# 2017/18 Vacation Scholarships

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| **Job Title:** | CSIRO Undergraduate Vacation Scholarships – **Mineral Resources** |
| **Reference No:** | 43703 |
| **Classification:** | CSOF1.1 |
| **Stipend:** | $1462.77 per fortnight (before tax) |
| **Location:** | Please refer to the list of ***Projects*** at the end of this document |
| **Tenure:** | 8 to 12 weeks from November 2017 to February 2018 |
| **Role Purpose:** | The 2017/18 Vacation Scholarship Program is designed to provide students with the opportunity to work on real-world problems in a leading R&D organisation.  Participation in the Vacation Scholarship Program has influenced previous scholarship holders in their choice of further study and future career options. Many have gone on to pursue a PhD in CSIRO or to build a successful research career within CSIRO, a university or industry. |
| **Project Description:** | Please refer to the list of ***Projects*** at the end of this document.  *If you require more information please contact the person listed for the project.* |
| **Eligibility/**  **Pre-Requisites:** | To be eligible to apply you must be an Australian/New Zealand Citizen, Australian Permanent Resident, or an international student who has full work rights for the 8 to 12 weeks duration (does not require visa sponsorship).  Vacation scholarships are for students who:   * are currently enrolled at an Australian university; * have completed at least three years of a full-time undergraduate course (however exceptional second year students may be considered); * have a strong academic record (credit average or higher); and * intend to go on to honours and/or postgraduate study. |
| **How to Apply:** | Please apply online at [www.csiro.au/careers](http://www.csiro.au/careers). **You will be required to:**   1. select your **top 2 preferred research projects** in order of preference; 2. submit a **resume/cover letter** (as one document) which includes:  * the reasons why the research project/s you have selected are of interest to you; and how your previous skills/knowledge and experience meets the project requirements; * an outline of your longer-term career aspirations and detail how this program will help you achieve them; and * using the project numbers listed below, list in order of preference, **all of the projects** you are interested in.  1. upload your **academic results** in the ‘***Requested Information’*** field.   **Referees:** If you would like to include referees (either work or university lecturers/ tutors)in your application, please add their name and contact details into your resume**.**  If you experience difficulties applying online call 1300 984 220 and someone will be able to assist you. Outside business hours please email: [csiro-careers@csiro.au](mailto:csiro-careers@csiro.au). |

**There are 20 projects available in Mineral Resources:**

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| **Project No.** | **Location** | **Project Title (see the following pages for more information)** |
| [**Minerals 1**](#_Minerals_1) | Clayton, VIC | Direct smelting of sulphide concentrates |
| [**Minerals 2**](#_Minerals_2) | Clayton, VIC | Flow Electrochemistry |
| [**Minerals 3**](#_Minerals_3) | Clayton, VIC | Novel composite materials for screen-printed reference electrodes |
| [**Minerals 4**](#_Minerals_4) | Clayton, VIC | Sopheres: CSIRO Cenospheres for Resource Recovery and Remediation Applications |
| [**Minerals 5**](#_Minerals_5) | Clayton, VIC | Specialty reagents for improved mineral recovery |
| [**Minerals 6**](#_Minerals_6) | Clayton, VIC | Air assisted pyrolysis |
| [**Minerals 7**](#_Minerals_7) | Clayton, VIC | Life cycle based environmental impact of slag dry granulation (DSG) |
| [**Minerals 8**](#_Minerals_8) |  | This project is no longer available. |
| [**Minerals 9**](#_Minerals_9) | Clayton, VIC | Distillation of Mg powder produced by the MagSonic™ process |
| [**Minerals 10**](#_Minerals_10) | Clayton, VIC | Evaluating the Counter-Current Wash and Separation of Metal-Organic Frameworks |
| [**Minerals 11**](#_Minerals_11) | Clayton, VIC | Separation of magnetically activated metal organic frameworks |
| [**Minerals 12**](#_Minerals_12) | Clayton, VIC | SENSEITM Column Testbed Optimisation |
| [**Minerals 13**](#_Minerals_13) | Clayton, VIC | Evaluating Downstream Activation Pathways for Scaling Up of Metal-Organic Frameworks |
| [**Minerals 14**](#_Minerals_14) | Pullenvale, QLD | Study of cutting with Actuated Disc Cutting |
| [**Minerals 15**](#_Minerals_15) | Pullenvale, QLD | Mathematical study of cutting with Actuated Disc Cutting |
| [**Minerals 16**](#_Minerals_16) | Pullenvale, QLD | Study of microwave effect on solids |
| [**Minerals 17**](#_Minerals_17_1) | Clayton, VIC | Sliding bed friction |
| [**Minerals 18**](#_Minerals_18) | Clayton, VIC | Investigation of Mixing in High Concentration Viscoelastic Fluids |
| [**Minerals 19**](#_Minerals_19) | Clayton, VIC | CFD modelling of polymer flocculant solution mixing |
| [**Minerals 20**](#_Minerals_20) | Clayton, VIC | CFD Modelling: Development of Thickener Database |

Select the **Project Numbers** above to take you directly to the project details, including relevant fields of study, Project Duties/Tasks and Locations for these projects (which are on the following pages).

