2021/22 Summer Research project listings

Queensland Alliance for Environmental Health Sciences (QAEHS)

Project title:	**Plastics in sentinel marine species project**
Project duration, hours of engagement & delivery mode	10 weeks and the applicant will be required on-site at PACE for the project.
Description:	This project will quantitatively assess plastics exposure in several iconic megafauna species. Faeces samples from turtles, marine iguana and sea lions collected from the Galapagos islands and Great Barrier Reef will be quantitatively analysed for traces of common plastics to assess how these sentinel species are exposure to plastics in their natural environment. The scholar will work with the Plastics Research team at QAEHS as well as collaborators from the University of the Sunshine Coast.
Expected outcomes and deliverables:	Scholars may gain skills in lab analysis and specifically microplastic analysis by gas chromatography-mass spectrometry, data processing and may have an opportunity to generate publications from their research. Students may also be asked to produce a report or oral presentation at the end of their project.
Suitable for:	This project is open to applications from students with a background in environmental sciences or chemistry or 3rd – 4th year students only.
Primary Supervisor:	Prof. Kevin Thomas
Further info:	The research in this project builds on work from these published studies: https://doi.org/10.1021/acs.est.0c02337 https://doi.org/10.1016/j.scitotenv.2020.136924

Project title:	**How much plastic do we eat?**
Project duration & delivery	10 weeks and the applicant will be required on-site at PACE for the project.
Description:	This research project will quantitatively assess plastics contamination in the standard Australian food basket with a focus on high fat samples, such as oily fish, dairy products, and meat. Analysis will be performed by pyrolysis gas chromatography mass spectrometry. The overall objective of the work is to establish human exposure to plastics from a typical diet.
Expected outcomes and deliverables:	Scholars may gain skills in lab analysis and specifically microplastic analysis by gas chromatography-mass spectrometry, data processing and may have an opportunity to generate publications from their research. Students may also be asked to produce a report or oral presentation at the end of their project.
Suitable for:	This project is open to applications from students with a background in environmental sciences or chemistry or 3rd – 4th year students only.
Primary Supervisor:	**Prof. Kevin Thomas:**
Further info:	The research in this project builds on work from these published studies: https://doi.org/10.1021/acs.est.0c02337 https://doi.org/10.1016/j.scitotenv.2020.136924

Project title:	**What chemicals are in breast implants?**
Project duration, hours of engagement & delivery mode	10 weeks and the applicant will be required on-site at PACE for the project.
Description:	This research project will analyse removed silicone breast implants (explants) for a range of chemicals that we are all exposed to every day. The aim of the project is to link chemicals in explants with exposure to Australian women and compare with exposure is other countries.
Expected outcomes and deliverables:	Applicants may gain skills in lab analysis and data processing, including extracting organic chemicals from environmental samples and using state of the art instrumentation for analysis and data processing. Students may also be asked to produce a report or oral presentation at the end of their project.
Suitable for:	This project is open to applications from students with a background in environmental sciences or chemistry or 3rd – 4th year students only.
Primary Supervisor:	Dr Cassandra Rauert and Dr Jake O'Brien
Further info:	For further information students are welcome to contact Dr Cassandra Rauert prior to application: c.rauert@uq.edu.au

Project title:	**Chemical exposure from bushfires**
Project duration, hours of engagement & delivery mode	10 weeks and applicant will be required on-site for the project.
Description:	Exposure to bushfire smoke has been linked to numerous health effects. There is a lack of knowledge on how general population are affected regarding chemical exposure and how long the impact lasts. The research project aims to characterise human exposure associated with bushfires. The approaches will include urine analysis for exposure biomarkers and data analysis for human exposures.
Expected outcomes and deliverables:	Scholars will gain skills in human biomonitoring and have an opportunity to generate publications from their research (leading and/or co-authoring). Students may also be asked to produce a report or oral presentation at the end of their project.
Suitable for:	This project is open to applications from students with a background in analytical chemistry/general chemistry.
Primary Supervisor:	Dr Xianyu (Fisher) Wang
Further info:	

