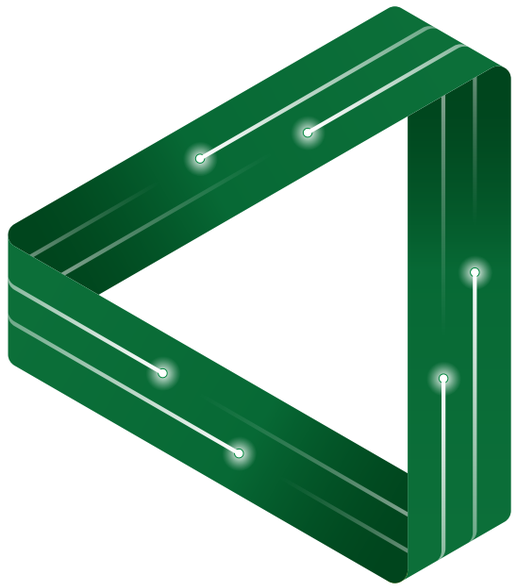


FLEET

ARC CENTRE OF EXCELLENCE IN FUTURE LOW-ENERGY ELECTRONICS TECHNOLOGIES

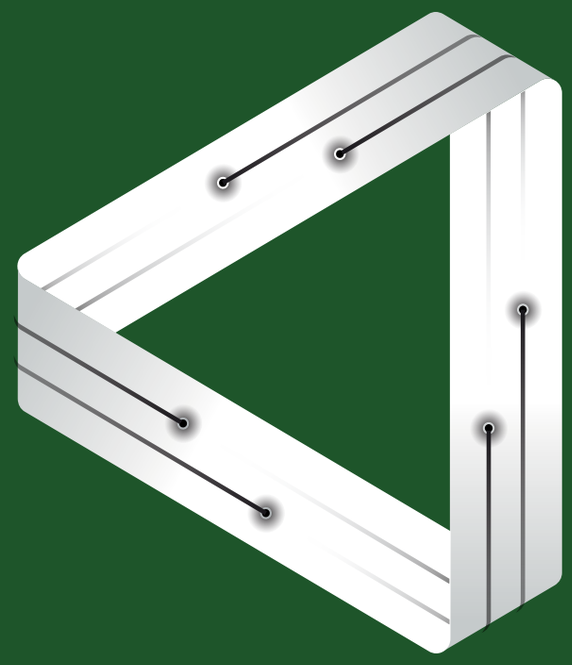
STRATEGIC PLAN 2018 - 2020

OUR STRATEGIC PRIORITIES

1	2	3	4	5	6
Enable discoveries at the scientific frontier	Develop next generation of science leaders	Establish synergistic partnerships with industry, academia & government	Foster equity & diversity in Science Technology Engineering & Mathematics (STEM)	Promote public science literacy	Facilitate internal and external communication to support FLEET's strategic goals

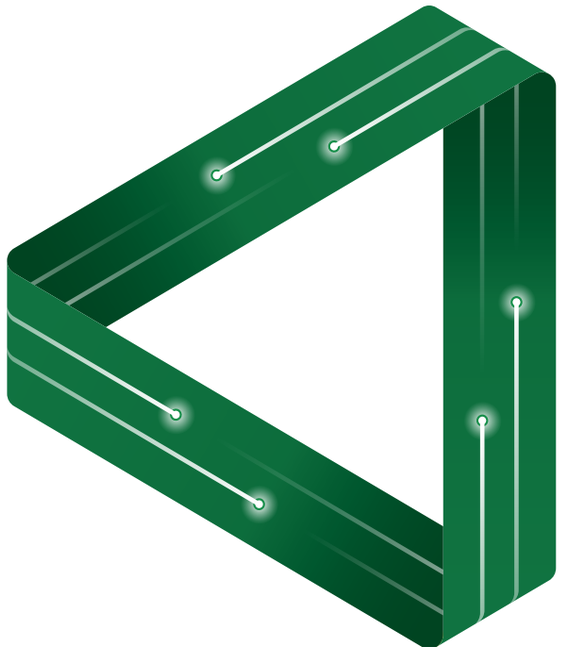
MISSION VISION

FLEET will develop the scientific foundation and intellectual property for a fundamentally new electronics technology, which will supercede silicon. The Centre will build capacity in Australia for advanced electronics research, and train the workforce for the electronics industry of the future. FLEET will place Australia at the forefront of the international electronics industry through the development of innovative electronics technologies.



FLEET envisions extending the information technology revolution sustainably into the future through a new, more energy-efficient computing technology developed in Australia.

OUR VALUES



INNOVATE

FLEET nurtures a culture of scientific curiosity to advance knowledge

COLLABORATE

FLEET seeks to build synergistic partnerships across disciplines with international research, industry and educational networks

ENGAGE

FLEET encourages team cohesion and cultivates a growth mindset

STRATEGIC PRIORITY 1: ENABLE NEW DISCOVERIES AT THE SCIENTIFIC FRONTIER

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
1.1 Realise topologically-protected dissipationless transport of electrical current at room temperature, and novel devices based on the ability to switch on and off this dissipationless current	Research Plan Pages 11-13	Research theme 1 researchers Enabling technologies A and B researchers	Project milestones and research outputs
1.2 Demonstrate exciton superfluidity at elevated temperatures	Research Plan Pages 14-15	Research theme 2 researchers Enabling technology A researchers	Project milestones and research outputs
1.3 Realise systems that exhibit dissipationless transport when driven out of equilibrium, using periodic (Floquet) and/or strong fields	Research Plan Pages 16-17	Research theme 3 researchers	Project milestones and research outputs