Pease read though these and decide **which 2 projects are your preferred choices** as you will need to enter these into your application. If you require more information please contact the person listed for each project.

Note: CSIRO are advertising vacation scholarships by the different business units we have. You can apply for more than one CSIRO business unit, but your application for **Mineral Resources** should only refer to Minerals projects, such as Minerals 1, Minerals 2, etc.

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| Project Number | **Vacation Scholarships Project Details** |
| Minerals 1 | **Project Title**  Direct smelting of sulphide concentrates  **Project Description**  The project will investigate the technical feasibility of direct to metal smelting of a variety of metal sulphide concentrates. Some metal sulphides are amenable to direct to metal smelting due to the high level of chemical stability of metals compared to metal oxides and metal sulphides at high temperatures. This project is designed to determine the best candidate metal sulphides and how the high temperature processing of mixed sulphide concentrates creates processing difficulties.  **Project Duties/Tasks**   * Literature review of direct to metal smelting processes, with an emphasis on applicable metals/metal sulphides, process limitations and metal quality * Thermodynamic modelling of direct to metal smelting processes of a variety of metal sulphides * Design of an experimental apparatus to test direct to metal smelting.   **Relevant Fields of Study**   * Metallurgy * Chemical engineering * Chemistry   **Location:** Clayton, VIC  **Contact:** For more details please contact **Michael Somerville** on phone on (03) 9545 8668 or email [michael.somerville@csiro.au](mailto:michael.somerville@csiro.au) |
| Minerals 2 | **Project Title**  Flow Electrochemistry  **Project Description**  This project will test the effectiveness of a novel flow electrochemical cell for environmental remediation. This newly-developed technology has various applications, one of which is the removal of trace amounts of metal ions from solution by electrodeposition. The project will involve preparing and characterising test solutions, then treating them using the flow cell under different conditions to measure which produces the best outcome.  **Project Duties/Tasks**   * Learn how to operate the flow electrochemical cell * Make up solutions containing various dilute concentrations of dissolved metal ions * Run the cell using the dilute solutions and measure the effectiveness of the cell for the removal of metal ions * Learn a range of analytical techniques for measuring the impact the cell has for metal removal.   **Relevant Fields of Study**   * Chemistry * Electrochemistry * Environmental Studies   **Location:** Clayton, VIC  **Contact:** For more details please contact **Bita Bayatsarmadi** on phone on (03) 9545 8135 or email [Bita.Bayatsarmadi@csiro.au](mailto:Bita.Bayatsarmadi@csiro.au) |
| Minerals 3 | **Project Title**  Novel composite materials for screen-printed reference electrodes  **Project Description**  A reference electrode is a fundamental requirement for all potentiometric and voltammetric measurements. It has to be stable and maintain a well-known electrode potentials because the potentials of other “indicator” electrodes (such as the pH electrode) are measured against this electrode. In addition to stability, an ideal reference electrode must have low impedance.  In this project a Vacation Scholar will screen variety of polymer / salt composite materials to be used as part of the screen-printed reference electrodes.  **Project Duties/Tasks**   * Tests selected polymer / salt composite materials, especially their hydrophilic / hydrophobic properties and diffusion of salts through the material. * Prepare screen-printed reference elements and test their electrochemical performance using potential monitoring and electrochemical impedance spectroscopy. * Combine screen-printed electrodes with other indicator electrodes and test their analytical performance.   **Relevant Fields of Study**   * Material Science * Electrochemistry * Chemistry * Nanotechnology   **Location:** Clayton, VIC  **Contact:** For more details please contact **Mikko Vepsalainen** on phone on (03) 9545 8802 or email [mikko.vepsalainen@csiro.au](mailto:mikko.vepsalainen@csiro.au) |
