



School of Engineering

Okanagan Campus

ANNUAL REPORT 2020-21



During the pandemic, UBC developed campus protocols to ensure the health and safety of the community. Although the campus remained open, operations and activities were modified.

Welcome



MESSAGE FROM THE DEAN

Throughout this challenging and unexpected year, I continue to be humbled, and impressed by the dedication and accomplishments of the School of Engineering faculty, staff and students.

Even in the face of uncertainty, transitioning to online learning, disruption to our research activities, and large-scale systems transformation, we have watched our students, faculty, and staff maintain their focus and succeed. Importantly, the creativity and ingenuity of the School of Engineering has been on display through the past year in the research discoveries of our faculty and students.

I'd like to express my continued gratitude for everything you are doing to ensure our Faculty's success. The sustained success of the School of Engineering is a testament to the outstanding researchers, instructors, students, and staff that provide such a rich environment for all.

In the Faculty's strategic plan entitled "Transforming Tomorrow", we highlight our core purpose of discovery, design, and innovation within the context of providing top-tier education while championing a community of responsible professionals. Through this global pandemic, that core purpose has helped guide and motivate us as we now look to the future.

James Olson, PEng, PhD, FCAE

Dean, Faculty of Applied Science
Professor of Mechanical Engineering



MESSAGE FROM EXECUTIVE ASSOCIATE DEAN

The 2020-21 academic year was one that challenged us all, and ultimately demonstrated our resiliency. From transitioning to online learning to adapting research to address pandemic-related projects, the entire School of Engineering community has worked hard to empower each other and the greater community.

Overcoming challenges is the basis of engineering, and I have been proud to watch our students, faculty, and staff adapt to the many unexpected hurdles we encountered during the past year. As a School, we have emerged with a renewed focus to meeting and exceeding our goals as they relate to social innovation; particularly related to clean technology.

The School is thrilled to welcome ten new faculty during 2021. Together, they will bring expertise in data analytics, entrepreneurship, biomedical engineering, structural engineering, microbial engineering, and advanced manufacturing that will complement the existing research clusters while addressing current and future trends.

In the meantime, we are excited to share many of our accomplishments from this past year in the School's 2020/21 annual report.

Rehan Sadiq, PEng, PhD, FCAE, FCSCE

Executive Associate Dean, School of Engineering
UBC's Okanagan campus

By the numbers

Despite the pandemic, enrollment at the School of Engineering continues its upward trajectory and is among the fastest growing post-secondary engineering programs in Canada. Over 70 countries and territories are represented among the School's 582 international students; creating a diverse academic community.

