ALGAL PHENOMICS FACILITY

Australia's and world-first phenomics facility designed for high throughput screening of algal strains, mutants and transformants in a dynamic environment.

We are a multi-disciplinary group of scientists and engineers accelerating the use of algae and algal-based bioproducts for industrial applications to support the transition to a sustainable bioeconomy by developing and fostering collaborative research between industry, government, and academia.

UTS
Climate Change Cluster

UTS is harnessing the power of microalgae, robotics and artificial intelligence to modernise key sectors of the economy and hasten the global move away from fossil fuels as an energy and materials source

What makes the Facility unique?

Fully automated, multi-instrumented and capable of running 24/7, the Facility can do high-throughput liquid handling which cuts the time to perform phenomics experiments many hundreds, if not thousands of times over.

How does it work?

The single-celled microalgae are grown in "hotels" with each floor of the hotel growing the same species but under different growth parameters. Once grown, they are automatically sent through a series of machines that assess their qualities (also known as traits), and the strain with the highest yield is selected as the elite strain. With machine learning capabilities, the Facility can then recommend the specific growth conditions that optimise the yield of a particular compound or metabolite of interest.

This is not GMO, it's accelerated evolution.

What is the Algal Phenomics Facility?

The only facility of its kind anywhere in the world, the UTS Algal Phenomics facility has the ability to rapidly screen, test, evolve and characterise algae to optimise their potential for developing new products, accelerate production and innovate sustainable biology.

It creates enormous possibility to improve both the bottom line and sustainability of organisations, ranging from start-ups to multi-nationals and from government to non-profit and environmental groups. We encourage you to start a conversation with us and find out how we can help.

What is algal phenomics and why is it exciting researchers?

Because algal phenomics is such a rapidly evolving and innovative field, let's cover some basics.

While the study of phenomics has been used for hundreds of years to improve the quality and yield of food types by varying the conditions they are subjected to, the typical improvement cycle can take several months to many years and use significant resources and land.

To speed this process up, as well as expand the potential of algae to create new products and services, UTS researchers have designed the Algal Phenomics Facility. With aims that include understanding, classifying, screening and tailoring the properties of the organism in question (in this case microalgae) the Facility is exploring an enormous variety of commercial and environmental applications across many industries.

The Facility is also exciting because of the potential of microalgae to reduce industry's reliance on fossil fuel-based products in terms of both the energy and raw materials used to make consumer goods.

A sense of the scale…

For each run of the system, there are 4 floors in each of 2 hotels with 6 x 96 well plates on each floor an incredible 4,608 possible samples.

How can the results be used?

By identifying "elite" algae strains with preferable traits, the recommendations made through our unique machine-learning capabilities allow for these algae strains to be rapidly grown and utilised for research and commercial purposes. The proteins, lipids and carbohydrates produced by the microalgae can then be used as the source material for many different products - human food, animal food, cosmetics, nutraceuticals, pharmaceuticals, bioplastics, textiles, the list goes on.

Why should you be excited?

This type of novel biotechnology is growing exponentially and there are many impact investors and companies wanting to tap into this resource in order to build products or transition their operations towards carbon neutrality. The economics are attractive, but if like all our partners you are genuinely interested in making that switch to sustainability, this is an avenue worth exploring.

We focus on designing and developing innovative tools, methodologies, and techniques to deliver a broad array of radical advances spanning the entire algae production process.

Instruments and Technology

Automation integrated instruments:
- Robotic system (PSI/Omron)
- Algal growth chamber (PSI)
- Liquid handling robot (Opentrons)
- Custom designed FluorCAM fluorometer (PSI)
- Cell culture plate centrifuge (Agilent)
- Hyperspec optical analysis unit (PSI)
- Flow Cytometer (Beckman Cytoflex LX)

Stand-alone instruments:
- DNA/RNA extraction robot (Qiagen QIAcube HT)
- QTof/Tof LCMS (Waters Xevo G2-XS)
- Open (and Closed) FluorCAM fluorometer (PSI)
- DXR™3 SmartRaman Spectrometer (Thermo Fisher Scientific)
- Cell culture plate reader (Tecan Spark)
- 3L photobioreactor with turbidostat, CO2 control; with florometer, optical density, pH, temperature and CO2 sensors (PSI)
- Multispectral multicultivator MC MIX (PSI)
- Stackable incubators with CO2 control (Eppendorf Innova® S44i)

Who do we work with?

The Facility facilitates original research and mutually beneficial projects with partners in sectors that include: biotechnology, advanced manufacturing, agriculture, pharmaceutical, nutraceutical, environmental, textiles, cosmetics and chemical.

Access funding for your project

As a rapidly growing field of interest, depending on your project, you may be able to access funding from:

- NSW Business and Innovation scheme
- ARC Linkage scheme
- Food and Beverage CRC grants
- Federal Government decarbonisation grant.

As experts in navigating the tricky world of funding, we can also help determine your eligibility and assist in the application process.

Working in partnership

Achieving our mission of sustainable change requires genuine connections across all levels of industry, government, and civil society. We work hard to build and foster innovative, robust, and effective collaborations focused on mutual learning that inform and add value to our research. We are a point of contact for researchers looking to connect with complementary capabilities or for external stakeholders looking to engage with our researchers.

Start the conversation

If this sparks an interest, we'd love to hear from you about your project and take you on a tour of the Facility. This technology is on the absolute cutting edge, so we'll take care to step you through the ins and outs and help determine if, and how, we can help.

How we can help you

We offer:
- Optimisation of growth conditions for maximum biomass production.
- Optimisation of growth conditions for production of a specific compound.
- Evaluation of breeding, assisted evolution or hybridization to yield elite traits.

Our research focused applications:
- Changes in phenome in response to different environmental conditions.
- Ramanome analysis.
- Metabolome analysis.
- Fluorome analysis.

Contact Us

Prof. Peter Ralph
Team Leader
Executive Director
Climate Change Cluster (C3)
Peter.Ralph@uts.edu.au

Dr. Alex Thomson
Industry Engagement Manager
Climate Change Cluster (C3)
Alexandra.Thomson@uts.edu.au

🌐 **c3.uts.edu.au**

UTS Climate Change Cluster