| Minerals 4 | **Project Title**  Sopheres: CSIRO Cenospheres for Resource Recovery and Remediation Applications  **Project Description**  Cenospheres are lightweight inert hollow spheres mostly made up of alumina (55-65%) and silica (30-40%). They are one of the three types of structures in fly ash which is produced during the process of burning coal in thermal power plants. Cenospheres are a waste product, however are valued for their physical properties and are recycled into building and construction materials.  The purpose of this project is to develop new technology of chemically functionalising cenospheres for applications in mineral processing and resource recovery from mine tailings for environmental remediation by using CSIRO developed cenospheres technology (Sopheres). The objective is to test the efficacy of the Sopheres technology.  **Project Duties/Tasks**  The work program involves conducting experimental tests including optimising/modifying experimental parameters of chemically functionalising cenospheres and testing their performance on acid mine drainage remediation (AMD).  Tasks include:   * Chemical functionalisation of cenospheres for pH adjustment of AMD water * Chemical functionalisation of cenospheres for heavy metal recovery from AMD * Chemical functionalisation of cenospheres for removal of high SO42- from AMD solution * Perform characterisation tests and review data to evaluate process performance * Write a report on the work conducted.   **Relevant Fields of Study**   * Process Chemistry * Chemistry * Surface Chemistry * Electrochemistry * Physical Chemistry   **Location:** Clayton, VIC  **Contact:** For more details please contact **Dr. Miao Chen** on phone on (03) 9545 8749 or email [Miao.Chen@csiro.au](mailto:Miao.Chen@csiro.au) |
| Minerals 5 | **Project Title**  Specialty reagents for improved mineral recovery  **Project Description**  Froth flotation is the most widely used method for ore beneficiation to separate valuable minerals from worthless material or other valuable minerals. Although flotation is a well-developed technology, the mining industry would benefit from the availability of more versatile and specialised flotation reagents to improve the recovery of valuable minerals, minimise waste and maximise our natural resources. More sophisticated technologies are sought these days because the grade of ore being processed more and more often is decreasing.  The aim of this project is to synthesise and characterise several novel flotation reagents and evaluate their mineral flotation capabilities in order to determine their commercial appeal.  **Project Duties/Tasks**   * Synthesise new materials/reagents * Fully characterise these new materials and assess their stability * Evaluate their mineral flotation capabilities relative to reagents traditionally used commercially.   **Relevant Fields of Study**   * Chemistry * Material science * Metallurgy   **Location:** Clayton, VIC  **Contact:** For more details please contact **Dr Theo Rodopoulos** on phone on (03) 9545 8713 or email [Theo.Rodopoulos@csiro.au](mailto:Theo.Rodopoulos@csiro.au) |
| Minerals 6 | **Project Title**  Air assisted pyrolysis  **Project Description**  CSIRO is developing a large scale autothermal pyrolysis process to produce charcoal. The aim is to replace non-renewable coke with charcoal in a range of metallurgical applications. Tests have shown that the fixed carbon content of charcoal produced by autothermal pyrolysis is not high enough for some metallurgical applications. The project will be a continuation of a student project in which small scale experiments will be conducted to determine the effect of introducing a small amount of air into the process.  **Project Duties/Tasks**   * Undertake mass and energy balances on the lab-scale system * Set up and conduct small scale pyrolysis experiments in a vertical tube furnace * Analyse the product charcoal for fixed carbon.   **Relevant Fields of Study**   * Chemical Engineering * Process Engineering   **Location:** Clayton, VIC  **Contact:** For more details please contact **Dr Christian Doblin** on phone on (03) 9545 8658 or email [christian.doblin@csiro.au](mailto:christian.doblin@csiro.au) |
| Minerals 7 | **Project Title**  Life cycle based environmental impact of slag dry granulation (DSG)  **Project Description**  Process Evaluation Team assesses life cycle based environmental impact of new and conventional technologies for mineral processing. CSIRO has developed a new technology to process slag from metallurgical processing plants. An updated flowsheet has been developed and evaluated for techno-economic performance. The proposed flowsheet will be will be evaluated based on life cycle assessment (LCA methodology) for energy, carbon, water and solid waste footprints.  **Project Duties/Tasks**   * Compile input data for selected DSG flowsheets (given), including materials, chemical and utilities for processing (e.g. natural gas, electricity, water etc) * Prepare life cycle inventory (LCI) tables based on the input data. * Set up life cycle assessment models to calculate embodied energy and water footprint per tonne of slag granulated. * Deliverables will be a models in Excel, a short report.   **Relevant Fields of Study**   * Chemical Engineering * Metallurgical Engineering * Environmental Engineering   **Location:** Clayton, VIC  **Contact:** For more details please contact **Dr Nawshad Haque** on phone on (03) 9545 8931 or email [Nawshad.Haque@csiro.au](mailto:Nawshad.Haque@csiro.au) |