1703 Undergraduate students

359 Graduate students

66 Faculty

32 Staff

UNDER-REPRESENTED STUDENT GROUPS

26% Graduate students are female

10% Increase in female undergraduate student enrollment since 2019/20

54% Increase in registered Indigenous students since 2016/17

UNDERGRADUATES BY YEAR

29% First-year

24% Second-year

24% Third-year

23% Fourth-year

UNDERGRADUATES BY PROGRAM*

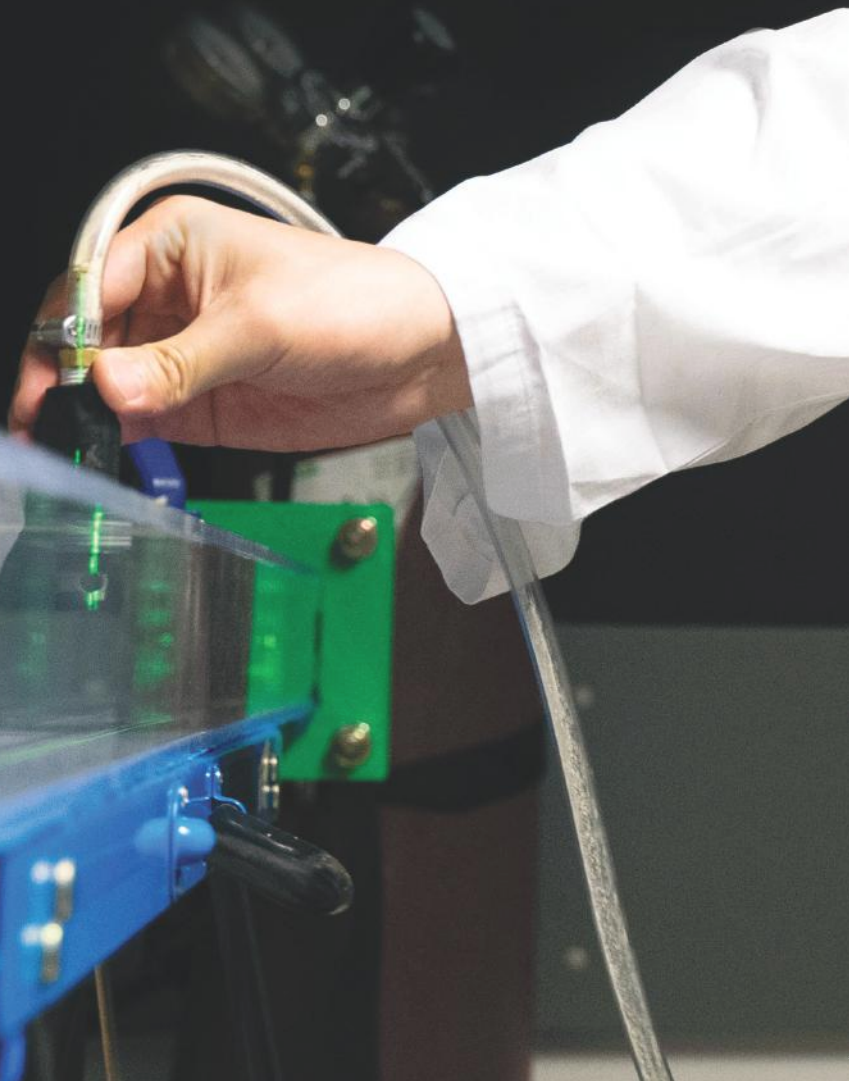
20% Civil

20% Electrical

2% Manufacturing

29% Mechanical

*All first-year students are considered undeclared







Research

Led by engineering researchers on the Okanagan campus of UBC, new funding from Western Economic Diversification Canada is spearheading an innovation hub that will promote clean technologies that convert carbon-based additives and components in new sustainable products. The Clean Tech Hub will be located at the new Innovation Precinct One (IP1) Building opening in Summer 2021.

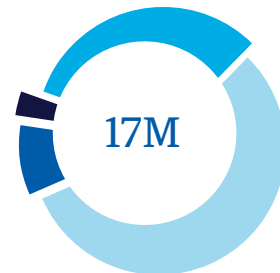
With a broad inter-disciplinary approach to research, School of Engineering researchers are exploring diverse challenges facing industry and communities around the world. In 2020/21, engineering researchers led 455 projects with partners in the Okanagan and beyond. Total research funding continues to grow with a goal of reaching \$25-million dollars by 2024.

Four School of Engineering researchers were recognized for being among the top 2% of cited scientists worldwide in their fields according to a recent Stanford study. Executive Associate Dean and Civil Engineering Professor **Rehan Sadiq** was joined on the list by Civil Engineering Professor **Solomon Tesfamariam**, and Electrical Engineering Professors **Julian Cheng** and **Stephen O'Leary**.

2020/21 Funding

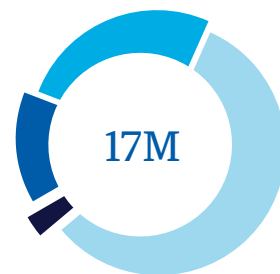
FUNDING BY SOURCE

32%	Tri-Council Funding \$5,639,093
3%	Infrastructure \$475,258
9%	UBC Internal Funding \$1,630,542
56%	Other External Funding \$9,709,111



FUNDING BY DISCIPLINE

26%	Civil \$4,475,021
14%	Electrical \$2,546,664
3%	Manufacturing \$477,500
57%	Mechanical \$9,954,820



Research Headlines

REMOVING TOXIC CHEMICALS

Researchers at the Nanomaterials and Polymer Nanocomposites Laboratory create cost-effective material that can help remove toxic chemicals, like cancer-treatment drugs, from water supplies - **Farhad Ahmadjokani** and **Mohammad Arjmand**