Project title:	**What's coming out of my washing machine? Understanding chemical risks from washing machine effluent**
Project duration, hours of engagement & delivery mode	10 weeks and applicant will be required on-site for the project. *If COVID restrictions are in place a desktop study can be implemented instead.*
Description:	The research project involves using advanced analytical methods to assess what compounds of potential concern come out of our washing machines and may be associated with the clothes and fabrics we encounter daily and the surfactants we use to wash our clothes. Methodologies will include the use of state-of-the-art high-resolution mass spectrometry techniques to identify potentially hazardous constituents of interest in washing machine effluent and elucidate their potential impact on environmental systems.
Expected outcomes and deliverables:	Applicants may be involved in specific tasks and are expected to gain skills in one or all of: experimental design, wet chemistry and analysis techniques, data interpretation and critical thinking. Students may be asked to produce a short summary report or oral presentation at the end of their project.
Suitable for:	This project is open to applications from students with a background in chemistry / analytical chemistry / environmental chemistry / ecotoxicology or 3rd – 4th year students.
Primary Supervisor:	Dr Sarit Kaserzon and Prof. Kevin Thomas
Further info:	To discuss applications please contact Dr Sarit Kaserzon on: k.sarit@uq.edu.au

Project title:	**Assessment of human exposure to pesticides in household plants to inform public health risks**
Project duration, hours of engagement & delivery mode	10 weeks and applicant will be required on-site for the project. *If COVID restrictions are in place a desktop study can be implemented instead.*
Description:	The research project involves developing methods to measure pesticides (for example pyrethroids and glyphosate, and their degradation products) in household plants purchased from gardening centres and nurseries. Methods will be validated via application to reference plants / plant materials. The methods will then be used to examine if and the extent and type of potential pesticide exposure to plants in our households.
Expected outcomes and deliverables:	Applicants may be involved in specific tasks and are expected to gain skills in one or all of: experimental design, wet chemistry and analysis techniques, data interpretation and critical thinking. Students may be asked to produce a short summary report or oral presentation at the end of their project.
Suitable for:	This project is open to applications from students with a background in chemistry / analytical chemistry / environmental chemistry / ecotoxicology or 3rd – 4th year students.
Primary Supervisor:	Dr Sarit Kaserzon and Prof. Kevin Thomas
Further info:	To discuss applications please contact Dr Sarit Kaserzon on: k.sarit@uq.edu.au

Project title:	**Identifying excretion factors of major antibiotics for WBE applications**
Project duration, hours of engagement & delivery mode	*10 weeks and applicant can work off-site with regular meetings with the supervisor during the project.*
Description:	*The research project involves searches and review of the literature to identify the excretion of major antibiotics used in the population so that it can be used in wastewater-based epidemiology (WBE). This parameter is important for accurately estimate the level of antibiotics used in each community by WBE approach.*
Expected outcomes and deliverables:	*Students will gain skills in literature search and screening as well as data collection and data analysis. There is an opportunity to generate publications from their research. Students may also be asked to produce a report or oral presentation at the end of their project.*
Suitable for:	T*his project is open to applications from students with a science background, good math skill in 2nd – 4th year.*
Primary Supervisor:	Phong Thai.

Project title:	**Looking at WBE data for patterns of pharmaceuticals**
Project duration, hours of engagement & delivery mode	*10 weeks and applicant can work off-site with regular meetings with the supervisor during the project.*
Description:	*The research project involves assessing and evaluating weekly and seasonal trends of pharmaceuticals measured in wastewater-based epidemiology. This study aims to rationalize sampling methods for identifying the minimum number of samples required to obtain accurate information about temporal trends. A range of sampling strategies will be examined: (i) targeted days (e.g. weekdays, weekends), (ii) completely random or stratified random sampling, and (iii) a number of sampling strategies informed by known weekly cycles in drug use data.*
Expected outcomes and deliverables:	*Students will gain skills in data collection and data analysis, and have an opportunity to generate publications from their research. Students may also be asked to produce a report or oral presentation at the end of their project.*
Suitable for:	T*his project is open to applications from students with a science background, good math skill in 2nd – 4th year.*
Primary Supervisor:	Phong Thai.