Research theme 1 - Topological Dissipationless Systems

Research theme 2 - Excitonic Dissipationless Systems

Research theme 3 - Dynamically-Controlled Dissipationless Systems

Enabling technology theme A - Atomically-thin Materials

Enabling technology theme B - Nano-device Fabrication

STRATEGIC PRIORITY 2: DEVELOP NEXT GENERATION OF SCIENCE LEADERS

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
2.1 Develop world-class training & mentoring programs	Education & Training Plan Pages 23-24	Education & Training committee	Number of members participating in mentoring programs as mentors and mentees and number of external mentors Number of research and professional development courses Number of members and non-members participating in centre training workshops Number of mentoring programs and number of organisational links in mentoring/ training programs
2.2 Establish centre succession planning	Succession Plan Page 18-19	Executive committee	A plan is in place
2.3 Facilitate opportunities for research collaboration 2.4 Establish a collaborative culture within the centre	Education & Training Plan Pages 23-24	Research leaders	Number of travel grants to facilitate collaboration Number of FLEET-wide colloquia and research seminars and workshops held Number of collaborative visits between FLEET and partners and intra-centre exchange of expertise Number of new organisations collaborating with FLEET
2.5 Identify opportunities for members to be recognised	Education & Training Plan Pages 23-24	Executive committee	Number of awards and grants received by members for their scientific and leadership achievements

STRATEGIC PRIORITY 3: ESTABLISH SYNERGISTIC PARTNERSHIPS

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
3.1 Establish international partnerships	Research Plan Pages 11-17 Industry Engagement Plan Page 22	Research leaders	Number of investigators, ECRs and students visiting partner organisations Number of visits to FLEET nodes by partners and collaborators
3.2 Establish links to industry and end users	Industry Engagement Plan Page 22	Industry relationships and Communications committees	Number of briefings to end-users and industry
3.3 Create a network to commercialise FLEET discoveries	Industry Engagement Plan Page 22	Industry relationships committee	Number of relationships with end-users established Number of industry engagement workshops held

STRATEGIC PRIORITY 4: FOSTER EQUITY AND DIVERSITY IN STEM

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
4.1 Foster a culture of equity and inclusiveness	Equity & Diversity Plan Pages 20-21	Equity & Diversity and Communications committees	Response rate to annual surveys High levels of satisfaction with FLEET workplace culture Compliance of all events organised or supported by FLEET with the Centre's Equity and Diversity guidelines
4.2 Increase diversity among all cohorts of researchers	Equity & Diversity Plan Pages 20-21	Equity & Diversity committee	Increased number of female researchers and HDR students across FLEET
4.3 Establish career support initiatives for women in FLEET	Equity & Diversity Plan Pages 20-21	Equity & Diversity committee	Increased retention rates of ECR women in FLEET Increased participation of FLEET researchers with family / carer's responsibilities in FLEET and / or external events
4.4 Establish a women-specific mentoring network	Equity & Diversity Plan Pages 20-21 Education & Training Plan Pages 23-24	Equity & Diversity committee Education & Training committee	Increased uptake of mentoring opportunities by women in FLEET through individual mentoring arrangements and mentoring workshops

STRATEGIC PRIORITY 5: PROMOTE PUBLIC SCIENCE LITERACY

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
5.1 Promote a sustained understanding of FLEET's work	Outreach Plan Pages 25-26	Outreach and Communications committees	Increased FLEET involvement in the education curriculum and scientific engagement events
5.2 Develop the scientific literacy of Australians through the use of teaching aids, classroom lessons and science demonstrations	Outreach Plan Pages 25-26	Outreach committee	Increased public awareness of scientific concepts Increased number of FLEET members participating in STEM Professionals in Schools
5.3 Promote the uptake of STEM subjects in schools	Outreach Plan Pages 25-26	Outreach committee	Increased number of girls choosing STEM subjects in senior years at partner schools Increased retention in STEM subjects from year 11 to 12 at partner schools

STRATEGIC PRIORITY 6: FACILITATE COMMUNICATION

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
6.1 Support centre strategic goals through internal communication using tools such as monthly e-newsletters	Communications Plan Page 27	Communications committee	Improvement in internal newsletter opens
6.2 Engage with scientific research community through research stories published on key online science platforms and stakeholders' newsletters	Communications Plan Page 27	Communications committee	Increased number of external newsletter audience
6.3 Promote FLEET research and scientific literacy to public through web content and social media	Communications Plan Page 27	Communications and Outreach committees	Number of social media audience reached on priority channels (Twitter, Facebook) Number of major mainstream media articles
6.4 Engage with key partners including the ARC, the government, participating nodes and collaborators through research stories, stakeholders' newsletters and social media	Communications Plan Page 27	Communications and Outreach committees	Number of briefings to government agencies and NGOs
6.5 Empower FLEET members to communicate their scientific work by providing communication skills training, resources and incentives	Communications, Outreach, Education & Training Plans Pages 23-27	Communications committee Outreach committee Education & Training committee	Number of non-peer reviewed articles Number of members discussing their science on social media Number of members presenting their research in a public forum Number of student members participating in Three-Minute-Thesis competition

RESEARCH THEME 1: TOPOLOGICAL DISSIPATIONLESS SYSTEMS

Strategic Statement: The goals of Research theme 1 are to realise topologically protected dissipationless transport of electrical current at room temperature, and novel devices based on the ability to switch this dissipationless current on and off.