| Minerals 8 | **Project Title**  Energy Efficient Electrical Connections (Cu-Cu Contact Study)  **Project Description**  This project is no longer available. |
| Minerals 9 | **Project Title**  Distillation of Mg powder produced by the MagSonic™ process  **Project Description**  The MagSonic™ process is a novel carbothermic magnesium production technique involving the acceleration of metallic vapours through a de Laval nozzle to supersonic speeds to induce ultra-rapid quenching of >106°C/s. The powder metal product is highly reactive due to its high surface area, and contains some impurities from the feedstock and back reaction.  This project will examine the effect of process parameters on the distillation of magnesium powder including those factors that most influence the purity of the distilled metal product.  **Project Duties/Tasks**   * Perform a literature review of metal distillation, particularly for Mg * Design experimental program and laboratory rig to perform distillation experiments * Carry out distillation runs to test effect of experimental variables * Perform morphological and chemical analysis on products * Compile results and recommendations into a short report.   **Relevant Fields of Study**   * Chemical Engineering * Metallurgical Engineering   **Location:** Clayton, VIC  **Contact:** For more details please contact **Dr Daniel Jewell** on phone on (03) 9545 8108 or email [Daniel.Jewell@csiro.au](mailto:Daniel.Jewell@csiro.au) |
| Minerals 10 | **Project Title**  Evaluating the Counter-Current Wash and Separation of Metal-Organic Frameworks  **Project Description**  Metal Organic Frameworks (MOFs) are porous crystalline materials which have a cage structure of metal ions co-ordinated to organic compounds. They have potential application in gas storage, gas separation and catalysis, amongst others. In the current production method the cost and time required for the wash and separation stage is disproportionately high and alternative methods are being investigated.  The purpose is to study an alternative method through the counter-current processing of the MOF solution. The method will be evaluated by determining the effect of number of wash stages and wash volume on the MOF quality and purity. The results will also be used to calibrate wash and separation modelling work.  **Project Duties/Tasks**   * Produce sufficient quantities of MOF solution for investigation * Develop and conduct batch-wise experimental work * Conduct physical characterisation tests to evaluate MOF and wash solutions * Compare results against modelling work and evaluate outcomes * Write a report on the work conducted.   **Relevant Fields of Study**   * Physical Chemistry * Chemistry * Chemical Engineering   **Location:** Clayton, VIC  **Contact:** For more details please contact **Trevor Hadley** on phone on (03) 9545 8981 or email [trevor.hadley@csiro.au](mailto:trevor.hadley@csiro.au) |
| Minerals 11 | **Project Title**  Separation of magnetically activated metal organic frameworks  **Project Description**  Metal organic frameworks (MOFs) are a new class of very high surface materials. CSIRO is developing processes to scale up their production. One challenge is to separate the MOF from the solvent in which it is formed. The aim of this project is to evaluate the strategy of magnetically separating MOFs deliberately seeded with varying amounts of magnetic nanoparticles from the solvent. The concept will be tested with water based aluminium fumarate MOF using commercially available Fe­3O4 nanoparticles.  **Project Duties/Tasks**   * Synthesise aluminium fumarate with varying amounts of Fe­3O4 nanoparticles using a flow reactor * Characterise the product MOF (BET surface area, optical and scanning electron microscopy, XRF, XRD, magnetic) * Measure separation performance in a laboratory scale wet high intensity magnetic separator.   **Relevant Fields of Study**   * Chemistry * Chemical Engineering   **Location:** Clayton, VIC  **Contact:** For more details please contact **Dr Christian Doblin** on phone on (03) 9545 8658 or email [christian.doblin@csiro.au](mailto:christian.doblin@csiro.au) |
