HyTECH

ARC Training Centre

Innovation in advanced hyphenated analytical separation technologies

Mid-point highlights

Aug 2023–Mar 2026

Developing future thought leaders.

Director's message

"As we move forward through 2026 HyTECH researchers and their research projects are delivering outcomes at a truly impressive pace, with their collective efforts starting to have real and very tangible impact right across our network of academic and industrial partners. It has been particularly rewarding to see how our Centre has developed over its first two full years of operation into a thriving research community, with so many new linkages and collaborations having been established amongst our members.

As expected for this middle period of our Centre, we are now seeing great academic publications from our PhD candidates and Postdoctoral Fellows, each detailing cutting-edge developments in fundamental and applied science, the majority of which are co-authored with our industrial partner investigators. In addition to these scholarly outputs, advanced project IP is also being generated and secured, and we are witnessing the translation of new analytical methodologies into our partner's organisation and processes, where the true impact of our research program is materialised. However, beyond the above achievements, the Centre continues to mark as its main focus the professional development and advanced training of our PhD candidates and Postdoctoral Fellows, and this past 24 months has been heavily weighted towards delivering upon these activities.

With a significant number of professional development training courses, workshops and seminars, together with industrial placement periods being undertaken right across the Centre, the overall transformation in the capabilities, confidence and advanced skills of our researchers has been really outstanding".

Prof Brett Paull
Training Centre Director

Contents

Report highlights

Pioneering through industry partnership.

Research outputs

39 journal articles

34 conference publications

4 book chapters

Published in leading journals including *Environmental Science & Technology*, *Chemosphere*, *Science of the Total Environment*, and *Journal of Chromatography A*.

Industry and government engagement

29 industry briefings

12 government briefings

6 public presentations

Training and workforce development

5 Post-doctoral Fellows

14 PhD candidates

5 Affiliate PhD candidates

37 industry placements supporting diverse career pathways

494 placement days with partner organisations

52 professional development workshops delivered

Media and outreach

19 media releases

16 feature articles

129 social media posts

HyTECH is amplifying research impact through national media coverage, including ABC, and a growing digital community with 780+ LinkedIn followers and more than 43,000 post impressions over the past five months.

Additional industry partner contributions

56% growth in the centre's in-kind and cash support

- Leveraged **$589,059** funding
- Additional **$460,271** in cash contributions
- Additional **$709,500** in-kind contributions

Driven by new industry partners — Noumi and LECO — along with increased commitment from Shimadzu, the Australian Antarctic Division and Thermo Fisher.

Equity, diversity and inclusion

68% women among PhD candidates and Postdoctoral Fellows

96% internationals among PhD candidates and Postdoctoral Fellows

64% women on the Management Committee

HyTECH fosters a diverse and globally connected research community, with strong female representation across ECRs and leadership, and a highly international early career cohort.

Research highlights

Predicting Chemical Mobility and Persistence in the Environment

Every year, thousands of new synthetic chemicals enter the environment, yet detailed safety data exist for only a small fraction of them. Tobias Hulleman's PhD research develops computer-based tools that use molecular structure and analytical chemistry data to predict two key environmental risks: how readily a chemical moves through water systems, and how quickly it breaks down.

Using more than 140,000 liquid chromatography records, one model classifies chemical mobility, finding that roughly one in five REACH-registered chemicals would be considered very mobile. A second model predicts biodegradability, extending predictions even to chemicals detected in the environment but never structurally identified. Together, these tools offer a scalable, data-driven approach to prioritising chemicals of concern for water quality and ecosystem protection.

Microplastics in Everyday Life

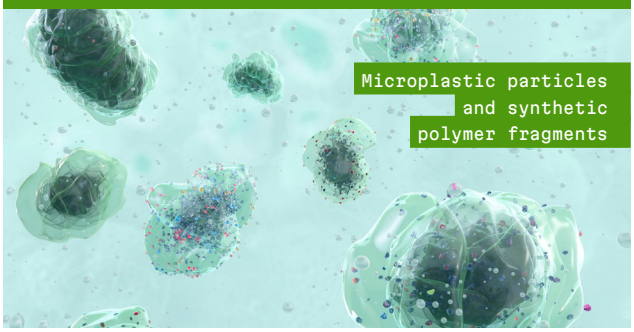
HyTECH research is uncovering how everyday activities and products contribute to microplastic exposure.

