



The CSIRO / Murdoch / Industry Bioplastic Innovation Hub

Colin Scott | August 2024



Overview

Microbiology
Process engineering
Scale up

Chemistry
Process engineering
Scale up

Chemistry
Microbiology
Environmental Sci.

Discovery
Gene editing

Fermentation

Separation

Formulation

Fabrication

End of life

Microbiology

Chemistry
Process engineering
Scale up

Chemistry
Process engineering
Scale up

Education
Socialisation
Outreach
Business development
Commercialisation

Systems approach
Needs coordination across research
Needs research, development and industrialisation
Needs all parties to benefit – clarity of roles



Discovery

Sampling from Pearse Lakes (Rottnest Island)

Isolated over forty new PHA-producing strains

Culture-dependent screening and strain characterisation

Novel polyhydroxyalkanoate (PHA) production strains

Other high-value products

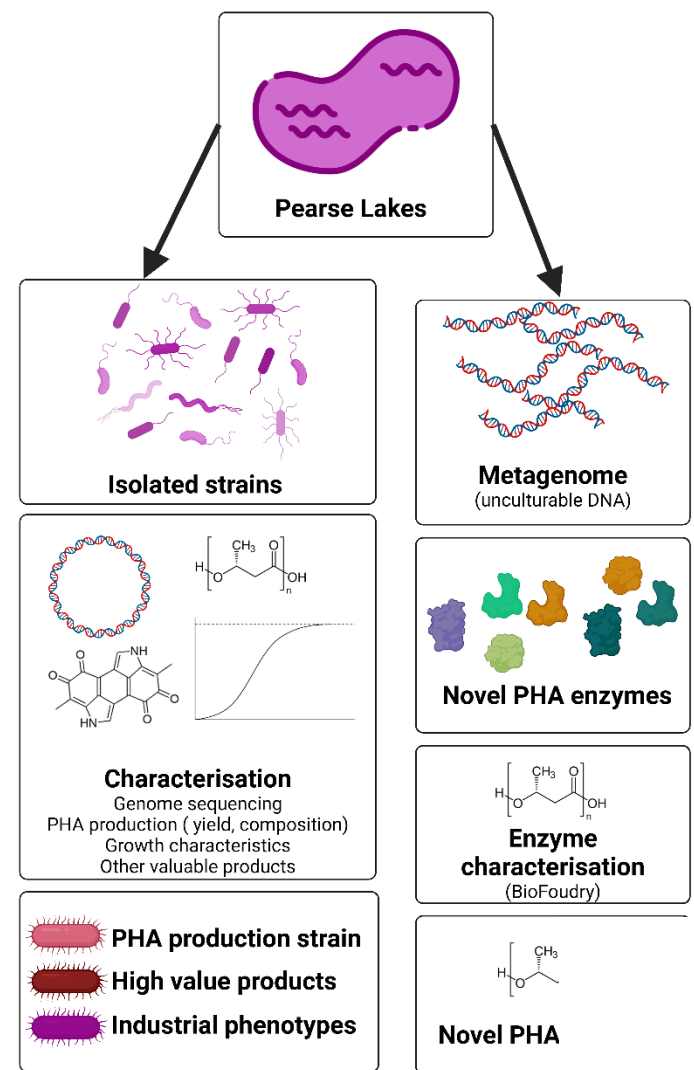
Phenotypes for reducing industrial process costs

Culture-independent screening via metagenomics

Identify novel PHA synthetic enzymes (e.g. PhaCs)

