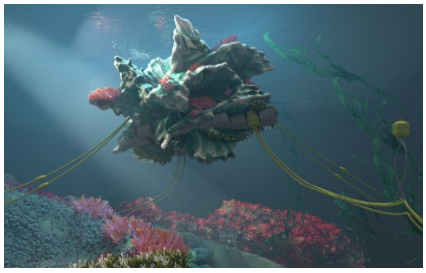
2022 Global Change Youth Research Project Description

Project title:	**ROBOCLAY: Robotic fabrication of bio-clay walls**
Project duration, hours of engagement & delivery mode	4 weeks during Winter Vacation and 1 day a week during semester 2, 2022. Between 20-36hrs per week COVID-19 considerations: Applicants will be required on-site for 70% of the project duration
Description:	Considering the impacts of climate change, the need for future sustainable development and the necessity of decreasing carbon footprint of construction, this project explores the use of clay-based bio-materials for robotic fabrication of future human habitats. It probs a material mixture for robotic clay printing and seeks to offer new methods of construction for affordable housing. Different mixtures of clay and agricultural wastes (in particular ash and algae) then will be printed by using robotic arm. The proposed high-performance clay-based material will be designed to generate lower CO2 emissions. The algae-based clay connects the natural ability of microalgae to capture CO2 to large-scale 3D printing potentials to deliver CO2-storing materials, allowing for transition into a 'net zero CO2 emissions' economy. It is expected that the new renewable and carbon capturing materials will advance sustainable construction through minimal surface strategies for novel applications. The versatility of robotic 3D print will enhance material and geometric properties and optimise the use of microalgae-derived biopolymers. Adapting higher construction technologies, the outcome of the research would inform upgrading clay-based constructions in indigenous communities and move towards a carbon-negative future. It appropriates the technology and offers a novel digital culture in such societies, contributing to the resilient construction of houses in these places.
Expected outcomes and deliverables:	The students will gain knowledge and skills in construction material composition, sustainable development, computational design and robotic fabrication. They will have the opportunity to engage in potential publication out of the research. The outcome of the research may secure entry for exhibitions particularly Brisbane Botanica or Melbourne Design Week exhibitions.
Suitable for:	Bachelor and Master students of Architecture or Engineering background, interested in digital fabrication Experience in Grasshopper is required.
Primary Supervisor:	Dr Maryam Shafiei
Further info:	Please contact the supervisor via m.shafiei@uq.edu.au prior to submitting an application.

Project title:	**Disaster proof 3D printed floating structure for artificial reef habitat**
Project duration, hours of engagement & delivery mode	4 weeks during Winter Vacation and 1 day a week during semester 2, 2022. Between 20-36hrs per week COVID-19 considerations: Applicants will be required on-site for 70% of the project duration
Description:	Climate change and nature disasters such as cyclones has been severely impacting our reef habitat. Nature habitats due to their constrained location are prone to those disastrous events with little method of combating. This project develops highly customisable buoyant infrastructure for development of artificial reefs with 3D-printed modules attached to floating pontoons submerged 2 to 25m deep. These modules can be rapidly constructed to create new marine habitats and be customised for different reef and marine habitat, increasing biomass of specific fish species, or new coral reefs. Floating artificial reefs with adjustable buoyancy can avoid above-sea threats (cyclones, debris, marine vessels). These reefs can be equipped with pump and sprinkler systems powered by energy generated through a mooring system to sprinkle seawater and break the ocean surface to reduce light penetration, cooling the reef and reducing bleaching events. The 3D printed modules will be optimized for hydro dynamic informed form with customizable parameters accommodating different types of marine habitat. 
Expected outcomes and deliverables:	The students will gain multi-disciplinary skills ranging from structure analysis, digital design, optimization to advance fabrication. The outcome of this research project may have the opportunity to exhibit in Melbourne Design Week 2022.
Suitable for:	Master students from Architecture or Engineering background. Previous research experience in digital design, advance fabrication, and structure optimization preferred.
Primary Supervisor:	Dr Dan Luo
Further info:	Please contact the supervisor at: d.luo@uq.edu.au prior to submitting application.

Project title:	**Offsite manufacture reimagined for high-performance adaptable housing (ARC Linkage)**
Project duration, hours of engagement & delivery mode	4 weeks during Winter Vacation and 1 day a week during semester 2, 2022. Between 20-36hrs per week COVID-19 considerations: the project tasks can be completed under a remote working arrangement if the student has access to digital graphic tools and library databases from their personal computer.
Description:	The project aims to address housing performance and affordability in Australia by deploying adaptable design for spatial reconfiguration and component reuse, to advance offsite timber manufacture towards energy efficient and healthy homes as mainstream practice. The intended outcome is the development, prototyping and monitoring of an offsite manufactured panelised lightweight timber system for high-performance homes, that is adaptable to all Australian climates and long-term household changes. This will contribute to the sustainable growth of the Australian housing market with significant benefits on housing affordability, adaptable design and long-lasting performance, while boosting the offsite manufactured timber construction sector.
Expected outcomes and deliverables:	This project includes various tasks and associated research methods, thus applicants may customise their learning experience according to their interests and skills. Applicants may be involved in mapping out and diagrammatically represent conceptual configurations of spatial needs for different Australian households based on desk research of case studies; they may analyse current market trends in housing layouts to identify any mismatch with householder's actual needs; or they may gain skills in data collection by compiling a database of adaptable housing projects and/or prefabricated housing projects. Depending on the selected tasks, applicants may be expected to produce a set of schematic plans and an associated report or datasets of documented case study.
Suitable for:	This project is open to applications from students with a background in architecture, design or social science, preferably enrolled in Master programs.
Primary Supervisor:	Dr Paola Leardini, with Ms Luisa Kuiri
Further info:	For further information, students can contact the supervisors via email: p.leardini@uq.edu.au or l.kuiri@uq.edu.au.