Approach/Project 1: Electric-field tuned quantum phase transition. The electric-field tuned quantum phase transition (QPT) from conventional to topological insulator provides the basis for a topological transistor in which the topological insulator represents the "on" state with conduction through dissipationless edge modes, and the conventional insulator represents the "off" state. The goal is to develop topological insulators with wide band gaps and robust dissipationless or extremely low energy surface states.

Approach/Project 2: Coupling of topological materials to ferromagnets for realising Quantum Anomalous Hall Effect (QAHE), to provide dissipationless transport. Key questions we will address are:

- Is it possible to make van der Waals (vdW) heterostructures of 2D topological insulators with ferromagnetic insulators to realise QAHE?
- Is it possible to exploit the properties of ferro(ferri) magnetic oxide insulators, and use them as substrates for atomically-thin 2D materials?
- Is it possible to engineer oxide heterostructures to make topological electronic or magnetic systems?

Approach/Project 3: Develop encompassing theoretical and computational models to understand the interplay of topological effects and disorder in realistic structures and realistic devices. Models will range from material-specific electronic structure, topological features (surface/edge states), to effective Hamiltonian models of transport characteristics including disorder, and device models. Such multi-scale models will explain how the underlying chemistry, materials science and device imperfections control and limit the performance of nanoelectronic devices made from topologically interesting materials.

Approach/Project 4: Engineering artificial topological systems. The aim of this approach is to use advanced nanopatterning techniques to create artificial graphene and artificial topological insulators from different heterostructure material systems.

Approach/Project 5: Bottom-up synthesis of 2D topological material based on the on-surface coordination of organic molecules (pi-conjugated) with heavy transition metal atoms. Characterisation via LT-STM, LT-STS, LT-ncAFM, XPS, ARPES. Systems will be first grown on noble metal surfaces, then on less-interacting surfaces, e.g., graphene, hBN.

Approach/Project 6: To develop novel wide-gap topological insulators with robust dissipationless surface state and 2D magnetic topological insulators for QAHE. Single crystal growth and thin film deposition will be used to synthesise high quality topological insulator materials. Doping will be used to optimise the electronic properties of the materials. Surface modification will be achieved using low energy ion implantation. Approaches will include:

- Single-crystal growth + mechanical exfoliation
- Thin-film growth and surface modification (MBE + PLD + ion beam)
- Probing topological edge states in 2D materials with transport measurement
- 2D heterostructure on ferroelectric substrates
- Coupled topological insulator and TPI to engineer proximity effect.

RESEARCH THEME 1: TOPOLOGICAL DISSIPATIONLESS SYSTEMS

	MILESTONES & DELIVERABLES	YEAR	RESEARCHERS RESPONSIBLE
M1.1	Develop techniques for electrical probing of ultra-high vacuum (UHV)-prepared topological materials (Fuhrer/Schiffrin labs), such as capping, mesoscopic electrode fabrication, gate structures.	2019	Fuhrer, Edmonds, Schiffrin
M1.2	Electric field tuning of bandgap in van der Waals topological materials (links/overlaps with Enabling technologies themes A and B)	2020	Fuhrer, Medhekar, Hamilton, L. Wang, Kalantar-zadeh
M1.3	Understand phase of 2D Bismuth on various substrates - a possible 2D quantum spin Hall system with large bandgap on oxide FM layers (links/overlaps with Enabling technology theme A)	2020	Medhekar, Fuhrer, Edmonds
M1.4	Understand prospects of electric-field switching of QPT for low-voltage switching	2020	Fuhrer, Culcer, Cole, Medhekar
M1.5	DFT-validated effective tight binding models, preliminary transport models for a prototype material (few layer polytypes of Bismuth)	2019-2020	Medhekar, Cole
M1.6	Understand magnetic proximity effects at the interfaces of van der Waals heterostructures	2020	Cole, Medhekar
M1.7	Realise Quantum Anomalous Hall Effect and other topological devices via proximity effects (links/overlaps with Enabling technology theme B)	2020	Fuhrer, L. Wang, X. Wang, Cortie
M1.8	Develop theoretical models that include effects of disorder (Effective Hamiltonian, DFT, Density matrix)	2020	Cole, Medhekar, Culcer
M1.9	Fabricate artificial lateral superlattices in heterostructure materials such as GaAs, BFO/LAO/STO (links/overlaps with Enabling technology theme B)	2019	Klochan, Valanoor, Seidel, Hamilton
M1.10	Demonstrate artificial bandstructure effects controlled by engineered lateral superlattices in conventional materials	2020	Klochan, Valanoor, Seidel, Hamilton, Sushkov