High-throughput characterisation at the BioFoundry

Identification of novel PHA compositions



Fermentation

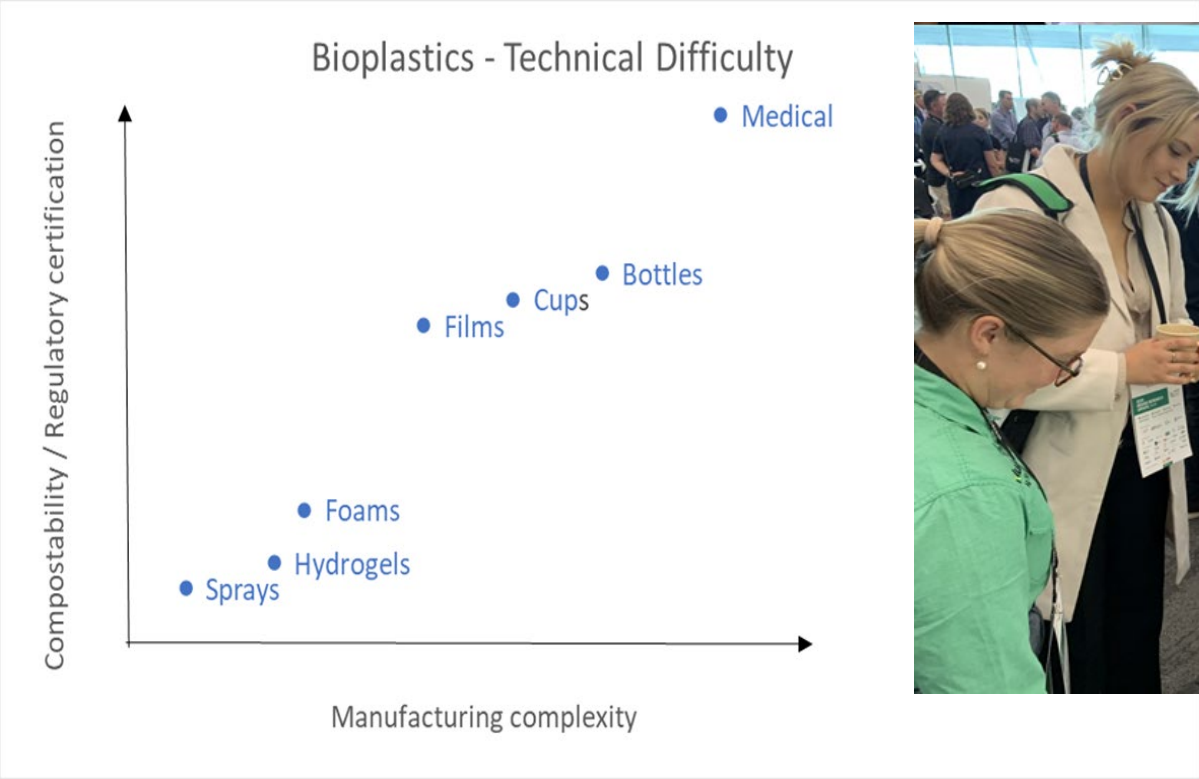
Selected production organisms

Scaled to >100 litre

Producing polymer at this scale



First Applications



Australian certification (AS4736) achieved



Stability and persistence of biodegradable plastic mulch films

Baseline 'controls' to model future work

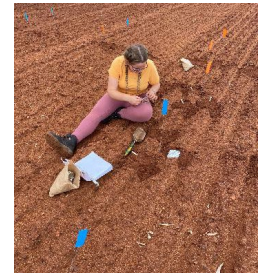
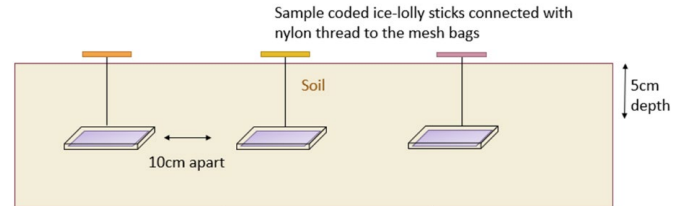
Polymer blends:	From:
PHA/PLA (75%:25%)	Industry partners (EcoPHA)
PCL/methylcellulose	CSIRO
PBAT	Bangor University
PBAT/PAAU/PHBV	Bangor University
PLA/PBAT (15%:85%)	Commensal (Biodegradable)
LDPE	Commercial (Synthetic)

Above ground:

- 10 cm x 400 cm films are laid over a ridge

Below ground:

- Mesh bags containing soil and 5 x 5 cm film are buried at 5 cm depth in the soil