ICE MONITORING

UBCO's Okanagan MicroElectronics and Gigahertz Applications (OMEGA) Lab develops microwave sensor that improves the real-time monitoring of frost and ice build-up along with the rate of melting - **Mohammad Zarifi**

TIMBER CONSTRUCTION

New research from UBC Okanagan, in collaboration with Western University and FPInnovations, points to timber as a sustainable and effective way to make tall, high-density, and renewable buildings - **Solomon Tesfamariam**

GAS TURBINE ANALYSIS

UBC researchers lay the ground-work to improve gas turbine engine design through debunking a 40-year old theory used as a basis of understanding how combustion is calculated - **Sajjad Mohammadnejad** and **Sina Kheirkhah**

TRACKING SHIPMENTS

Using deep learning algorithms, including cloud computing technology, researchers have created monitoring software that can be used by shipping companies to track shipments more effectively in real-time - **Zheng Liu**

MONITORING COVID TRAVEL PATTERNS

Researchers at the Centre for Transportation and Land Use Research (CeTLUR) are collaborating with the University of Auckland and Wayne State University to explore changes in the way we work, study, and travel as a result of COVID - **Mahmudur Fatmi**

AIRBORNE INFECTION CONTROL

UBC Okanagan researchers collaborate with Care Health Meditech to create a synchronous, local collection device (AIIR) for the dental industry. The device is designed to add an additional layer of airborne infection control - **Sunny Li**

OPTIMIZING DATA NETWORKS

Researchers at UBCO's Communication Theory Lab test a process that merges existing 3G networks with 5G networks to optimize efficiency and enhance performance - **Anas Chaaban**

IMPROVED HEART VALVES

A team of researchers at the Heart Valve Performance Lab (HVPL) develop a way to improve overall blood flow through heart valves, so the design of mechanical valves more closely match the real thing - **Hadi Mohammadi**

TREATING BACTERIAL INFECTIONS

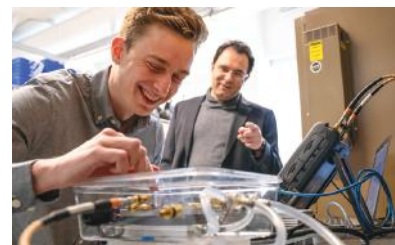
Using genetic material analysis and machine learning, researchers pinpoint several key factors to ensure successful fecal microbiota transplants (FMT), which have proven successful in treating bacterial infections in the gut including illnesses like C. difficile and Crohn's Disease - **Negin Kazemian** and **Sepideh Pakpour**

POWER SYSTEM RESILIENCY

As power grids are increasingly being impacted by climate change factors such as forest fires and severe weather, UBC researchers are investigating ways to make power systems more resilient - **Yuri Rodrigues** and **Morad Abdelaziz**

RECYCLED CONCRETE

Five-year study of recycled concrete shows it performs as well, and in several cases even better, than conventional concrete in terms of strength and durability - **Shahria Alam**



Innovation & Entrepreneurship

Social Innovation & Impact

Whether providing students with experiential learning opportunities or new funding for student-led start-ups through the newly-launched Innovation, Entrepreneurship & Impact (IEI) Fund, the School of Engineering is championing positive change through innovation.

Launched in 2021 as part of a 2-year pilot project to build a strong foundation for student-led start-ups, the IEI Fund encourages interdisciplinary student teams to undertake viable projects to solve real-world problems. Innovation, Entrepreneurship & Impact mentors include Drs. **Kenneth Chau**, **Alon Eisenstein**, and **Ray Taheri**.

Students Leading Change

The School's newest student design club, **Innovate, Design, Sustain (IDS)**, seeks to uncover innovative engineering and scientific solutions to create a more sustainable environment on campus and throughout the Okanagan. Spearheaded by three undergraduate students, the new club is registered with the UBC Okanagan Students' Union.