RESEARCH THEME 1: TOPOLOGICAL DISSIPATIONLESS SYSTEMS

	MILESTONES & DELIVERABLES	YEAR	RESEARCHERS RESPONSIBLE
M1.11	Realise artificial topological systems by adding spin-orbit interactions to artificial graphene	2022	Klochan, Valanoor, Seidel, Hamilton, Sushkov
M1.12	Investigate whether 2D metal-organic nanomaterials can exhibit nontrivial topological properties	2020	Schiffrin, Medhekar, Fuhrer, Tadich, Edmonds
M1.13	Synthesise and optimise a wide-band gap topological insulator (links/overlaps with Enabling technology theme A)	2019	X. Wang, Yue, Zhao
M1.14	Synthesise and optimise a 2D ferromagnetic material with a high Curie temperature (links/ overlaps with Enabling technologies themes A and B)	2019	Yue, L. Wang, Cortie
M1.15	Achieve Anomalous Hall Effect, ideally Quantum Anomalous Hall Effect in a new magnetic system (links/overlaps with Enabling technologies themes A and B)	2020	X. Wang, L. Wang, Li, Xiang, Cortie, Yue
M1.16	Supply 2D materials (wide band gap) for Theme 2 and Theme 3 (links/overlaps with Enabling technology theme A)	2020	Li, X. Wang, Kalantar-zadah

RESEARCH THEME 2: EXCITONIC DISSIPATIONLESS SYSTEMS

Strategic Statement: aims to demonstrate dissipationless behaviour of excitons and exciton-polaritons at room temperature.

Approach/Project 1: Indirect exciton condensates in atomically-thin bilayer semiconductor heterostructures. Atomically-thin semiconductor layers separated by atomically-thin dielectrics will be fabricated in order to realise spatially indirect excitons with large binding energy (much greater than room temperature). We will study optical and electrical injection of excitons in these structures. The ultimate goal is to demonstrate exciton superfluidity at elevated temperatures (up to room temperature) with electrical signatures in interlayer tunneling and electron-hole counterflow.

Approach/Project 2: Exciton-polariton condensates and superfluidity in atomically-thin semiconductors at room temperature. Atomically-thin transition metal dichalcogenides (TMDs) will be integrated into high-Q microcavities enabling strong light-matter coupling and formation of polaritons. The ultimate goal is to demonstrate condensation and superfluidity of polaritons in the monolayers at room temperature, as well as a useful device (ultrafast switch).

Approach/Project 3: Topologically protected states of exciton-polaritons in atomically-thin monolayers.
The spin-valley degree of freedom in TMDs holds hope for enabling topologically protected transport in microfabricated artificial lattice potentials (hexagonal, kagome, etc) for exciton-polaritons without the need for a magnetic field. Fabrication of microstructured samples for this research would rely on reliable production of high-Q microcavities with embedded large-area (several tens of micrometers) monolayers. The experimental possibilities have to be re-assessed at mid-term. The realistic mid-term milestone is to investigate this system theoretically.

RESEARCH THEME 2: EXCITONIC DISSIPATIONLESS SYSTEMS

	MILESTONES & DELIVERABLES	YEAR	RESEARCHERS RESPONSIBLE
M2.1.1	Establish vdW fabrication facilities and produce bilayer structures (with support from Enabling technology theme B)	2020	Kalantar-zadeh, Hamilton, Fuhrer, Bao
M2.1.2	Observe indirect excitons and tunnel-coupling in optical experiments	2020	Fuhrer, Bao
M2.1.3	Fabricate samples and perform low-temperature measurements of interlayer tunnelling in 2D-2D structures	2020	Fuhrer, Kalantaer-zadeh, Hamilton
M2.1.4	Fabricate samples and observe indirect/bilayer exciton transport at low/room temperature	2023	Hamilton, Kalantar-zadeh, Fuhrer
M2.2.1	Fabricate microcavities with TMDs, observe strong light-matter coupling	2019	Bao, Lu, Ostrovskaya
M2.2.2	Characterise carrier dynamics	2019	J. Davis
M2.2.3	Characterise low-energy interactions in exciton systems	2019	Parish, Levinsen
M2.2.4	Observe condensation and superfluidity in a monolayer at cryogenic/room temperature	2020/2023	Ostrovskaya
M2.2.5	Investigate transition to Bardeen-Cooper-Schrieffer (BCS) regime, prospect for BCS superfluidity	2020	Ostrovskaya, Parish, Levinsen
M2.2.6	Develop a new theoretical formalism applied to describe polariton Bose–Einstein condensates (BEC) formation	2020	M. Davis
M2.2.7	Demonstrate (theoretically) emergent flow states of superfluids between reservoirs	2020	M. Davis
M2.3.1	Develop theory for topological states of TMD polaritons without magnetic field to guide future experiments in microstructured samples	2020	Parish, Ostrovskaya, M. Davis

RESEARCH THEME 3: DYNAMICALLY CONTROLLED DISSIPATIONLESS SYSTEMS

Strategic Statement: The goal of Research theme 3 is to investigate and realise systems that exhibit dissipationless transport when driven out of equilibrium, using periodic driving (Floquet) and/or single/few-cycle strong fields.

Approach/Project 1: Floquet states in 2D materials. Femtosecond laser pulses will be applied to atomically-thin (2D) materials, such as WS_2, in order to modify the Bloch bands. The effect of any modification to the Bloch bands of the conduction of the material will be studied. The ultimate goal being to create dissipationless conduction states in the material that can be switched optically. In order to spatially identify and characterise electronic conduction states in the 2D materials, an apparatus to measure magnetic field profile using nitrogen vacancy (N/V) centres in diamond films will be developed.

Approach/Project 2: Strong field, transient modification of materials. Study and control of ultrafast charge dynamics in both 2D and 3D materials will be investigated using few-cycle VIS/NIR/MIR (few- to sub-fs; in collaboration with MPQ) and THz (fs; Swinburne, Monash) waveforms. Such experiments will provide insights of the change and control of topological invariants (nontrivial to trivial, and vice versa) of 2D materials. THz-STM (system to be set up at Monash) and in-plane plasmonic nanostructures for local field enhancement will be investigated.