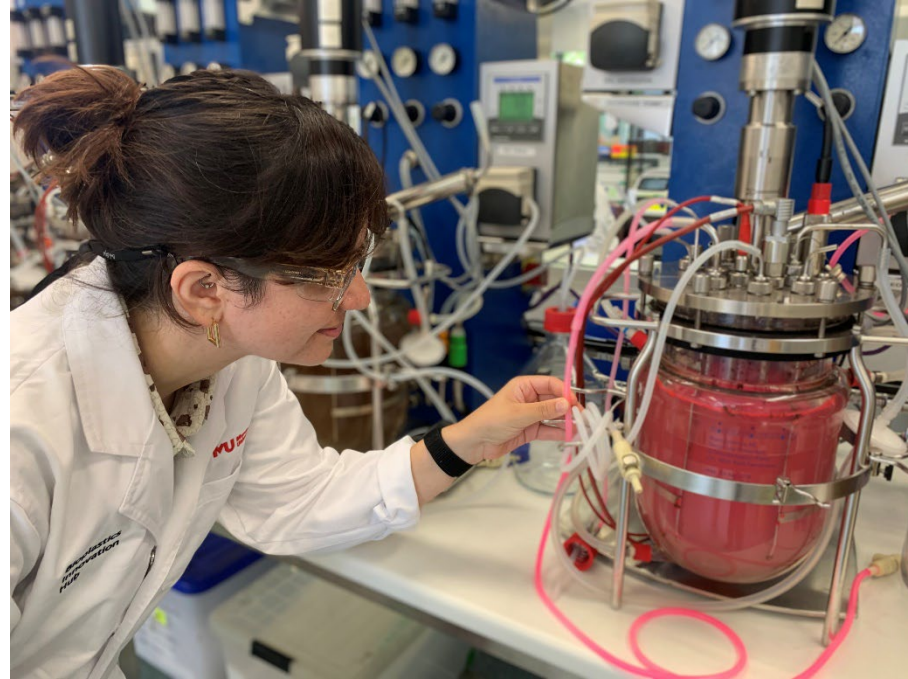
Industrial Training Program

- We will deliver an education, training and outreach program that will ensure product uptake into market.
- Target community and stakeholder engagement to establish the environmental credentials of PHA-bioplastics.

Pilot plant available for student and staff training

Industry and government engaged
(Plastics eBook)

Masters research training in Advanced
Biomanufacturing launched



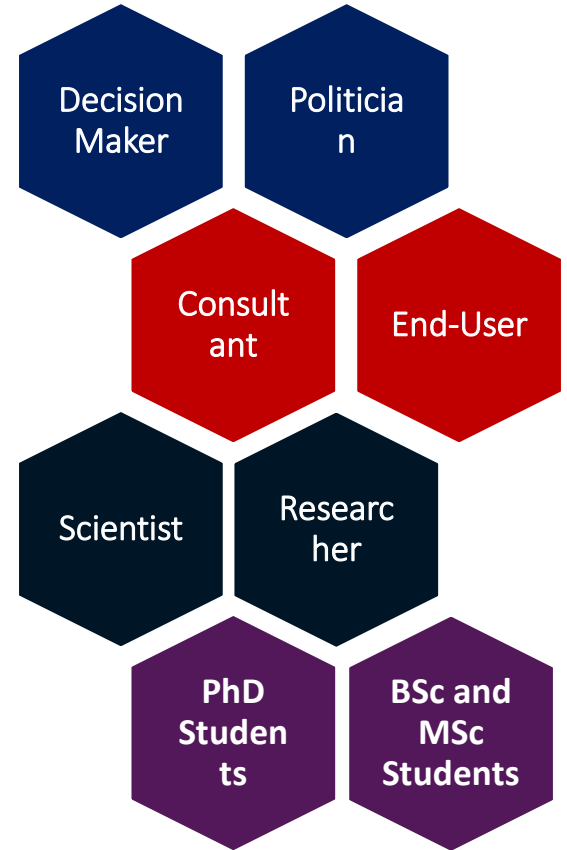
Knowledge Transfer

Multilevel Education Platform

BioPlastics eBook (Asia and Indo Pacific)

Scope:

- Evidence-based information
- Synthetic plastics – bioplastics – compostable plastics – additives
- Sustainable development goals
- Food-water-air quality, human health
- Social responsibility
- Circular economy principles and practices
- Life cycle analysis and economics
- Fate of plastics and environmental impact
- Ending plastic waste solutions
- Recyclability, potential applications for 'waste' or diversion
- Case studies from researchers, individuals, organisations
- Others



Acknowledgements:

Prof. Daniel Murphy
A/Prof. Wayne Reeve
Dr. Ravi Tiwari
Prof David Henry
Dr Todd Gillam
Prof Andy Whilteley
Prof Tony O'Donnell

Mr. Jordan Jones (extended leave)
Ms. Crystal Young
Mr. Harrison O'Sullivan
Ms. Dana Griffith
Mr. Hussain Alattas
Prof. Fran Hoyle
Mr Cameron Begley (Spiegare)

Mr Joseph Boctor
Ms Sam Viljoen

Prof Mike O'Shae

Thank you

