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FLEET

ARC CENTRE OF EXCELLENCE IN
FUTURE LOW-ENERGY
ELECTRONICS TECHNOLOGIES

FLEET NEWS

Dear <<First Name>>

It's been a busy month at FLEET, with our annual workshop, several members presenting at the national physics conference in Perth, or running a ferroelectric workshop at UNSW, and FLEET hosting an international 2D materials conference in Melbourne.

We share a few thoughts about the FLEET and 2D workshops below, along with a smattering of FLEET research and other news from around the Centre,

Best wishes for a good holiday break, and I hope you are able to relax with friends and family, recharging the batteries for another year of great science.



Regards,

Michael Fuhrer

Director, ARC Centre of Excellence in Future Low-Energy Electronics Technologies

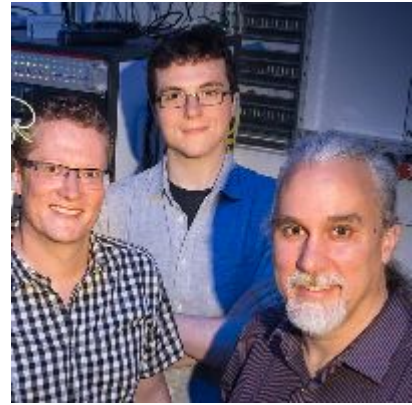
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FLEET research led from Monash has for the first time successfully 'switched' a topological insulator off and on via application of an electric-field – the first step in creating a functioning topological transistor.

This is the first time that the topological state in a topological insulator has been switched on and off using an electric field (crucial for any transistor of course).

It's also very significant that the researchers proved this is possible at room temperature, which is necessary for any viable replacement to CMOS technology in everyday applications.



[Read more online.](#)

Say cheese: capturing an exciton snapshot at ANU

The first ever 'snapshot' of Bose-Einstein condensation was achieved in this FLEET/ANU study, led by Eliezer Estrecho.

Previous observations of exciton-polaritons in BECs have been gained by statistical averaging over millions of events

[Read the full story online.](#)



Flux capacitor in Australian Physics magazine

FLEET's Jared Cole (RMIT) has written an article about his quantum collaboration (resembling the flux capacitor from *Back to the Future*) for the AIP's magazine. Check it out in the December issue of *Australian Physics*.

FLEET2018

Thanks to all our partners, collaborators and research affiliates who helped make this year's FLEET annual workshop such a success. Highlights included:

- How to write a Nature paper: ECR development workshop
- Inaugural FLEET trivia



Describing Nobel-winning science

FLEET CI Kris Helmerson (Monash) explained the physics and applications of 'optical tweezers', recognised by the 2018 Nobel Prize in Physics, at a public talk hosted by the Australian Institute of Physics.

About 50 people attended the talk, ranging in age from secondary school to retirees.

The AIP Nobel Prize Public Lecture is an annual event run by the AIP's Victorian branch, introducing the public to the science behind that year's Nobel Prize in Physics. Also read: [Nobel-winning physics applied at FLEET](#).

Women in FLEET fellowship

FLEET seeks two outstanding, early-career female candidates as Women in FLEET Research Fellows to work at either Monash, UNSW, Swinburne, ANU or UQ – as determined by the candidate's expertise and research aspirations.

This three-year appointment (full-time, with part-time arrangements negotiable upon request) will be at a level commensurate with the research experience and performance standards for academic levels A/B. Candidates identifying as female and within five years of the conferral date of their PhD or equivalent research higher degree are eligible to apply. [Read more online](#).



Please help us by sharing this scholarship in your network. **Deadline 14 January 2019.**

Describing FLEET at RSV

Three FLEET researchers will describe FLEET research and the background of ICT energy use in a presentation to the Royal Society of Victoria, in March. If you're in Melbourne, please come along, and help spread the message to family, friends and colleagues. [Details and bookings online](#).



Roadmap to a beyond-CMOS future

Have you read the new semiconductor roadmap? The International Roadmap for Devices and Systems (IRDS) is the successor to the International Technology Roadmap for Semiconductors (ITRS), steering semiconductor development direction.

The latest edition included both 'more Moore' directions (ie, improvements based on current CMOS technology), as well as a larger chapter than ever on 'beyond CMOS' computing options. (Note little mention of topological materials, so there's room for improvement here. Excitonic devices are on the map though.)

Download the beyond CMOS chapter online. Check out the IEEE's 'rebooting computing' video online.

ICON-2DMat success

FLEET hosted the 4th International Conference on Two-Dimensional Materials and Technologies in Melbourne this month. Around 300 international and Australian delegates enjoyed 6 plenaries, 16 keynote talks, 148 oral presentations and >130 poster presentations.



Free, on-site childcare was provided, paid for by the conference's sponsors.

Advanced materials & nanotech conference, NZ

The International Conference on Advanced Materials and Nanotechnology (AMN9) will be held in Wellington NZ in February next year, hosted by FLEET's frequent collaborators the MacDiarmid Institute. Michael Fuhrer will be a plenary speaker and FLEET's Agustin Schiffrin, Lan Wang and Karina Hudson are all invited speakers.



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Excitonic systems conference, Melbourne 2020

Hot on the heels of ICON-2DMat success, FLEET theme 2 members are now planning a major exciton conference in early 2020, which FLEET will host.