| Minerals 12 | **Project Title**  SENSEITM Column Testbed Optimisation  **Project Description**  The SENSEITM project team, are developing a real-time data and analytics service to help industry to maximise production processes by enabling sophisticated chemical monitoring of the most extreme process environments with a revolutionary network of robust solid-state electrochemical sensors. The SENSEITM Monitoring System is a commercial platform presently being developed to enable maximum impact and financial return to CSIRO from the core technology. A Column Testbed has been designed, built and commissioned at CSIRO Clayton site to prove up the prototype SENSEITM Monitoring System.  The SENSEITM Monitoring System will enable, for the very first time, full automation of an industrial scale column facility. This project focusses on understanding the new operational data presently being generated, developing and understanding of the relationships between to process parameters and recommending strategies for optimisation of the control system of the SENSEITM Column Testbed. A study will be conducted that will compare traditional manual control of the leaching process with automated control of the process for which only the SENSEITM Monitoring System can enable. If successful, the results of the work will be published at a suitable international conference.  **Project Duties/Tasks**   * Undertake independent review of the fundamentals of mineral leaching processes, particularly the leaching of copper from ore (context setting); * Participate in the in-house testing and verification of the very first SENSEITM Monitoring System within the SENSEITM Column Testbed to confirm total system operability; * Deliberately modify the SENSEITM Column Testbed operational conditions, record experimental results using the SENSEITM Monitoring System and analyse the experimental data in the context of the optimisation study; * Write a report describing the work and conclusions for the project; * Work with the Supervisor to draft a conference paper on the results of the work; and * Present the results of the work and individual experiences to the CSIRO staff at the conclusion of the tenure.   **Relevant Fields of Study**   * Electrical Engineering (Process Control) * Chemical Engineering   **Location:** Clayton, VIC  **Contact:** For more details please contact **David Molenaar** on phone on (03) 9545 8893 or email [David.Molenaar@csiro.au](mailto:David.Molenaar@csiro.au) |
| Minerals 13 | **Project Title**  Evaluating Downstream Activation Pathways for Scaling Up of Metal-Organic Frameworks  **Project Description**  Metal-Organic Frameworks (MOFs) are porous crystalline materials which have a cage structure of metal ions co-ordinated to organic compounds. They have potential application in gas storage, gas separation and catalysis, amongst others. CSIRO has scaled the formation of the MOFs. However, some scale up challenges still remain in the downstream washing & separation, and activation steps. The MOF quality is a function of surface area and crystalline structure which is facilitated through washing and activation stages.  The study will include the effect of the solvent exchange process parameters, including scale, on the particle morphology and quality. This work will provide data which will be used by the student to evaluate against alternative activation methods.  **Project Duties/Tasks**   * Produce sufficient quantities of MOF solution for investigation * Perform experimental tests and optimise/modify experimental parameters * Conduct physical characterisation tests to evaluate MOF quality * Evaluate results against alternative activation methods * Write a report on the work conducted.   **Relevant Fields of Study**   * Physical Chemistry * Chemistry * Chemical Engineering   **Location:** Clayton, VIC  **Contact:** For more details please contact **Daniella Caruso** on phone on (03) 9545 8500 or email [daniella.caruso@csiro.au](mailto:daniella.caruso@csiro.au) |
| Minerals 14 | **Project Title**  Study of cutting with Actuated Disc Cutting  **Project Description**  This experiment-based research projects aims to understand the cutting process of an actuated undercutting disc. Several cutting tests will be conducted at selected test conditions, and control variables such as cutting forces and cuttings size will be monitored and recorded for post-processing. The effect of operating conditions on cutting force will then be analysed.  **Project Duties/Tasks**   * Design and conduct of experiments * Data collection, processing and analyses * Develop codes in Matlab as necessary for data analyses and visualisation of results.   **Relevant Fields of Study**   * Mining Engineering * Petroleum Engineering * Geotechnical Engineering * Mechanical Engineering   **Location:** Pullenvale, QLD  **Contact:** For more details please contact **Dr Sevda Dehkhoda** on phone on (07) 3327 4156 or email [Sevda.Dehkhoda@csiro.au](mailto:Sevda.Dehkhoda@csiro.au) |