Approach/Project 3: Novel superfluidity in 2D Fermi gas. Produce and study a 2D Fermi gas of atoms close to a p-wave resonance. Investigate p-wave pairing either in equilibrium, utilising a Feshbach resonance, or non-equilibrium, via quenched interactions or rf-induced modification of quasiparticle distribution. The ultimate goal being the demonstration of topological superfluidity in a cold-atom system. Theoretically investigate dynamics of quasiparticle/impurities in superfluids, including the possibility of dynamical phase transitions.

Approach/Project 4: Spin-orbit coupled Floquet topological states. The generation of topological states in a Floquet system with spin-orbit coupling states will be investigated. Such a system will be realised in the spin-1/2 delta-kicked rotor implemented in a gas of cold atoms. A multidimensional spin-orbit coupled Floquet system can be realised by driving of the system at multiple frequencies. This will be utilised to study the generation of topological states in a multidimensional (e.g., $d > 3$) Floquet system. The utility of a time crystal perspective in the context of Floquet states will be investigated.

RESEARCH THEME 3: DYNAMICALLY CONTROLLED DISSIPATIONLESS SYSTEMS

	MILESTONES & DELIVERABLES	YEAR	RESEARCHERS RESPONSIBLE
M3.1	Demonstrate control of Floquet Bloch bands	2019	J. Davis, Kalantar-zadeh, Fuhrer, Bao
M3.2	Develop approaches to identify topological state	2020	J. Davis, Fuhrer, Wang, Helmerson
M3.3	Identify dynamic topological phase transition	2020+	J. Davis, Schiffrin, Helmerson
M3.4	Control of materials' topology via single cycle electromagnetic waveforms (non-Floquet)	2020	Schiffrin, J. Davis, Parish, Levinsen, Krausz, Schultze, Karpowicz
M3.5	Image current distribution in Floquet 2D material	2020	Helmerson, J. Davis
M3.6	Measure lifetime of p-wave resonance in 2D Fermi gas	2019	Vale, Dyke, Levinsen
M3.7	Demonstrate p-wave pairing in 2D Fermi gas	2020	Vale, Dyke, Levinsen
M3.8	Measure sound/transport in 2D Fermi gas	2020	Vale, Dyke, Levinsen
M3.9	Develop new theoretical approaches and numerical methods to treat dynamics of quantum impurities and quasiparticles	2020	Parish, Levinsen
M3.10	Investigate topological states in the delta-kicked particle (Floquet) system with spin-orbit coupling	2020	Helmerson, Parish, Levinsen, M. Davis
M3.11	Investigate topological states in multidimensional Floquet system	2020	Helmerson, Parish, Levinsen, M. Davis

SUCCESSION PLAN

Planning for continuity in leadership roles is an important element in ensuring success of FLEET's mission. FLEET's succession plan has the following goals:

- to ensure a continuity of leadership in the event of the departure of the Director, the Chief operating officer, or a Theme Leader from the Centre,
- to ensure that potential new leaders within the Centre are effectively mentored, such that they are capable and ready to take on leadership positions,
- to ensure that new talent is brought into the Centre, and
- to promote equity in the leadership roles within the Centre.

To accomplish the succession plan, FLEET has adopted the following strategies:

CONTINUITY OF LEADERSHIP

Director. In the event that the Director resigns or leaves FLEET, The Deputy Director of FLEET will be appointed as interim Director. Monash University will undertake an international search for a new Director with appropriate research credentials and leadership ability.

Chief Operating Officer (COO). In the event that the COO resigns from FLEET, Monash University will search for a new COO. In the interim, the Centre Executive Officer will work with Communications and Education & Training coordinators to carry out the COO's tasks.

Theme Leaders. To ensure a broad base of potential future leaders in FLEET, the Centre will provide leadership opportunities to its members, for example Chairs of Special Governance Committees, or Node Coordinator roles. Additionally FLEET will encourage members to engage in its career development program for mid-career researchers, as outlined below.

Communications Coordinator and Education and Training Coordinator. In the event that the coordinator resigns from FLEET, Monash University will search for a replacement. The business team will work with relevant Special Governance Committees to carry out the coordinator's tasks in the interim.

MENTORING FUTURE LEADERS IN FLEET

FLEET will offer multiple roles within the Centre which provide responsibility and an opportunity to build leadership skills. These include Chairs of the Special Governance Committees (Education & Training, Equity & Diversity, Outreach, Communications, and Industry Relations) and Node Coordinator positions where appropriate.

FLEET will facilitate four different mentoring programs for members at various stages of their careers:

- Academic mentoring program: for established researchers pursuing leadership positions in academia
- ECR mentoring program: for young researchers seeking mentorship from established researchers
- Women in FLEET mentoring program: for members seeking mentorship in overcoming challenges that are unique for women in the STEM sector
- Industry mentoring program: for members seeking insight from industry experts

SUCCESSION PLAN

BRINGING NEW TALENTS INTO FLEET

We anticipate that some CIs may depart FLEET or move to another eligible organisation within or outside of FLEET during the funding period of the Centre. The Executive Committee will review the research program and evaluate a strategy. This can include one or more of the following:

- working with a node to recruit a new CI at the node;
- adding a new CI or CIs to FLEET;
- adding new nodes to FLEET;
- rebudgeting to accommodate change in CIs; and/or
- changing the strategic plan to remove or add research directions.

