

**Summer Research Project -- Project Proposal**

**Form 1**

<p>Summer student research opportunities are available and sponsored by NSERC as Undergraduate Summer Research Awards (USRA) or as part of the financial need-based award program provided by the University of Guelph known as the Undergraduate Research Assistantships (URA)</p>	
<p>Department: PHYSICS</p>	<p>Name and Title of Proposed Supervisor:  Dr J.L. Campbell</p>
<p>Proposed Starting Date: 1 May 2009</p>	<p>Application:</p>
<p>Title of Proposed Research Project:  Basic physics issues in the calibration of the Mars Science Laboratory (MSL) Alpha-Particle X-ray Spectrometer (APXS)</p>	<p><input type="checkbox"/> URA  USRA</p>
<p>Outline of Proposed Research Project:</p> <p>Using X-ray spectra from the APXS instruments on board the present Mars Exploration Rovers we have developed a “fundamental parameters” approach to extracting element concentrations in Martian rocks and soils. We have also introduced a novel method which has enabled the first in situ determination<sup>1</sup> of water content of these samples. Both of our approaches are being developed for application to the APXS data which will flow from MSL starting in 2010. Major foci of the MSL mission are life and water. The work is done in close contact with Profs. Ralf Gellert at Guelph and Penny King at Albuquerque. Several projects are available for students: A large suite of geostandards is now being analyzed by the Guelph-based APXS which is identical to the MSL flight instrument. This work will continue through 2009 into 2010. Processing of these data will refine our FP approach to determination of element concentrations and help to calibrate the Martian instrument. Our software for extraction of water information is presently being upgraded and will need extensive testing with existing and new experimental data to determine sensitivity, detection limits and accuracy. Lab-based experiments, done by the PIXE method using the Guelph Accelerator Facility will provide basic atomic physics information required by our analytical approach. One example is the degree to which the K-shell fluorescence yield a light element (e.g. Si) changes when it is bonded within a silicate mineral. Another set of PIXE studies will use the proton microprobe to analyze individual grains in crystalline rock samples. We will try to relate these results to the “bulk analysis” results obtained with the APXS which has no spatial resolution capability. This will help us to understand the effect of mineral phases on the element analysis. Campbell et al. Quantitative in situ determination of hydration of bright high-sulfate Martian soils. J. Geophys. Res.: Planets 113, 2007JE002950, 2008.</p>	
<p><b>Contact Information:</b></p> <p>Name : _____ R. Vallillee _____</p> <p>Phone: _____ 519 824 4120 _____</p> <p>Extension: _____ 52262 _____</p> <p>Email: _____ rv@physics.uoguelph.ca _____</p>	
<p>Signature of Proposed Supervisor : _____</p> <p>Signature of Head of Deaprtment: _____</p> <p>Printed Name of Head of Department: _Leonid Brown _____</p> <p>Date: _____</p>	