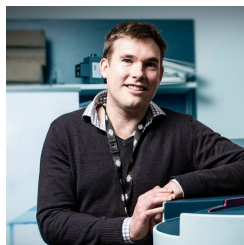
FLEET will be hosting the [10th International Conference on Spontaneous Coherence in Excitonic Systems \(ICSCE10\)](#) in Melbourne 28-31 Jan 2020, co-chaired by Elena Ostrovskaya,

Matt Davis, Tich-Lam Nguyen and Alex Hamilton are on the local organising committee and international program committee.



Previous news

Negative mass investigated at UQ A FLEET study clarified recent studies of negative mass, investigating the strange phenomenon of self-interference. [Read more online.](#)



Meet David Cortie (UOW) A next-generation electronics goal, plus the possibility of surprising discoveries along the way inspires FLEET AI David Cortie's research. [Read David's profile.](#)

Highly-cited researchers recognised Three FLEET CIs were named in the 2018 Clarivate Analytics list, recognising researchers ranking in the top 1% by citations for their field. Michael Fuhrer and Qiaoliang Bao (Monash) and Kourosh Kalantar-zadeh (UNSW and RMIT). [Read more online.](#)



The kilogram is changing FLEET CI Jared Cole (RMIT) was interviewed for a BuzzFeed article about the new definition of the kilogram, and explains why he thinks the new system is both "beautiful and sophisticated". [Read more.](#)

Regional exposure A recent FLEET collaboration featured in the Association of Asia-Pacific Physical Societies (AAPPS) bulletin this month – a handy opportunity to talk about FLEET research and regional partnerships to an international physics audience. [Read the article online.](#)

Describing the 'that's interesting...' moment "While working on liquid metals a few years ago, I noticed that when you roll liquid metal on a substrate, the surface layer is left behind." FLEET's Kourosh Kalantar-zadeh [describes the initial observation that sparked recent liquid-metal](#)

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New partners: University of Camerino A new research partnership between FLEET and the University of Camerino (Italy) will join complementary strengths in the study of exciton superfluids. [Meet FLEET's two new Partner Investigators.](#)



Electrically, topological insulators resemble a chocolate block wrapped in foil: electrically insulating on the inside (the chocolate), but electrically conductive around the edges (the foil). This useful analogy was recently tested by the Ops team: results (and what happened to the chocolate afterwards) [are revealed online.](#)

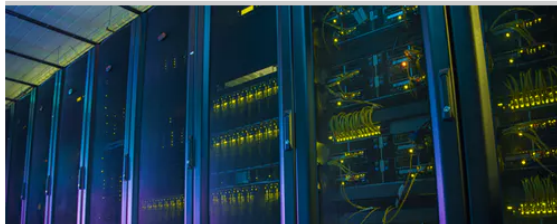
FLEET mission described in The Conversation

Daisy Wang and Jared Cole's recent feature in the Conversation describes the issue of ICT energy use, the end of Moore's Law, and the new fields of physics being investigated at FLEET to find a solution with new, low-energy electronics. [Read the article online.](#)

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The tools on our smartphones are enabled by a huge network of mobile phone towers, Wi-Fi networks and server farms. Shutterstock

Computing faces an energy crunch unless new technologies are found

Daisy Wang, UNSW and Jared Cole, RMIT University

The energy required to power the massive, factory-sized data centres that computers rely on already consumes 5% of global electricity. And that energy load is doubling every decade.

Summer School on ferroelectrics

FLEET sponsored the Summer School on Ferroelectrics at UNSW, which covered fundamental science and cutting-edge applications, catering for new and experienced researchers and students. The workshop was in-part organised by FLEET Research Fellows Daniel Sando and Peggy Zhang.

See the program at unsw-ssf.unsw.edu.au

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SYDNEY

Second Summer School on Ferroelectrics



FLEET is hiring: spread the word

FLEET is seeking talented researchers to fill three Research Fellow, Honours and PhD positions at Monash, UNSW, the ANU, RMIT and Swinburne.

You can see all the jobs at [FLEET.org.au/scholarships](https://fleet.org.au/scholarships) Please share amongst your network.

RESEARCH IN TOPOLOGICAL MATERIALS

RESEARCH IN EXCITON SUPERFLUIDS

RESEARCH IN LIGHT-TRANSFORMED MATERIALS

MONASH University

UNSW SYDNEY

Australian National University

RMIT UNIVERSITY

SWINBURNE SWINBURNE UNIVERSITY OF TECHNOLOGY

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

UNIVERSITY OF WOLLONGONG AUSTRALIA

Events next year

- **31 January** FLEET research seminar : toms on surfaces, Monash
- **5-8 February** Condensed Matter & Materials Meeting (“Wagga 2019”), Wagga Wagga, NSW
- **10-14 February** International Conference on Advanced Materials and Nanotechnology (AMN9), Wellington NZ
- **13-14 May** International Conference on Optics, Lasers & Photonics, Tokyo, Japan

Prizes & opportunities



The Melbourne Centre of Nanofabrication and ANFF Victoria

are seeking Masters or PhD interns to be partnered with industry clients to work on 2–6 month internship projects.

Australian Nanotechnology Network (ANN) funding for members to travel to Australian



APR]

APR provides internship opportunities within Australia for PhD students at various points in their candidature. [See current opportunities online](#). A current position in Melbourne ([generation of a solid model of a cutting tool](#)) indicates skills FLEET students might have, specifically programming, 3D graphics, etc.

Participating organisations

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



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