To ensure that there are potential future FLEET participants, FLEET should encourage those with synergistic activities to become **Associate Investigators in FLEET** and to participate in FLEET activities.

FLEET will establish a competitive **Seed Fund for Associate Investigators** with the following goals:

- support emerging research ideas and new collaborations with the promise to advance FLEET's goals;
- support Associate Investigators and approaches that have promise for incorporation into FLEET or into a future Centre of Excellence funding bid; and
- increase diversity in FLEET.

PROMOTING EQUITY IN LEADERSHIP ROLES IN FLEET

The FLEET equity and diversity policy should be considered when carrying out the above strategies. In particular, the current FLEET makeup falls short of the goals for gender equity, i.e. 2 of 20 CIs are female, 1 of 5 Theme Leaders is female, and 1 of 5 Special Governance Committee Chairs is female.

In particular, FLEET will:

- seek female Partner and Associate Investigators as a way to bring more women into the FLEET research environment;
- encourage Associate Investigators to apply to the Seed Fund;
- consider diversity when leadership opportunities arise within FLEET; and
- identify and recruit new female CIs to FLEET.

EQUITY AND DIVERSITY PLAN

FLEET aims to ensure fair policies and workplace practices that comply with the equal opportunities policies at all participating organisations, eliminate all forms of discrimination, and increase diversity among all cohorts of FLEET researchers. The FLEET Equity and Diversity committee, which has representatives at each node, oversees the implementation of this plan.

STRATEGIC PRIORITIES:

4.1 Foster a culture of equity and inclusiveness

The FLEET Equity and Diversity (E&D) committee will monitor and implement the best practices in equity and diversity across the STEM sector, and will actively work to increase awareness of the gender equity issues (e.g., through encouraging the uptake of the implicit bias test), as well as of broader access and inclusion issues (e.g., promoting and encouraging uptake of the LGBTIQA Allyship training). All new personnel are referred to an online induction package that includes information on FLEET E&D policy and practices. These include E&D guidelines for all events organised or supported by FLEET.

The Equity and Diversity committee will monitor levels of satisfaction with equity and diversity culture in FLEET through annual surveys.

Targets:

- more than 30% response rate to annual surveys
- high levels of satisfaction with FLEET workplace culture
- compliance of all events organised or supported by FLEET with the E&D guidelines.

4.2 Increase diversity among all cohorts of researchers

In particular, FLEET will focus on gender diversity by:

- promoting participation of young women in STEM subjects through outreach activities overseen by the FLEET Outreach committee (see Outreach Plan)
- implementing recruitment strategies to attract women scientists at all career stages to FLEET
- Offer ‘Women in FLEET’ scholarships and fellowships for outstanding higher-degree research (HDR) students and early-career researchers (ECRs)
- Have 50/50 gender balanced representation on selection panels, where practical, ensure presence of FLEET E&D committee member on each selection panel; ensure that all members of the selection panel are aware of the implicit bias issues and gender-coded language
- Implement the “50/50 if not then why not” policy for shortlisting
- Actively encourage following family-friendly work arrangements, such as part-time appointments and project sharing.

The above recruitment strategy is reflected in the Multi-Institutional Agreement:

Annexure 5 - FLEET HR Recruitment policy.

Target:

- 30% women researchers and HDR students across FLEET.

4.3 Establish career support initiatives for women in FLEET

FLEET aims to create and maintain a working environment that serves to eliminate the conflict of research and family commitments. Career support initiatives for women scientists within FLEET aim to create gender equity in the workplace and retain female scientists. While addressing the gender equity problem, these measures are designed to improve the working environment for researchers of all genders:

• Aim to retain women after the first postdoc, e.g., through the Women in FLEET Fellowship

• Offer strategic support to a project if a leader is on maternity or paternity leave

• Assist with family travel and childcare expenses associated with a FLEET member attending a conference

• Promote and encourage positive family-friendly working practices across FLEET, such as:

- Flexible working hours
- Focus on the outcomes rather than physical attendance

Targets:

- Increased retention rates of ECR women in FLEET
- Increased participation of FLEET researchers with family/carer's responsibilities in FLEET and/or external events

4.4 Establish a women-specific mentoring network

FLEET aims to offer individual mentoring opportunities for women through matching of mentors and mentees within the mentoring program run by the Education & Training committee (see Education & Training Plan).

To ensure inclusion of women researchers in broader professional networks, FLEET will seek and involve external mentors. In particular, from 2019 FLEET researchers will be actively involved in the national Mentoring and Guidance in Careers Workshop (MAGIC) for women ECRs.

Targets:

- More than 80% uptake of mentoring opportunities by women in FLEET through individual mentoring arrangements and mentoring workshops.

INDUSTRY ENGAGEMENT PLAN

Strategic statement: FLEET's eventual goal is to deliver tangible outcomes regarding the development of low energy electronic components, for commercial applications, that strongly consider benefits to the society. As such, engagement with industrial partners, end-users and entrepreneurs are essential for all FLEET members for translational achievements.

The tentative FLEET goals and ambitions for industrial engagement and achieving IP/commercial KPIs are expressed in the following strategic statements:

• Help FLEET members in understanding the commercial value of their products – by attending their talks and identifying the commercial opportunities for their developments

• Work with the Education & Training committees to offer industry focused training to FLEET members such as workshops on entrepreneurship, commercialisation, business acumen, IP management etc.