Project title:	**PFAS destruction reactions and Identification of reaction intermediates via mass spectrometry.**
Project duration, hours of engagement & delivery mode	This summer project is for 10 weeks with 36 hrs/week of engagement. This project requires extensive experimental work and hence this project is not available for remote students.
Description:	*The research project is focused on mass spectrometry based non-target analysis of reaction bi-products generated via Plasma destruction of PFAS pollutants, which are commonly found in AFFF. AFFF is aqueous fire-fighting foam that has been historically used for fire-fighting exercises. Due to the recent discovery of harmful health effects of certain chemicals found in AFFF, the use of AFFF containing such chemicals (e.g. PFAS) has been banned. However, the long-term use of such foams over the past several decades, the PFAS and associated chemicals have now seeped into the groundwater and soil, resulting in legacy issues.* *This project looks at the treatment of such polluted wastewater via a plasma process.* *The experimental activities will include conducting PFAS destruction tests in a small laboratory plasma devise followed by sampling, sample preparation and analysis using high-resolution mass spectrometry to determine the temporal evolution of the reaction breakdown species.* *The plasma reaction and sample preparation will be conducted in Longpocket (Indooroopilly) laboratory while the mass spectroscopy analysis will be conducted in QAEHS laboratory.*
Expected outcomes and deliverables:	1. *The experimental program will provide training in basic laboratory skills and conducting experiments.* 2. *Students will get to learn and operate state of the art analytical instrument for measuring the low concentration of pollutants in water* 3. *Have an opportunity to generate publications from their research or present at a conference.* *Project deliverables* 1. *Individual test results of PFAS and other pollutants destruction using Plasma reactor.* 2. *Identification of reaction intermediates based on analysis using mass spectrometry and proposing reaction pathways* 3. *A final report containing all test results and analysis information* 4. *Additional experimental data and test work report as advised by the supervisor.*

Suitable for:	• *UQ enrolled students only.* • *Candidates with a background in Analytical Chemistry, Environmental Chemistry, chemical engineering or related fields.* • *3rd or 4th year Bachelor degree students or master students.* • *While prior laboratory experience is favourable but not mandatory.*
Primary Supervisor:	Dr. Pradeep Shukla
Further info:	Please contact Dr Pradeep Shukla via email to discuss the role Email – pradeep.shukla@uq.edu.au

Project title:	**Treatment of Landfill leachates contaminated with PFAS using cobalt-peroxymonosulphate based oxidation process.**
Project duration, hours of engagement & delivery mode	This summer project is for 10 weeks with 36 hrs/week of engagement. This project requires extensive experimental work and hence this project is not available for remote students.
Description:	*The research project entails the investigation of Advanced oxidation technique to treat contaminated leachate containing AFFF and other toxic pollutants. AFFF is aqueous fire-fighting foam that have been historically used for fire-fighting exercise. Due to the recent discovery of harmful health effects of certain chemicals found in AFFF (for e.g. PFAS), the use of AFFF containing such chemical has been banned. However the long-term use of such foams over past several decades, the PFAS and associated chemicals have now seeped into the groundwater and soil, resulting in legacy issues.* *The current project is to investigate the efficacy of cobalt based catalytic chemical oxidation technique to destroy PFAS chemical present in ground and surface water. Cobalt together with peroxymonosulphate is a chemical catalytic reagent that produces active sulphate radical which is a potent oxidant. The oxidant is capable of destroying/mineralising several recalcitrant pollutants.* *The project work will include laboratory based experimental work to prepare artificial groundwater containing PFAS and then measuring pollutant destruction rate using several analytical techniques.*
Expected outcomes and deliverables:	• *The experimental program will provide training in basic laboratory skills and conducting experiments.* • *Students will get to learn and operate state of the art analytical instrument for measuring low concentration of pollutants in water* • *Students will gain skills in mathematical modelling of pollutant transformation and reaction* • *Have an opportunity to generate publications from their research or present in a conference.*
Suitable for:	• *UQ enrolled students only.* • *Candidates with a background in Analytical chemistry, chemical engineering and mathematics.* • *3rd or 4th year Bachelor degree students or master students.* • *While prior laboratory experience is favourable but not mandatory.* • *Student who plans to extend this vacation work research later as part of individual inquiry & Thesis in the following semester will be viewed favourably, but it is not a mandatory requirement.*
Primary Supervisor:	Dr. Pradeep Shukla
Further info:	Please contact Dr Pradeep Shukla via email to discuss the role Email – pradeep.shukla@uq.edu.au

