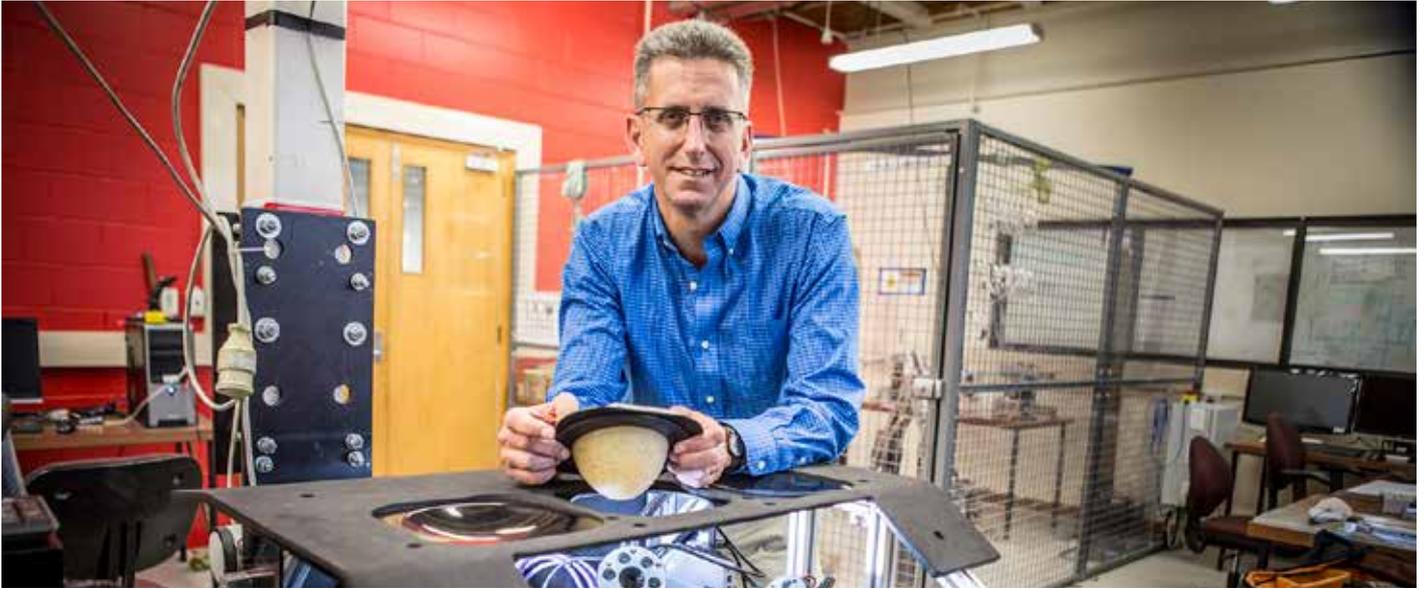


Recent Achievements



Finding new and inexpensive ways of detecting breast cancer

The Digital Image Elasto-Tomography, or DIET for short, is a new method for non-invasive early breast cancer detection.

The brainchild is Mechanical Engineering's Distinguished Professor **Geoff Chase** and his team of researchers. The technology uses digital image data from the surface motion of vibrating

breast tissue to look for any stiff or malignant masses within the breast tissue.

According to the Ministry of Health, breast cancer is the third most common cancer in New Zealand and results in over 600 deaths every year. It is more likely to be found in women over the age of 50, but regular screening for women in their 20s,

30s and 40s can lead to early detection and treatment.

In 2017, Prof Chase and his team published a research paper entitled "A Surface Vibration-based Method for Tumor Detection of Women Breast in a DIET System" wherein they detailed the methods used to accurately detect cancerous tumours without 'misidentifying other regions or a healthy no-inclusion phantom.' The research team spun off into a company called Tiro Medical and raised \$450,000 from Callaghan Innovation in 2015. The mobile screening machine does not use any radiation methods to detect breast cancer. The young company has carried out a clinical study to improve its system and plans to have larger clinical trials in the near future.

Tiro, which is partly owned by the University, currently sponsors consulting research at the University, including that for a Five Year Plan. **Zane Ormsby** is one of the two UC grads employed by Tiro. Zane is pursuing his Master's in Mechanical Engineering as a part of his work with Tiro.

Head of Department

Dear Alumni & Friends of the Department, we are very pleased to introduce the first edition of the MECH CONNECT to keep you informed and up to date about the happenings in the Department of Mechanical Engineering! In this edition, read about our recent achievements in Bioengineering and 3D printing.