Studies led by **Dr Elvis Okoffo** show that:

- Household dishwashers can release **up to one million micro and nanoplastic particles per cycle**
- Common products such as **plastic kettles** may be previously overlooked sources of exposure

While individual sources may seem small, their **global cumulative impact is significant.**

This work highlights the importance of **real-world exposure pathways** and showcases HyTECH's leadership in **harmonised, high-precision microplastics analysis.**



Microplastic particles and synthetic polymer fragments

The 'lab-in-a-van' roadshow

Science in the Field

HyTECH is translating laboratory capability into real-world applications.

Through partnerships with **Trajan Scientific and Medical** and **ADE Consulting**, researchers have deployed **mobile LC and LC–MS technologies** for on-site chemical analysis.

A **3,000 km 'lab-in-a-van' roadshow** along the east coast of Australia successfully detected **PFAS in soil and sediment samples**, demonstrating how advanced analytical tools can be taken beyond the laboratory.

This work highlights HyTECH's role in delivering **practical, field-ready solutions** to complex environmental challenges.

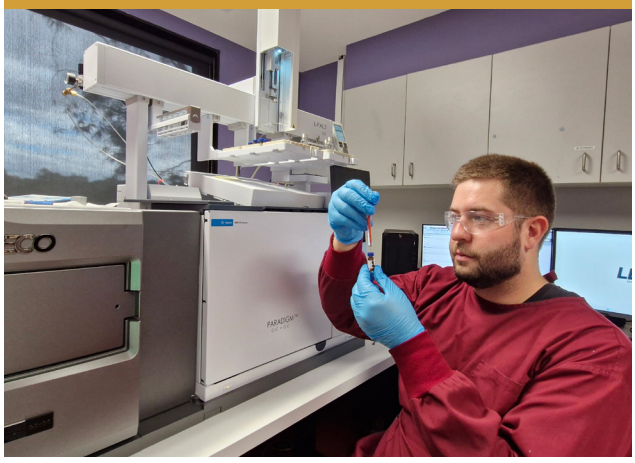
Food Innovation Through Industry Collaboration

Kevin Ghavalas is working closely with industry to improve food quality, stability, and consumer experience.

In collaboration with **Noumi Ltd** and other partners, research is advancing understanding of **flavour changes in UHT milk during storage**—a key challenge for Australia's dairy export sector.

By integrating **advanced aroma analysis, analytical chemistry, and sensory science**, this work identifies the compounds responsible for flavour changes and supports improved product consistency and shelf life.

Importantly, these projects also provide **hands-on industry experience** for PhD candidates, building capability for the next generation of scientists.



Advanced Analytical Capability

HyTECH continues to strengthen national capability in cutting-edge analytical technologies.

In 2024, the Centre launched the **HyTECH Ion Analysis Laboratory** in partnership with **Thermo Fisher Scientific**—a nationally registered biosecurity facility unique in Australia. The lab combines ion chromatography and advanced mass spectrometry to deliver highly sensitive analysis of complex samples.

This is complemented by expanded capability in **comprehensive two-dimensional gas chromatography (GC×GC)**, enabling high-resolution analysis across environmental, food, and materials applications.

Together, these platforms support **multi-institutional collaboration**, high-impact research, and industry-focused innovation.

"This is how we know our work is relevant and is solving the problems industry experiences – in water monitoring, forensic science, mining, pharmaceuticals and a myriad of other industries and partner organisations our scientists engage with every day.

– **Prof Brett Paull**

From research to real world impact – A HyTECH success story

Dr Valarie Heng

Research & Development Scientist, Trajan Scientific and Medical

What is your role now and what do you do?