| Minerals 15 | **Project Title**  Mathematical study of cutting with Actuated Disc Cutting  **Project Description**  This analytical-based research projects aims to understand the physics of cutting process with an actuated undercutting disc. The interaction between the mechanical tool and the rock has been explained through complex mathematical equations. A numerical or closed form solution will be developed for these equations and the results will be validated with experiments.  **Project Duties/Tasks**   * Develop closed form solutions * Use numerical methods for finding the solution * Develop codes in Matlab as necessary for calculation and visualisation of results.   **Relevant Fields of Study**   * Physics * Mathematics * Mechanical Engineering (with strong math background)   **Location:** Pullenvale, QLD  **Contact:** For more details please contact **Dr Sevda Dehkhoda** on phone on (07) 3327 4156 or email [Sevda.Dehkhoda@csiro.au](mailto:Sevda.Dehkhoda@csiro.au) |
| Minerals 16 | **Project Title**  Study of microwave effect on solids  **Project Description**  This research projects aims to understand the damage from microwave energy on materials such as metal and rock. Characteristic of microwave energy and its influencing factors will be reviewed and analysed. Effect of microwave on mechanical and physical properties of selected material will be studied based on previous case studies and methodologies will be developed to enhance or minimise the effect on material as necessary. Ultimately, the learning will be used to design schematics of a microwave system for a multimedia environment.  **Project Duties/Tasks**   * Desktop studies: literature review, technology and market studies * Critical analysed of microwave effect on selected material * Identify methods to enhance or minimise microwave effect on selected material. * Develop schematic design for the identified microwave system.   **Relevant Fields of Study**   * Mechatronics Engineering * Mechanical Engineering * Physics   **Location:** Pullenvale, QLD  **Contact:** For more details please contact **Dr Sevda Dehkhoda** on phone on (07) 3327 4156 or email [Sevda.Dehkhoda@csiro.au](mailto:Sevda.Dehkhoda@csiro.au) |
| Minerals 17 | **Project Title**  Sliding bed friction  **Project Description**  CMR has an advanced program of research into the pipeline transport of multi-phase suspensions. This is an area of major significance to the minerals industry. A common occurrence in transporting dense minerals is the formation of a bed of settled solids along the pipe invert. This may be a stationary or sliding bed, depending on the coefficient of friction (CoF) between the solids and the pipe surface. Most heterogeneous transport models require data for sliding bed friction but it is extremely sparse in the literature. CMR has a unique instrument for generating CoF data under varying flow conditions.  **Project Duties/Tasks**   * Literature review on sliding bed models in pipelines * Developing a test protocol for CoF measurement * Generating and analysing data for a variety of solid-surface combinations.   **Relevant Fields of Study**   * Engineering * Materials Science   **Location:** Clayton, VIC  **Contact:** For more details please contact **Andrew Chryss** on phone on (03) 9545 8743 or email [andrew.chryss@csiro.au](mailto:andrew.chryss@csiro.au) |
| Minerals 18 | **Project Title**  Investigation of Mixing in High Concentration Viscoelastic Fluids  **Project Description**  CSIRO is a world leader in understanding the processes occurring within gravity thickeners through the P266 series projects ([www.p266project.com](http://www.p266project.com)). Flocculation is the key step in thickening, governed by factors that include flow rates, solids concentration, flocculant dosage and applied concentration.  The project will focus on a bottlenecks faced at many operations - how to most effectively mix concentrated flocculant solutions with diluent prior to dosing into thickeners. The student will work in a state-of-the-art multi-phase flow measurement lab, employing ERT (Electrical Resistance Tomography) to measure and quantify concentrated flocculant mixing into water streams with the aid of static mixers. Varying flow regimes and flocculant concentrations will be tested to produce experimental data to test/validate computational modelling (work with a separate student project).  **Project Duties/Tasks**   * Operate pipe apparatus fitted with a static mixer with a major diluent flow, introducing minor streams of either (i) water only (0% flocculant) and (ii) high viscosity miscible fluid (0.2% flocculant) under selected conditions. * Record ΔP, flow, ERT and flow visualisation observations. * Repeat with more concentrated (≤0.5%) or alternative flocculant to compare with both Task 1 and numerical modelling (2nd student). * Write a report describing work and outcomes/conclusions. * Verbal presentation describing results and experience at end of tenure.   **Relevant Fields of Study**   * Mechanical Engineering * Chemical Engineering   **Location:** Clayton, VIC  **Contact:** For more details please contact **Krishna Mohanarangam** on phone on (03) 9545 8677 or email [krishna.mohanarangam@csiro.au](mailto:krishna.mohanarangam@csiro.au), or **Kosta Simic** on phone on (03) 9545 8716 or email [kosta.simic@csiro.au](mailto:kosta.simic@csiro.au) |
| Minerals 19 | **Project Title**  CFD modelling of polymer flocculant solution mixing  **Project Description**  Computational models are increasingly playing important roles in engineering and the design of new equipment. With improvements in computing speeds, algorithms and parallelisation techniques, computational fluid dynamics (CFD) is now widely used for predicting complex multiphase flows and is increasingly being applied to new applications.  CSIRO is a world leader in modelling thickeners (www.p266project.com) and a key factor in controlling thickener performance is the preparation and mixing of viscoelastic polymer flocculants into liquid streams. One means of achieving mixing is to use static mixers. This project aims to use CFD modelling to predict the mixing of high concentration flocculant solutions into a water stream using a static mixer. This modelling will be supported by experimental work in a separate student project.  **Project Duties/Tasks**   * Become familiar with ANSYS CFD software. * Build a CFD model of the system being used in the experiments. * Review viscoelastic fluid rheology models to identify a suitable model. * Select and perform simulations of various flow conditions measured in the laboratory, analyse results and make recommendations on physical design/operating condition changes to improve mixing. * Write a report describing the work and conclusions obtained. * Verbally present results and individual experiences to CSIRO staff.   **Relevant Fields of Study**   * Mechanical Engineering * Chemical Engineering * Applied Mathematics   **Location:** Clayton, VIC  **Contact:** For more details please contact **Peter Witt** on phone on (03) 9545 8902 or email [peter.witt@csiro.au](mailto:peter.witt@csiro.au) |
| Minerals 20 | **Project Title**  CFD Modelling: Development of Thickener Database  **Project Description**  Computational models are increasingly playing important roles in engineering and the design of new equipment. With improves speeds, algorithms and parallelisation techniques, computational fluid dynamics (CFD) is now widely used to predict complex multiphase flows in many new applications.  CSIRO is a world leader in modelling thickeners (www.p266project.com) and has developed a number of CFD-based tools in this area. A new simplified CFD approach has been developed that greatly reduces the computation time for simulations but also simplifies the model physics. To ensure both the new and old tools produce comparable results, this project aims to build a database of model outputs over a wide range of operating conditions that can then be used to “train” the simplified model. **Project Duties/Tasks**   * Become familiar with the CFD software. * Build a CFD model of a small section of a typical flow domain. * Develop a framework to run the CFD simulations and to analyse results for a large number of simulations over a range of conditions. * Review conditions observed in a range of typical thickener simulations previously undertaken at CSIRO and develop a design of experiments (DoE) to cover that range. * Using the framework developed, run the DoE to build a database. * Analyse results and determine how best to use the results to train the simplified model. * Write a report describing the work and conclusions obtained. * Verbally present results and individual experiences to CSIRO staff.   **Relevant Fields of Study**   * Mechanical Engineering * Applied Mathematics * Physics   **Location:** Clayton, VIC  **Contact:** For more details please contact **Peter Witt** on phone on (03) 9545 8902 or email [peter.witt@csiro.au](mailto:peter.witt@csiro.au) |