Student Entrepreneurship

AQUAHACKING FINALISTS

Two UBC Okanagan teams finished among the top 5 in the 2020 BC Aquahacking Challenge. Team **GAPSS (Gravity Assisted Particle Separation Systems)** placed second and **Team Elite** placed fourth. Both teams pitched initiatives to address stormwater contamination. A number of student teams from APSC 169 submitted proposals to the online competition that sought solutions to B.C.'s greatest water challenges.

ALUMNI ENTREPRENEURS OF THE YEAR

2021 e@UBCO Entrepreneur of the Year - Alumni Category awarded to Engineering alumni including **Pouria Mehrabi**, **Arpan Kandola**, **Michael Oyatsi**, and **Mohamed Gamal**.

FEDERAL FUNDING

Happipad Technologies Inc., founded by an engineering alum, has been awarded a \$250,000 grant under the National Housing Strategy Demonstrations Initiative to expand its web-based companion housing platform in partnership with 18 community organizations in Western Canada.

QUICK PITCH WINNERS

Engineering students were big winners at the 2021 MNP Quick Pitch Competition hosted and judged by the Valhalla Angels Investor Group.

GAPSS - Gravity Assisted Particle Separate System took first prize - the stormwater decontamination system was developed by second year engineering students **Jacob Sol** (Civil), **Cole White-Robinson** (Mechanical), **Jayden Wong** (Electrical), **Graeme Kumagai** (Electrical) and **Rudransh Kumar** (Engineering Physics).

Cloudtrac placed second - a theft-prevention system for motorcycles and other vehicles - founded by fourth year engineering student **Connor Scott** (Electrical) and alumnus **David Rojas**, BBA.

Agronome finished third - a smart agtech platform targeting farmers in Africa founded by **Michael Oyatsi**, a UBC Okanagan Mechanical Engineering alumnus and **Kennedy Wafula**.

Wireless Innovation

DR. JULIAN CHENG

2021 UBC Okanagan Researcher of the Year (NSERC category)

Dr. Cheng's research focuses on the theory and applications of wireless communications. He has an exceptional publication record with over \$2M in research funding. Through his leadership, UBC has expanded its connections to China, and emerged as an important contributor to the international wireless communications research community.

Dr. Cheng's area of expertise is digital communications and signal processing. He continues to make important contributions to the subject of code-division multiple access (CDMA) and performance analysis of digital communication systems with co-channel interference. Dr. Cheng's latest research focuses on using deep learning techniques for designing massive MIMO millimeter-wave systems and large-scale intelligent reflecting surface aided communication systems.



Excellence

Research Excellence

The Principal's Research Chairs (PRC) program at UBC Okanagan provides internal funding support for top-tier researchers engaged in outstanding research or creative scholarship.

Three PRCs were announced for Engineering faculty in early 2021 as part of the program's second cohort of appointments.

Shahria Alam, *Professor of Civil Engineering*
PRC Tier 1 Resilient and Green Infrastructure

Jian Liu, *Assistant Professor of Mechanical Engineering*
PRC Tier 2 Energy Storage Technology

Lisa Tobber, *Assistant Professor of Civil Engineering*
PRC Tier 1 Women in Engineering

These new appointments highlight the importance and quality of research on the Okanagan campus. The research findings and creative scholarly activities of these outstanding researchers will translate into tangible benefits to the local region and global society.

National Recognition

Mechanical Engineering Professor **Abbas Milani** was named a new member of the *Royal Society of Canada's College of New Scholars, Artists and Scientists* in January 2021.

The College of New Scholars, Artists and Scientists is Canada's first national system of multidisciplinary recognition for the emerging generation of Canadian intellectual leadership.

Micro-Credentials Take Flight

The Skills in Industrial Automation was one of two programs launched by UBC Okanagan in early 2021 as part of the Province's initiative to develop short-duration training for British Columbians to reskill or upskill. The programs are currently being delivered online and learners earn a non-credit letter of proficiency, which includes a traditional paper copy of the credential and one or more digital badges which can be shared on their professional social media profiles.





