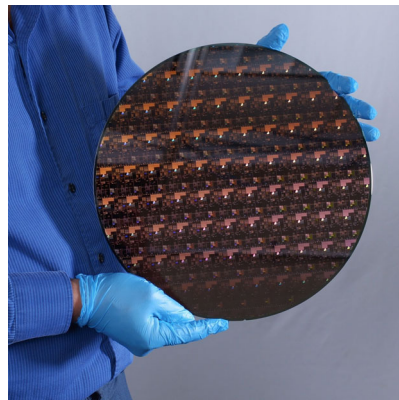
## Conference: low-energy electrodynamics in solids: LEES

A free-registration online conference at the end of June looks promising for FLEET-relevant science. LEES2021 will cover topological semimetals and insulators, novel magnets, unconventional light-matter interactions, nonlinear optical effects in quantum matter unconventional superconductivity and 2D materials. [See the website for more information.](#)

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## Industry news

Other than the ongoing 'chipageddon' chip shortage (which has helpfully spotlighted the importance of electronics to so many components of the economy), the biggest semiconductor-industry news this last month has been the announcement of 2nm nodes at IBM, projected to achieve 75% lower energy use than 7nm node chips. [Read more on the IBM site.](#)



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## Congratulations to our ECR authors this month

Congratulations to Lina Sang, Yun Suk Eo (alum) and Qingdong Ou... who are first or second authors in our [most-recent publications](#).



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## Alum spotlight: congratulations Hareem Khan

Congratulations to FLEET alum Dr Hareem Khan, whose work at RMIT with Kouros Kalantar-Zadeh, Torben Daeneke and JianZhen Ou on the synthesis and study of atomically-thin materials was recognised this week by the RMIT HDR Impact Award, recognising considerable impact outside the academia in 2020.



Meet other FLEET's alums at [FLEET.org.au/alums](https://fleet.org.au/alums)

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## ECR women writing workshop

Learn tips from the experts on writing grant applications and scientific papers, at ANU in September. The workshop is aimed at strengthening the scientific writing, critical thinking and communication skills, providing mentoring, transparent peer review and centralised writing

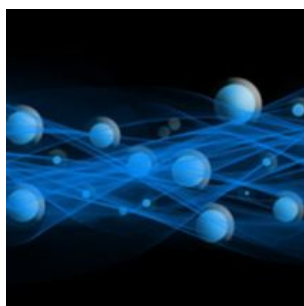
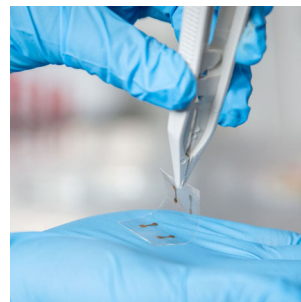
training opportunities. The workshop is currently planned to be onsite at ANU, with an online backup plan. [More information online.](#)

For other outreach/development opportunities see [In2science](#) mentoring, and [CSIRO STEM Professionals in Schools.](#)

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## Previous news

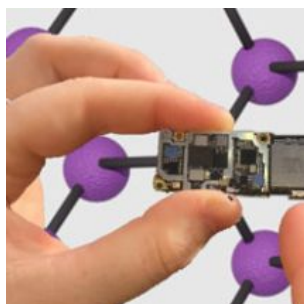
**A new 'positive' approach to transparent electronics** could be the key to next-generation flexible, transparent electronics. The RMIT-led team introduce ultrathin beta-tellurite to the 2D semiconducting material family, providing an answer to a decades-long search for a high mobility p-type oxide. [Read more online.](#)



**Hole qubits offering a speed/coherence sweet spot** could be the solution to a long-standing operational trade-off, potential allowing scaling up of qubits to a mini-quantum computer. FLEET PhD Zhanning Wang and CI Dimi Culcer at UNSW led this study which finds that qubits composed of holes offer lower noise and increased coherence: a possible solution to a long-standing trade-off between speed and coherence. [Read more online](#)

### Tools of the Trade: a new explainer on ion injection

from UOW's Zengji Yue featured in the Nature series 'Tools of the Trade', covering the intercalation of ions into or between atomically-thin materials to fine-tune properties or exfoliate 2D layers. [Read more online.](#)



**Topological materials beat Boltzmann's tyranny** in a FLEET collaboration confirming the potential for topological materials to substantially reduce the energy consumed by computing. The UNSW-UOW-Monash study showed that electronics based on topological insulators rather than conventional semiconductors can reduce transistor switching energy by a factor of four, in the process defeating the famous Boltzmann's tyranny, which puts a lower limit on operating voltage. [Read more online.](#)



PI Kirrily Rule describes nanoparticle cancer research at ANSTO in the news last month, explaining how magnetism experiments supported UOW research on silver-doped nanoparticles as a potential therapy for brain cancers. [Read more online](#) | [watch Kirrily's interview on youtube](#).



FLEET's 2020 annual report [AR2020.FLEET.org.au](https://AR2020.FLEET.org.au) details an extraordinary level of scientific output last year, as well as FLEET's response to COVID-19.



## 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.