We are also delighted to announce the opening of our new labs, which spread over 4,000 m², and feature cutting edge R&D

equipment! We would love for you to visit the labs and socialise with us on 16 August (please find details on our Facebook page).

I am looking forward to welcoming you here!

A/Prof Shayne Gooch



Recent Achievements



3D printed titanium car engine makes waves globally!

Four hours of sleep? – check

Chugging on copious amounts of Red Bull?
– check

Designing, building & 3D printing a reliable titanium engine for the UrbanConcept car?
– check

Technical inspection of the car and engine a success? – check (more like hurrah!)

Great driver to drive it in an Eco-marathon?
– check

Impressed judges? – check

Sponsors on board? – check

Winning an Innovation award beating over 100 teams from 21 countries?
Priceless!

While easy to read for us, these tough questions must have been at the top of the minds of UC Team EnduroKiwis and faculty advisor Bruce Robertson. All the adrenaline and excitement must have paid off when the results for Shell Eco-marathon Asia 2018 were announced, making EnduroKiwis the winners of the Technical Innovation Award trophy and a sweet as US\$3,000 (~ NZ \$4,200)!

The cherry on the top of this achievement was hearing the judges gush about the team's self-designed 3D printed titanium engine. They lauded it for being a stronger engine with finer and intricate details, optimized not just for production efficiency but also for being engine fuel efficient! EnduroKiwis, consisting of Robbie Murray, Ben Murton, Tim Marsh and Bruce Robertson were at the Shell Eco-marathon track at Changi Exhibition Centre in Singapore in March

2018. The project was supervised by **Dr Don Clucas**. This kind of success could not have been possible without the help of technicians Ken Brown, Scott Amies, David Read and Garry Cotton!

Of the win, Robertson said, "When competing internationally it always strikes me that we might be doing a particularly good job of educating engineers at UC. We are also so honoured to have such generous support from our external partners including Shell NZ, Singapore Airlines Cargo, and Rodin Cars. Without their support the world might have one fewer glimpses of what Kiwis can do."

In 2017, the UC EnduroKiwis team won the Design award at the Eco-marathon for producing a car keeping recyclability in mind, using a refreshing and holistic approach to design and using a common, light, low cost and easy to reuse material: thermoplastic.

Our Staff

A/Prof Dan Zhao joins ME

The Department welcomes Associate Professor Dan Zhao as a new staff member. When not playing his favourite tennis or golf, Dan is busy digging into aerospace engineering, combustion and energy, aeroacoustics, energy harvesting, gas/hydro turbines, noise control, renewable energy, tornado and propulsion among others.

His research areas have included theoretical, numerical and experimental approaches to study combustion instability, thermoacoustics, fabric drying, energy conversion, heat and mass transfer, fluid-structure interaction, aeroacoustics, aerodynamics, propulsion and energy harvesting.

After completing his Master's degree at the University of Manchester, Dan pursued a PhD at the University of Cambridge in 2005. By now, he has supervised 5 PhD students, 4 post doctorates and 4 research associates. Dan has been awarded and has completed several projects from various Singaporean organisations like the National Research Foundation, the Civil Aviation Authority Singapore, grants from the Nanyang Technological University and Ministry of Defense. He has also researched for the Singaporean Marine and Energy industries and completed projects from the Singapore Ministry of Education, Ministry of Defense and Singapore Prime Minister's Office (NRF).

In addition to these achievements, Dan is also actively involved in the editing of several SCI-indexed journals such as the Journal of Aerospace Science and Technology, the Journal of Low Frequency Noise, Vibration and Active Control, and Progress in Aerospace Sciences.

He counts Irvine and Ukiah in the USA and Cambridge in the UK as his favourite cities. A big hearty welcome to the Department!



Our Facilities

ME inaugurates new labs with state of the art research equipment

The Department has unveiled new laboratories with cutting edge tools and equipment for teaching and research.

- an Automotive Lab for the FSAE showroom workshop
- a Dynamometer with a 300kW extraction system

- an Advanced Manufacturing Laboratory with multiple 3D printers, including a Stratasys Connex 350, a large flatbed laser cutter, an HTC Vive virtual reality setup and a Kreon ace arm with Solano laser scanner
- a Capstone Gas Turbine
- a Mechatronics facility

- flexible Space which will shortly feature a 1200 x 1200mm MDF router and
- A large entrance space for seminars, displays and events.

