'396' Undergraduate Research Project Application Form

Office for Undergraduate Research in Science
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Form version 200603

Instructions for supervisors

- *All fields are required, unless indicated otherwise.*
- Form available in Word and LaTeX formats.
- Complete Sections 1 & 2 electronically.
- Email to victor.chisholm@mcgill.ca who will post as PDF on www.mcgill.ca/science/ours/

Instructions for students

- *All fields are required, unless indicated otherwise.*
- Download and print this form. Complete Section 3 and sign.
- See "How students can apply" instructions in Section 2.10.
- Your supervisor or department will tell you if you are selected for this project. If so, you will receive a code to register for a '396' course on MINERVA.

1 Supervisor Information

Name:	Prof. Boswell Wing
Email:	boswell.wing@mcgill.ca
Phone:	514-398-6772
Website:	
Department or Unit:	Earth and Planetary Sciences
Course number:	EPSC396

2 Project Information

2.1 Term:

Fall 2008

2.2 Project start & end dates:

September 16 - December 2, 2008

2.3 Project title:

A search for extant ^{36}Cl in the Early Solar System

2.4 Project description:

While the gross chemical evolution of our solar system has been fleshed out over the last half-century, outstanding problems still remain. One of these, in particular, is the nature of the event that sparked initial collapse of the proto-solar nebula. Nucleosynthetic anomalies in early solar system material (e.g., Calcium Aluminum Inclusions [CAI] from chondritic meteorites) provide evidence for the initial presence of extinct, short-lived radionuclides in the first stages of solar system formation. The presence of these extinct radionuclides has been used to infer the injection of material from nearby galactic objects (e.g., supernovae; asymptotic giant branch stars) into the proto-solar disk. Dynamical models suggest that the shock wave accompanying some of these injection events may have been the trigger for nebular collapse. Other interpretations suggest that the nucleosynthetic anomalies may represent products of intense irradiation but the very young Sun. Discriminating between these possibilities for the origin of extinct radionuclides may offer a new window into the events that set our solar system onto its evolutionary path.

Project Description: This project will examine whether a record of the extinct radionuclide, ^{36}Cl, exists in early solar system materials. Chlorine-36 decays with a half-life of 0.43 Myr along two branches; 98.1% goes to ^{36}Ar by β decay, while 1.9 % goes to ^{36}S by β^+ and ϵ decay. Therefore, the presence of excess ^{36}S, relative to that expected on the basis of ^{32}S, ^{33}S, and ^{34}S measurements, may document the prior existence of ^{36}Cl. We will look for ^{36}S anomalies in primitive meteorites including the CV carbonaceous chondrite Allende and the ordinary chondrite Zag. A previously established multiple step extraction scheme will be used to examine different S reservoirs within the studied meteorites. We note that Allende is of particular interest because of: (1) a yet-to-be-reproduced S isotope anomaly identified in the McMaster isotope lab in the late 1970s; and (2) ion microprobe identification of a ^{36}S anomaly in Allende CAIs. Zag is especially intriguing because halite has been identified in individual specimens, potentially providing a Cl-rich reservoir for production of ^{36}S.

2.5 Prerequisites:

1 term completed at McGill + CGPA $\geq$ 3.0; or permission of instructor.

2.6 Grading scheme:

50% of final grade based on participation in lab meetings and 1-on-1 meetings with advisor; 50% of final grade based on final report

2.7 Other:

2.8 Status:

This project is:
( ) Open to applicants
( ) Already taken; no more positions available this term
(X) Taken, but contact me for other possible projects this term

2.9 Ethics, safety, & training:

Which of the following, if any, is involved?
( ) Animal subjects
( ) Human subjects
( ) Biohazardous substances
( ) Radioactive materials
(X) Handling chemicals
( ) Using lasers
For undergraduate students, ethics and safety compliance is the supervisor's responsibility.

2.10 How students can apply:

Send me an email indicating your interest. We can set up a meeting to discuss the project.

3 Student Information. (1) Print legibly and sign. (2) See 'How students can apply' in Section 2.10.

Name:	
McGill ID:	
Email (first.last@mail.mcgill.ca):	
Phone:	
Program (e.g., B.Sc. Maj. Chem. Minor Biology):	
Level: (circle one)	U0 / U1 / U2 / U3
I have not applied for another 396 course this term. **Student signature:**	
Date:	

4 Approvals. (1) Print names and sign. (2) Notify Office for Undergraduate Research in Science. (3) Give student code to register for course on MINERVA.

Supervisor:	
Date:	
I certify that this project conforms to departmental requirements for 396 courses. **Unit Chair, Director, or designate:**	
Date:	