January 15, 2010

Additional 2010 Goddard Projects for International Student Consideration

Besides GSFC projects listed at:
http://education.gsfc.nasa-telophase.com/Applyprojects/browseProject/All , see the list below.

1. **Title:** Visible Nulling Coronagraphy for Exoplanet Detection and Characterization

   Abstract: NASA has led the way in the development of complex coronagraphic and nulling instruments for the direct detection and characterization of jovian (Jupiter-like) and terrestrial (Earth-like) planets around nearby stars. Currently, a multitude of potential detection approaches exist but ultimately these will lead a space flight mission that could detect and identify biomarkers. GSFC has the led the way in the development of the visible nulling coronagraph (VNC) approach and has developed 3 testbeds with a 3rd 'Compact Nuller' in development.

   We are actively seeking highly motivated interns to work in a team environment to design, develop and facilitate laboratory experiments on these testbeds. The desired skills are the ability to learn quickly, interact openly with a tight knit team, and the desire to learn to computationally model, analytically characterize, design, develop, manufacture, assemble, align and test such instruments. Students with interests in astronomy/astrophysics, optics, control systems, computer modeling and mathematical/analytical skills are encouraged to apply.

2. **Title:** James Webb Space Telescope (JWST) Mission Systems Verification Project

   Abstract: Support the James Webb Space Telescope (JWST) Mission Systems Verification Working Group. The specific task consists of matching up the specific tests, analyses, demonstrations and inspections called-out in Observatory-level documentation to the scheduled date for which these items are identified in the detailed Program schedule. The result is a metric of planned verification progress as a function of time. Another specific task would be a review of available test information sheets to ensure they are compatible with Expanded Verification Matrices. Additional tasks would be assigned on an "as available" and "as identified" basis.

3. **Title:** James Webb Space Telescope (JWST) Mission Assurance Modeling Project

   Abstract: Numerical modeling is an integral part of how much of industry, and in particular NASA, deals with the challenges of understanding complex designs. There are key elements of a good model that help lead to Mission Success. With this in mind, Mission Assurance needs to develop a proper understanding of what constitutes a

good model, as well as how our Quality team can provide the most value-added support with regards to models and modeling. A checklist that would incorporate those aspects that are agreed to contribute to a high-fidelity model would therefore be of significant benefit to the Quality Professional. This checklist would be based upon our current NASA requirements for model acceptance and validation. As such, an individual with some modeling background would be beneficial in helping to lay the groundwork for the establishment of a Mission Assurance modeling checklist.

4. **Title:** Formation of liquid water in the shallow subsurface of Mars and prospects of Martian habitability

   Abstract: Availability of liquid water is one of the major constraints for the potential Martian biosphere. Therefore, understanding of conditions under which liquid water would form on Mars is of critical importance to the future Martian missions. This project will focus on the laboratory modeling of the Martian shallow permafrost layer. The intern will study formation of liquid films of water in various soils using Martian simulation chamber. The intern will measure conductivity and dielectric constant of ice/soil martian analog samples as a function of temperature, frequency and salt content. Pending on the intern's progress the second part of this project would involve studies of bacterial growth in the simulated Martian permafrost conditions.

5. **Title:** Evolved Gas Analysis of Mars Analog Materials

   Abstract: This project would primarily involve using an evolved gas analysis mass spectrometer (EGA-MS) setup to analyze Mars analog rocks and soils, as well as relevant mineral standards. These EGA-MS studies are being undertaken because they represent part of the capabilities of the Sample Analysis at Mars (SAM) instrument suite on the upcoming Mars Science Laboratory (MSL). SAM consists of a quadrupole mass spectrometer (QMS), a gas chromatograph (GC), and a tunable laser spectrometer (TLS). The set of chemical composition and isotope measurements that will be performed by SAM will allow us to better understand the current or past ability of Mars to support life. The results from this project will be directly relevant to understanding measurements that will be performed by SAM on Mars. In addition, some analyses may be carried out using a Terra field-portable X-ray Diffraction/X-ray Fluorescence (XRD/XRF) instrument, as they are needed to provide insight into specific EGA results and as time allows. XRD/XRF allows quantitative characterization of the mineralogy of a sample. The work would involve sample preparation (cutting and crushing rocks,
   sieving soils, etc.), performing runs on the EGA-MS system, carrying out

some XRD/XRF analyses time permitting, data processing using instrument software and Microsoft Excel, and finally data interpretation by comparison to the literature and previous work carried out at Goddard. The results and conclusions from the work will be summarized in a short report and presented in a short final presentation. A chemical or geological background is required.