• Specially train and nurture PhD students and early career researchers to:

(A) Make them industry ready – engage them with companies that are in contact with FLEET, attending industrially oriented workshops

(B) Promote entrepreneurship – attend business plan workshops and competitions, help them in spinning-off companies

• Constantly promote engagements with companies and commercial entities

• Develop strategic industry relationships with a focus on commercialisation outcomes

• Promote entrepreneurship at all levels

• Promote patenting and close engagements with research and industry divisions of universities and follow a very pro-active approach

• On an annual basis, survey FLEET members' current engagement with industry and their input to who else FLEET should engage with

• Align some specific development activities across FLEET with industrial partners

• Help the engagement of the companies for supporting future ARC Linkage, NHMRC Development, Acceleration commercialisation type grants – for many such grants, universities have to include 25 - 50% of the money and this should be lobbied. FLEET will also strategically fund seed activities when needed

• Maintain and expand relationships with current industry liaisons

• Access industry liaisons' expertise through FLEET organised workshop / mentoring program / inviting them to participate at our committee meetings

Performance Target	2018	2019	2020-2023
Patents applied	1	1	2
Technical briefings presented to targeted industry groups	0	1	1
Number of industry engagement workshops held	1	1	1
Number of presentations / briefings to industry / business / end-users	3	4	4
Total number of end-user relsationships established	6	10	10

EDUCATION AND TRAINING PLAN

Purpose: FLEET members will be provided with high quality training opportunities in order to allow our members to become well-rounded researchers and find employment in whichever field they choose. These opportunities will typically be provided for Early Career Researchers (ECRs), including HDR students and postgraduate fellows, but may also be offered to senior members if required.

STRATEGIC PRIORITIES:

2.1 Develop world-class training & mentoring

FLEET will provide training above and beyond what is offered at individual universities, by identifying different types of training available or needed, and circulating these around the nodes. Where possible, these training sessions will be aligned with university requirements and counted as professional development hours. In addition to training at individual nodes, high quality training prior to the Annual Workshop will be provided, taking advantage of all ECRs being together in the same place at the same time. Courses offered will include research development, such as grant writing skills, and professional development, such as media training. Training in gender equity and diversity will also be provided. Training that provides skills for members that will increase their employability will be provided. For example, skills desired by industry will be offered as part of FLEET training.

Target: When established, FLEET will offer a minimum of four development courses in research development, four courses in professional development and one in diversity and gender equity per year.

FLEET will partner with EQUS to offer the Idea Factory, a yearly event bringing ECRs together to learn communication skills in pitching and presenting work, working collaboratively with other ECRs, culminating in a presentation designed to obtain a grant.

Target: Yearly

FLEET will take advantage of an established Summer School program at ANU, aligning the topic to FLEET research approximately every two years. This will introduce a wider community to FLEET topics, and give ECRs an opportunity to build their knowledge base.

Target: Biennially

FLEET will provide mentoring programs, matching centre mentees with mentors within and external to FLEET. Guidelines and expectations for mentoring relationships will be communicated to participants and the Education & Training Committee will monitor these relationships over a period of time. Mentoring relationships will be organised based on the mentees' desire to obtain new skills and have someone in a particular area to talk to.

Target: Initially introduce pilot programs, targeting approximately 50 people within the centre, upgrading so that all ECRs and HDRs are part of at least one mentoring program, with all new members assigned a mentor as they become part of FLEET.

EDUCATION AND TRAINING PLAN

2.3 Facilitate opportunities for research collaboration

Internships of 3-6 months will be offered to PhD students to complete at partner organisations. The committee, together with CIs, will identify potential projects from partners, and determine appropriate HDR students to complete these projects. These will be completed at different stages of the students' candidature, based on university requirements.

Target: All completing PhD students should have completed a 3-6 month internship, either nationally or internationally, prior to the completion of their candidature.

The FLEET Education & Training committee will offer a grant scheme whereby members, particularly ECRs, will apply for funding to complete training at other institutions. For example, a researcher may desire training on a specific piece of equipment. They could then identify a group working with that equipment, and request funding to go and learn that technique at that lab. This will be a competitive process that would also provide the ECR an opportunity to practice their grant writing skills and receive feedback.

Target: Two grant rounds per year, offering up to a total of $20,000 in total, up to $5,000 per person.

2.4 Establish a collaborative culture within the centre

A regular series of colloquia will be established where ECRs present their research, which will be live-streamed to all nodes. This FLEET-wide colloquia series will give all members an opportunity to interact with FLEET members from other nodes while learning more about the work going on in other laboratories.

Target: Up to 10 seminars per year.

The Education & Training committee will offer the opportunity for researchers, particularly HDR students, to visit labs at other nodes for 2 - 5 days for the purpose of determining how these labs run and the work being completed. They will participate in the day to day activities in these labs for this purpose.

Target: All completing PhD students should have completed a 2 - 5 day visit to another lab before their thesis submission.

OUTREACH PLAN

FLEET is committed to outreach in order to further public awareness of science and its growing role in society, and contribute to building a STEM-proficient workforce. This will be achieved by increasing the number of students, particularly girls, undertaking STEM at senior secondary and tertiary levels. FLEET will do this by connecting with students, teachers and the public, committing to increase equity in physics, and participating in public events to bring FLEET research to the public.

Audience: FLEET outreach is aimed at school students, teachers and the broader public. This may also include more specialised groups such as industry, government, NGOs, etc.