Teaching Excellence

DR. JANNIK EIKENAAR

2021 UBC Okanagan Provost Teaching Excellence & Innovation Award Recipient



Dr. Eikenaar was also named one of two inaugural recipients of the Marshall Bauder Professorship in Experiential Learning and Leadership. In that role, he will build on existing activities in the Faculty of Applied Science to create a leadership and experiential learning program with a strong

focus on equity, diversity and inclusion, and traditional teamwork values.

A passionate and engaging teacher, Dr. Eikenaar is dedicated to supporting his students and making the School of Engineering's learning spaces more inclusive, diverse, and engaging.

Awards & Recognition

Gordon Lovegrove

2020 EGBC Community Service Award

Mehran Shirazi

2021 Canadian Federation of Engineering Students Association Appreciation Award

Mina Hoorfar

2021 Canadian Society for Mechanical Engineering Emerging Technologies Medal

Kasun Hewage & Rehan Sadiq

Canadian Society for Civil Engineering Fellowships

Mohammad Arjmand

2021 Polymer Processing Society Polymer Processing Society Early Career Award

Saif Aldabagh

Top Presentation at the SEABC YMG Competition 2021

Levi Bieber & Negin Kazemian

Alexander Graham Bell Canada Graduate Scholars

Solution Focused

2020/21 FISCAL YEAR PROJECTS

- 15% Electrical - 69
- 29% Civil - 131
- 2% Manufacturing - 8
- 54% Mechanical - 247



PUBLICATIONS

- 507 Scholarly Outputs
- 57% Outputs in Top 10 Citation Percentiles*
- >18K Total Citations (2020)

*Publications in Top 10% Journal Percentiles by CiteScore Percentile

SCHOOL OF ENGINEERING OPERATING BUDGET

Operating Expenses	Capital Expenses	Faculty Salaries	Other Salaries & Benefits	Total Expenses
\$337,000	\$615,000	\$8,164,000	\$2,950,999	\$13.69M



Interdisciplinary Research

School of Engineering researchers are playing key roles within interdisciplinary teams as part of two 2020 Clusters of Research Excellence initiatives.

AIRBORNE DISEASE TRANSMISSION EMINENCE RESEARCH CLUSTER

This Research Cluster is developing infection isolation and removal solutions, and devices designed to mitigate the transmission of COVID-19 and other airborne illnesses in healthcare settings.

Co-Lead
Sunny Li

Cluster Research Team Engineering Faculty
Joshua Brinkerhoff, Sina Kheirkhah and Vicki Komisar

AGING IN PLACE EMINENCE RESEARCH CLUSTER

This cross-sectoral research is helping older adults 'age in place' or remain in their homes, safely and comfortably.

Lead
Jennifer Jakobi
(Health & Exercise Sciences)

Cluster Research Team Engineering Faculty
Vicki Komisar





Student & Alumni Success

With over 2000 graduates since the first graduating class in 2009, School of Engineering alumni have become a major force throughout industry and academia in Canada and around the world. The lessons they learned at UBC and the networks they developed are the foundation of their success.

2020 Convocation Numbers

21 PhD	29 MEng
36 MASc	249 BASc

New Faces

The School of Engineering continues to grow and welcomed new faculty and staff during 2020/21.

FACULTY



Ahmad Al-Dabbagh

Assistant Professor, Manufacturing & Principal's Research Chair in Control Systems (Tier 2)

Dr. Al-Dabbagh's research interests are in the area of control systems, and focuses on networked cyber-physical systems and process data analytics.



Michael Benoit

Assistant Professor, Manufacturing

Dr. Benoit investigates the development of crack-free Al alloys for additive manufacturing.



Vicki Komisar

Assistant Professor, Mechanical

Dr. Komisar uses the tools of biomechanics and motor control to uncover solutions that improve balance control and reduce the risk for falls and injuries through assistive technologies and built environments.



Alon Eisenstein

Assistant Professor, Technical Communications & Entrepreneurship

Dr. Eisenstein has a background in chemistry and entrepreneurship, he champions experiential learning pedagogy to develop entrepreneurial and professional skills in students.



Babak Mohamadpour Tosarkani

Assistant Professor, Manufacturing

Dr. Tosarkani's research focuses on the application of possibilistic programming, robust optimization, and stochastic programming to deal with uncertain parameters in decision-making problems.