In my current role as an R&D Scientist at Trajan Scientific and Medical, I am responsible for development and advancement of the SilFlow™ microfluidics product line. SilFlow is a high performance microfluidic platform designed to enable advanced gas chromatography techniques such as flow splitting, backflushing, and Dean's switching, while maintaining exceptional thermal stability and chemical inertness.
On a day to day basis, my work focuses on leading the development of new SilFlow applications and translating emerging analytical needs into practical, scalable solutions. I also work closely with customers on technical projects, providing specialised support to ensure our products deliver reliable performance in complex analytical environments.

Beyond research and development, I serve as a Subject Matter Expert across production and quality teams, helping to diagnose and resolve manufacturing challenges to ensure product consistency and long term reliability.

Can you describe how HyTECH helped you build the connection that eventually led to your industry role?

My transition into this industry focused role was made possible through the HyTECH partnership, which facilitated an industrial placement with Trajan during my PhD. This placement was a pivotal moment in my professional journey, allowing me to move from a purely academic mindset into a commercial R&D environment. For the first time, I experienced the pace, priorities, and accountability that define industry innovation.

During my internship, I applied my doctoral research expertise directly to a key customer project, working on a real world technical challenge with defined deliverables and commercial significance. Seeing my research contribute to a tangible outcome—and receiving direct customer feedback—was both motivating and transformative. This experience demonstrated the value of my skill set beyond academia and ultimately led to a full time position at Trajan, marking a successful transition from PhD candidate to industry scientist.

Beyond industry connections, what did HyTECH bring to your personal or professional development?

Beyond facilitating industry connections, HyTECH played a critical role in my broader personal and professional development. The program provided a unique multicultural and cross institutional environment that would not have been possible through a standard PhD pathway. Collaborating across three universities exposed me to a much broader research landscape and a diversity of scientific perspectives. I had the opportunity to engage with peers whose areas of expertise were vastly different from my own, from both scientific and cultural standpoints.

Observing how others approached problem solving, navigated challenges, and balanced professional and personal pressures gave me a deeper appreciation of different scientific philosophies and working styles.

These experiences helped me build adaptability, communication skills, and a more holistic view of research and innovation. HyTECH did more than support my career progression—it shaped how I think as a scientist and collaborator. The perspectives and connections gained through the program continue to inform my work today, enabling me to bridge academic rigour with real world application and contribute meaningfully to industry driven innovation.

In 2025 Valarie completed her PhD delivered by the Tasmanian Institute of Agriculture at the University of Tasmania.

Noumi Limited and the HyTECH ARC Training Centre

Noumi is an Australian company driven by its purpose of Imagining a Healthier Tomorrow. From our pioneering origins in plant and dairy beverages to our expertise in nutritionals, we blend the wonders of nature with the power of science to create leading brands that nourish our consumers, our communities and our planet.

Our partnership with the HyTECH ARC Training Centre has been an especially rewarding industry-research collaboration.

What kind of research outcomes has this partnership delivered?

At its core, this partnership has delivered meaningful, business-relevant research outcomes. Our two PhD projects (one exploring flavour development in chocolate dairy applications, and the other developing analytical methods to detect enzyme activity in raw milk as an indicator of UHT export versus domestic suitability) address genuine commercial challenges that directly inform our product quality and market strategy.

These are not peripheral projects; they sit at the heart of how we make decisions. Beyond the research itself, what has stood out about this collaboration? The value has extended well beyond the research itself. Working with our PhD candidates has been a privilege. Engaging with them as they present their findings, contribute ideas, and connect analytical science to real-world processing challenges has been genuinely energising for our team.

Watching them grow into confident, capable young professionals has been a most rewarding aspect of this collaboration.

How has engaging with the broader HyTECH network influenced Noumi?

Equally, the opportunity to engage with the broader HyTECH academic network has deepened our internal understanding of hyphenated analytical technologies and their application in food manufacturing. The conversations and connections within the ARC Training Centre have had a lasting influence on how we think about quality, authenticity, and innovation across our business.

We are proud to be a HyTECH partner and look forward to continuing this collaboration as we advance science-led innovation in Australian food and beverage manufacturing.