FLEET Members: FLEET members are required to complete a minimum of 20 hours of outreach per year. This will take a number of forms, including presenting to the public, organising events, designing and developing educational resources, etc. FLEET members will be supported in this, and will be provided with training in ways to deliver outreach. FLEET prizes for outstanding efforts in outreach will be awarded as an incentive to members.

STRATEGIC PRIORITIES:

5.1 Promote a sustained understanding of FLEET's work

FLEET will be involved in public events as a way of bringing FLEET research to the public. These include Melbourne Knowledge Week, Sydney Science Fest, Scienceworks Astrolights and regular public lectures.

Target: Increased involvement in public events. FLEET was involved in presenting FLEET research in one event in 2018; this will be increased to three in 2019, with at least three per year after that. FLEET will also have an activity as part of National Science Week in each state where there is a node.

Timeline: FLEET will aim to have a National Science Week activity in one state in 2019, increasing this by at least one state/territory each year.

FLEET will develop a unit of work to be done as a Year 10 science elective at John Monash Science School. This unit will further be developed and offered online, and in schools.

Target: Unit of work to be completed for JMSS by FLEET members working in consultation with JMSS staff. Following completion and evaluation, changes can be made for online version.

Timeline: This unit will be tested in 2019 and developed for online completion in 2020

5.2 Develop the scientific literacy of Australians

FLEET will develop resources such as animations, demonstrations, teaching aids and classroom lessons for Australian schools.

Target: FLEET to continually develop hands-on activities and online resources that can be used in classrooms and demonstrations for use at events, such as Open Days.

Timeline: Ongoing development of activities, demonstrations and animations, linked to FLEET research.

FLEET will also develop relationships with Australian schools through STEM Professionals in Schools. FLEET members can participate as a “scientist in residence” at the school, present their own work or run activities for students based on the curriculum.

Target: Increased numbers of FLEET members signed up with STEM Professionals in Schools each year, doubling each year.

Timeline: A minimum of 10 FLEET members signed up in 2019, and 20 signed up in 2020, with increasing numbers each year.

5.3 Promote the uptake of STEM subjects in schools

To increase the numbers of girls doing STEM subjects, with a focus on physics, FLEET will connect with partner schools to offer outreach programs. For example, a 3-day, lab-based program for students to complete in school holidays, based on the Growing Tall Poppies campaign. This will be facilitated in FLEET labs in Term 3 holidays for Year 9 and 10.

The number of girls choosing physics in senior years at these schools will be tracked over the long term to determine connectedness to physics.

Target: Create lab-based activity for each practical group, possibly in conjunction with theoretical groups, aiming for at least one activity per node.

Timeline: Implement first activity for Term 3 holidays in 2019, with increased potential activities from there.

COMMUNICATIONS PLAN

FLEET's communications plan aims to facilitate internal and external communication channels to support the Centre's strategic goals.

STRATEGIC PRIORITIES:

6.1 Internal communication supporting the following strategic goals:

2.1 Develop world-class training & mentoring programs

2.4 Establish a collaborative culture within the centre

4.1 Foster a culture of equity and inclusiveness

Using tools such as internal newsletter to reinforce important Centre principles such as the importance of all nodes, reinforce collaborations between nodes/disciplines.

6.2 Communication to science/research community supporting the following goals:

3.1 Establish international partnerships

3.2 Establish links to industry and end users

Use stakeholders' newsletter, social media, briefings, research articles on key online science platforms and science media to raise awareness of FLEET research and discoveries, increasing opportunities for collaboration and raising profile of FLEET researchers.

Engage with thought leaders in semiconductors, 'beyond CMOS', ICT energy technologies.

Tools: supported by dual-purpose accessible/detailed content on website, research and other news stories

Target: grow total newsletter audience to 350 by end 2019

6.3 Public-facing communication that supports the following goals:

5.1 Promote a sustained understanding of FLEET's work

5.2 Develop the scientific literacy of Australia

5.3 Promote the uptake of STEM subjects in schools

Using social media and mainstream media to raise awareness of the background to FLEET research (namely, ICT energy use), societal value, and the research undertaken at FLEET. More widely, reinforcing the value of fundamental and applied science, and increasing science literacy (supporting goal 5.2). Supported by accessible content on website, research and other news stories.

Target: Social media audience 750 on each priority channel (Twitter, Facebook) by end of 2019

One major mainstream media article by end 2018; three by end 2019.

6.4 Communication to key partners including ARC, participating nodes, partner nodes, government, supporting the following goals:

5.4 Communicate background and results to partners and wider society

Communicate cutting-edge nature of research, and scientific/societal value of discoveries. Demonstrate FLEET's collaborative way of working, and centre's commitment to science leadership, including development, equity, STEM literacy.

Tools: stakeholders' newsletter, social media, research articles.

Target: NGO briefings three in 2019; Politician briefings three in 2019.

6.5 Empower FLEET members to communicate their own science, supporting the goal:

2. Developing next generation of scientific leaders

Provide skills training, incentives, resources in order for FLEET members to communicate their own research, developing future science leaders and improving authenticity of communications.

Target: 5 non-peer reviewed articles in 2019. 30 members/affiliates actively discussing their science on Twitter by end 2019.

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FLEET

ARC CENTRE OF EXCELLENCE IN
FUTURE LOW-ENERGY
ELECTRONICS TECHNOLOGIES