If you're visiting Christchurch or plan to visit the University, we'd love to have you over to show you around! For further details please e-mail us: mechpublicity@canterbury.ac.nz

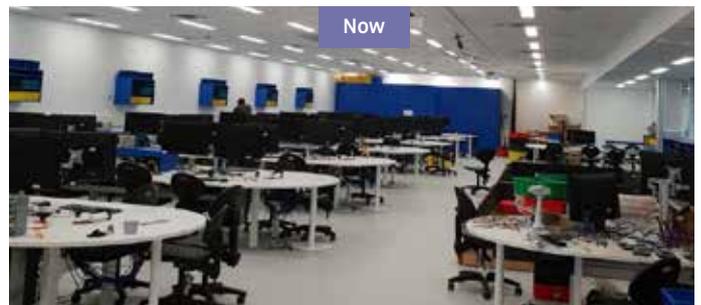
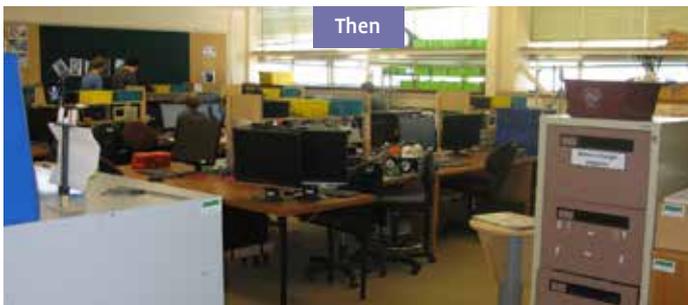
3D Printing/Design Lab



Project Space



Mechatronics Lab



Student Workshop



Our Students

Matariki Doctoral Scholarship for Jake Campbell's research in Bioengineering

The Dept of Mechanical Engineering congratulates PhD student Jake Campbell for being awarded the UC Matariki Doctoral Scholarship for his research in Bioengineering!

The scholarship is awarded to full and part time Maori students pursuing a research doctoral degree at the University.

Jake is supervised by Dist Prof Geoff Chase and Dr Chris Pretty, whose research work involves intensive care and acute care medicine, biomedical and physiological systems modelling; and bioengineering, mobile robotics, model-based therapeutics, among other similar and related fields respectively.

Jake's current research title is "Cardiovascular Monitoring of the Neck to Obtain Venous and Arterial Oxygen Levels." Of



Jake's research, Prof Chase says, "Jake Campbell is working on advanced mechatronics and medical sensors around sensing venous oxygen in the blood non-invasively. We've done this with pulse oximeters on the finger and are now looking to do so on the neck."

Prof Chase adds, "Venous oxygen is important as it tells you what level of oxygen is being taken up by tissues from the arterial blood. This is vital

in managing critically ill patients who need breathing and/or circulation support (a large number to most). Currently, venous oxygen can only be measured in the hospital via blood sample and expensive equipment. Non-invasive, continuous and real-time sensing using light (what we are doing) would radically change that situation."

From Alumni

Bioengineering PhD Kent Stewart furthers career at The Institute for Medical Device Technology in Stuttgart, Germany

After successfully bagging a PhD in Mechanical Engineering at UC, **Kent Stewart** is now a post doctorate at The Institute for Medical Device Technology in the University of Stuttgart, Germany. Kent says that travelling internationally for conferences motivated him to seek the vast research opportunities and resources overseas, which in turn directed him to go overseas.

At the University of Stuttgart, Kent works on supervising student engineering projects, labs and assisting with lectures, and also conducting research in areas such as surgical robotics, medical imaging, and personal medical assistance devices. Kent completed his PhD under the supervision of **Dr. Chris Pretty** and **Dist. Prof. Geoff Chase** at the UC Centre for Bioengineering.



In his PhD thesis titled "Model-based glycaemic control using subcutaneous insulin for in-patients", Kent developed, simplified and improved the STAR protocol – Stochastic TARgeted (STAR) model-based Glycaemic Control (GC) used for all patients in the ICU – for better suited use with patients having Type 2 diabetes, making it more adaptable for a range of settings.

He also designed and initiated a clinical trial at St George's Hospital in Christchurch to further investigate the metabolic behaviours of individuals with Type 2 diabetes. This clinical trial is currently running.

In his free time, Kent enjoys exploring the many activities and cultural experiences in Germany. The ME department wishes Kent all the success in his future endeavours!

Alumni events

Come to see our labs and socialize with us on the 16th of August (find details on our Facebook page).

Keep up to date and stay in touch

Website: canterbury.ac.nz/engineering/schools/mechanical/

Facebook page: facebook.com/UCMechanical

E-mail: mechpublicity@canterbury.ac.nz