STAFF



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Lab Technician V



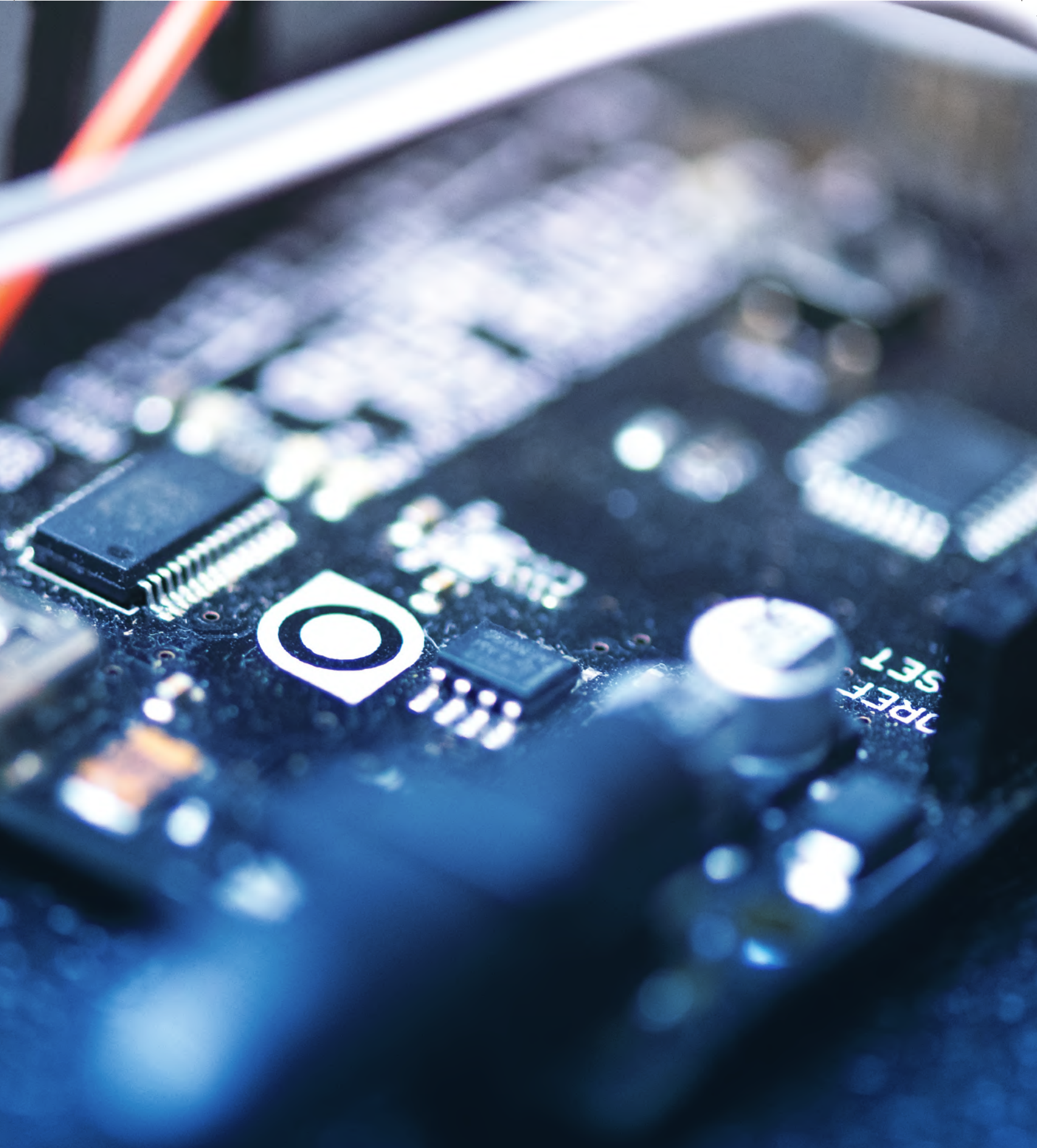
Adam Cornford

Geering Up Coordinator



Grant Topor

Professional Development Officer



THE UNIVERSITY OF BRITISH COLUMBIA

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