Dr Sonja Kukuljan
Director of Science and Nutrition, Noumi Limited

People and partners

HyTECH is where the University sector, with its specialist centres of research excellence and focus, works in partnership with both end-user groups and technology manufacturers, to deliver uniquely skilled and industry ready graduates. This is the purpose and aim of the Training Centre, within which all the essential partners have come together with this single and united focus.

Academic partners

University of Tasmania

The University Of Queensland Australia

Deakin University

Technology providers

SCIEX The power of precision

advancedmaterialstechnology

SHIMADZU Excellence in Science

ThermoFisher Scientific

TRAJAN

LECO

Technology end-users

Australian Government Department of Climate Change, Energy, the Environment and Water Australian Antarctic Division

Australian Antarctic Program

Derwent Estuary Program

Australian Government Defence

BOYER

noumi

Queensland Government

Affiliate partners

ferment hq cultivating innovation

Cobram Estate

The Product Makers Bioactive Division

Centre support

Dr Mara Ruiz Minano (Centre Manager)

Simone Lewin (Administration)

Academic members

UTAS

Prof. Brett Paull

Em/Prof. Paul Haddad

Prof. Robert Shellie

Dr Estrella Sanz Rodriguez

Dr Fernando Maya Alejandro

Prof. Andrew Bowie

Deakin

Prof. Russell Keast

Dr Snehal Jadhav

Dr Dan Dias

Dr Vipul Gupta

Dr Agnes Mukurumbira

UQ

Prof. Kevin Thomas

Dr Cassandra Rauert

Dr Jake O'Brien

PhD candidates

UTAS

Mingxia Lai

Nuwanthika Kaushalya Kankani Durage

Dilhara Dissanayake

Nanda Mrabawani

Arathy Parameswaran Sreeletha

Di Hu

Affiliate PhD candidates

Sanathri Maththumagala Kankanamalage

Snezhana Astrakhantseva

Deakin

Yuying (Krystal) Feng

Mayushi Jayakody

Kevin Ghavalas

Yasara Wickramasinghe

Amanda Liyanage

Affiliate PhD candidates

Hemavaruni Fernando

UQ

Ruvini Weerasinghe

Tobias Hulleman

Haitao Lin

Zongxi Zhao

Affiliate PhD candidates

Lily Pan

Postdoctoral Fellows

UTAS

Dr Harrison Stevens

Dr Ibraam Mikhail

Dr Leo Lebanov

Deakin

Dr Yada Nolvachai

UQ

Dr Xuejian Wang

Affiliate Postdoctoral Fellow

Dr Elvis Okoffo

Industry partners

Dr Sonja Kukuljan (Industry Partner Investigator, Noumi Ltd)

Dr Yan Li (Industry Partner Investigator, Shimadzu)

Dr Anna Barlow (Affiliate Industry Partner Investigator, FermenHQ)

Dr Desmond Richardson (Affiliate Partner Investigator, Boyer Mill)

Dr Harald Ritchie (Industry Partner Investigator, Advanced Materials Technology)

Dr Andrew Gooley (Industry Partner Investigator, Trajan Scientific and Medical)

Mr Mark Albertson (Industry Partner Investigator, Thermo Fisher Scientific)

Mr Bart Cleeren (Industry Partner Investigator, Thermo Fisher Scientific)

Dr Mark Curran (Industry Partner Investigator, Australian Antarctic Division)

Dr Thusitha Rupasinghe (Industry Partner Investigator, AB Sciex)

Mr Stewart Carswell (Industry Partner Investigator, Queensland Health)

Mr Ben MacLeod (Industry Partner Investigator, LECO Australia)

Mr Phillip Pennisi (Partner Investigator, Derwent Estuary Program)

Dr Matt Flavel (Industry Partner Investigator, The Product Makers)

Dr Claudia Guillaume (Affiliate Industry Partner Investigator, Cobram Estate Olives)

Dr Michael Landman (Affiliate Partner Investigator, Boyer Mill)

Past HyTECH members

Wan Sin Heng (Valarie) (Graduated PhD candidate)

Dr Sarah Hulme (Previous Centre Manager)

Mr Carl Lehnert (Industry Partner Investigator, Shimadzu)

Dr Bernadette Proemse (Industry Investigator, Derwent Estuary Program)