Project title:	**What is in our trade waste – collating information on types and loads of chemicals of concern in tradewaste**
Project duration, hours of engagement & delivery mode	10 weeks (expected 250 – 300 hours in total over 10 weeks (ie 20-36hrs per week). This project is unlikely to be impacted by Covid. All key components can be carried out remotely if needed.
Description:	This project builds on our research on emerging contaminants such as per and polyfluorinated chemicals where trade waste make important contributions to the loads going in and out of wastewater treatment plants (WWTP). WWTPs are a key barrier pollutants between their production and use and the environment. However for many chemical pollutants WWTPs cannot provide effective removal and therefore it becomes important to control pollutants at the source. Trade waste is an important source for many pollutants. The aim of this study is to identify key chemical pollutants associated with trade waste and provide an estimate of contributions from various industry. The project will aid towards prioritisation of pollutants and industries that may need monitoring and be considered in source control and the regulation of trade waste.
Expected outcomes and deliverables:	Applicants will obtain an understanding of chemical pollutants and industries that may be sources for different types of chemical pollutants. Applicants will gain first hand experience with regulators and the wastewater industry in in data collection and potentially a publication. Students may also be asked to produce a report or oral presentation at the end of their project. Depending on the progress and engagement there is a potential that the student may co-author a publication and maintain future involvement in our research.
Suitable for:	*The project is open to applications from students with a background in environmental science, chemistry and/or chemical engineering. No criteria for where the student is in their degree (ie first year students may also apply).*
Primary Supervisor:	Prof Jochen Mueller
Further info:	Students are welcome to contact me via email j.mueller@uq.edu.au prior to their application to discuss the project.

Project title:	**Identifying and collating relevant pooled serum, urine and potentially wastewater samples for identifying markers associated with temperature stress**
Project duration, hours of engagement & delivery mode	10 weeks (expected 250 – 300 hours in total over 10 weeks (ie 20-36hrs per week). This project is unlikely to be impacted by Covid. All key components can be carried out remotely if needed.
Description:	Rising temperature and humidity is associated with adverse health outcomes. However to date little data available is that allows a direct assessment of such stress. We have established a human biomonitoring program where we asses biomarkers of exposure in urine and blood. Furthermore our wastewater based monitoring program has established the use of wastewater for monitoring both endogenous and exogenous markers of health. This Research project aims to assist with the development of a novel approach for assessing health markers associated with a changing climate. The student is to work with us to develop a sampling approach for identifying suitable samples from our ongoing program and in the selection of suitable biomarkers that are linked to temperature stress on human health.
Expected outcomes and deliverables:	Applicants will obtain an understanding in human biomonitoring and stress biomarkers. We envisage that the student will get an introduction into liquid chromatography mass spectrometry techniques and the measurement of biomarkers. Applicants will also gain first hand experience working in collaboration with one of Australia's leading pathology laboratories. The student will be expected to provide a final short report (2000 Words) and a short presentation to the QAEHS team. Depending on the progress and engagement there is a potential that the student may co-author a *publication and maintain future involvement in our research*
Suitable for:	*The project is open to applications from students with a background in pharmacy, pharmacology, environmental science, chemistry or related. The project is most suited to third and forth year students but first year students may also apply.*
Primary Supervisor:	Prof Jochen Mueller
Further info:	Students are welcome to contact me via email j.mueller@uq.edu.au prior to their application to discuss the project.