2015 YCCSA SUMMER SCHOLARSHIP PROJECT SUBMISSION

Date	*2015-01-08*
Main Supervisor's	*Prof. Seth Davis*
Department	*Department of Biology*
Co-supervisor's name and Department	*Dr. Jennifer Dodson (Department of Chemistry)*
Project Title	*Exploring the metal-uptake potential of the microalga Galdieria sulphuraria*
Project Description	*The unicellular red alga Galdieria sulphuraria (Galdieria) exhibits enormous versatility with the ability to thrive at temperatures above 50 °C and under highly acidic conditions (pH below 2). It shows vigorous growth on virtually any sugar, sugar-alcohol or organic acid source. This project will work as a joint collaboration between Biology and Chemistry departments to study the "mining" capacity of different Galdieria strains and their ability to sequester valuable metals, with a particular emphasis on ionic gold, silver, vanadium, palladium, tellurium, and rare-earths, such as yttrium, lanthanum and gadolinium.* *The project will focus on understanding the ability of Galdieria to uptake different metals and therefore assess its potential for cleaning and mining from precious metalliferous waters, which are often found in anthropomorphic run-offs of strip mines. Galdieria could be very useful here due to its ability to thrive in highly acidic solutions, which leads to increased solubility of many available metals. The student would grow algae on different metal-containing solutions and study the relationship of genetic profile to metal-choice. Metal uptake by these microalgae would involve the use of Inductively Couple Plasma Atomic Absorption Spectroscopy (ICP-AAS). Where high uptake of metals are found, one would then assess the potential for metal recovery or the production of catalytically or valuable materials via thermal treatment of the materials (pyrolysis, combustion). Here methods experiences include metal testing techniques (ICP-AAS, XRD), thermochemical conversion techniques (pyrolysis, combustion) and materials analysis (IR, porosimetry, SEM). Together the student thus reveals the features of an elemental harvester.*
Required skills	*Required: a scientific background with an interest of enquiry; interest and ability to absorb new concepts and terminology. A significant interest in biology and chemistry.* *Desirable: previous experience with microbiology or chemistry.*
Project dates	*Monday, 13 July 2015 - Friday, 11 September 2015.*
Other information	*The student will work in both the Biology and Chemistry department to drive forward an interdisciplinary approach that intersects physiology, genetics, microbiology, physical-chemical analysis and chemical-materials sciences*
References	(1) *Schönknecht et al., "Gene transfer from bacteria and archaea facilitated evolution of an extremophilic eukaryote"*, Science ***339*** *p.1207 (2013).* (2) *Minoda et al., "Recovery of rare earth elements from the sulfothermophilic red alga Galdieria sulphuraria using aqueous acid", Applied Microbiology and Biotechnology e02206 (2014)* ***99*** *p.1513 (2041).*