JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8906

Project Title: Office of Safety and Mission Success (OSMS) SharePoint Architect

Project Description: With guidance from a JPL mentor the student intern will lead an internal SharePoint development effort. The student will also develop custom reports in the Learning Management System (LMS) and link data to the SharePoint site. Responsibilities will include but are not limited to: 1. SharePoint development--Ability to work from concept, Edit/Update existing SharePoint pages and lists, Create new lists, surveys, forms, libraries 2. Custom Report Creation--Utilize/bring in data from other applications (LMS), Write/build custom reports in LMS and link data to SharePoint

References: N/A

Major(s) accepted: Information Systems/Technology;

Suggested/Required Background & Skills: Required Qualifications: --Strong written and verbal communication skills and ability to work in a team environment --Must be proficient in SharePoint Desired Qualifications: --Experience in Learning Management Systems --Experience in custom report writing

Hazard(s), if applicable: NONE

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8901

Project Title: Engineering Tool Development for NISAR

Project Description: You will work with radar system engineers to develop software for facilitating instrument testing activities. Depending on experience and interest, you may also support implementation and testing of a data analysis tool for processing and validating engineering data as well as performance evaluation and optimization of the tool.

References: http://www.jpl.nasa.gov/missions/nasa-isro-synthetic-aperture-radar-nisar/

Major(s) accepted: Electrical Engineering and Computer Science; Computer Engineering;

Suggested/Required Background & Skills: Python/C/C++. Graphic User Interface (GUI) design and implementation experience are also desired. Knowledge of basic computer science topics such as data structures, algorithm development, modular programming, and unit testing. Working knowledge of Unix.

Hazard(s), if applicable: NONE;

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8900

Project Title: Automaton Rover for Extreme Environments

Project Description: You will be developing mechanisms and mechanical systems to create prototype style clockwork rovers. Project will consist of both early prototyping, design of mechanisms, and getting metal parts fabricated through the machine shop. Familiarity with mechanic computing or mechanical/pneumatic logic systems is a plus.

References:
https://www.nasa.gov/directorates/spacetech/niac/2017_Phase_I_Phase_II/Automaton_Rover_Extreme_Environments

Major(s) accepted: Mechanical Engineering; Aerospace Engineering;

Suggested/Required Background & Skills: Solidworks/CAD, Hands-on, familiar with hand tools. Familiar with FDM 3D printers. Ability to think outside the box. Experience designing mechanisms.

Hazard(s), if applicable: Machinery, Soldering;

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8899

Project Title: Studying the stress effects on microbial growth under laboratory and planetary conditions

Project Description: The student will work with the PI on field minerals and laboratory analogue samples to simulate controlled baseline growth profiles with bacteria. Microbes will be introduced to stresses that hamper typical cell growth and conditions indicative of ancient Mars to present day Mars.

References: https://www.annualreviews.org/doi/abs/10.1146/annurev-earth-060313-055024
http://adsabs.harvard.edu/abs/2017AGUFM.P41B2838P

Major(s) accepted: Earth Science; Biology/Bioengineering; Geology, Mineralogy

Suggested/Required Background & Skills: Mineralogy, Earth Science, Biology, Chemistry, Mathematics

Hazard(s), if applicable: Chemicals,Cryogens,Repetitive Motion (Ergonomics),Laser; DNA primers and media

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8897

Project Title: Upwelling and Subduction on Venus from Radar Imaging, Topography, Composition, and Modeling

Project Description: In this project, we will examine synthetic aperture radar, topographic, and gravity data (where resolution is adequate) for evidence of delamination and subduction, focusing on trenches associated with coronae. We will examine the fracture patterns, estimate and crustal elastic thickness from the gravity & topography signature. The overall objective is to test the hypothesis that subduction is occurring on Venus and on refining the conditions that permit subduction to initiate.

References: Oâ€™rourke, J.G. and S.E. Smrekar, Signatures of lithospheric flexure and elevated heat flow in stereo topography at coronae on Venus, J. Geophys. Res., doi:10.1002/2017JE005358, 2018. Davaille, A., S.E. Smrekar, Experimental and Observational Evidences for Plume- Induced Subduction on Venus, Nature Geosciences, doi 10.1038/ngeo2928, 2017. Smrekar, S.E. and Sotin, C., Constraints on mantle plumes on Venus: Implications for volcanism and volatile history, Icarus, doi:10.1016/j.icarus.2011.09.011, 2012. Smrekar, S.E., T. Hoogenboom, E.R. Stofan, and P. Martin, Gravity analysis of Parga and Hecate Chasmata: Implications for rift and coronae formation, J. Geophys. Res. Planets, 115, E07010, doi:10.1029/2009JE003435, 2010. Anderson, F. S. and S.E. Smrekar, Global mapping of crustal and lithospheric thickness on Venus, J. Geophys. Res. Planets, J. Geophys. Res. Planets, 111, E8, E08006, doi: 10.1029/2004JE002395, 2006.

Major(s) accepted: Planetary Science; Physics/Applied Physics; Geology, Geophysics, Earth Science

Suggested/Required Background & Skills: Geophysics, Physics, Math/Applied Math, plus Matlab, ArcGIS or other programming experience

Hazard(s), if applicable: NONE;

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8878

Project Title: Mars Data Analysis

Project Description: Work will be directed at characterizing the geology and safety of candidate landing sites for future Mars missions, including the NASA Discovery Program, InSight mission to land on Mars in 2018 and the Mars 2020 Rover. Safety issues focus on quantification of slopes of concern for landing safely in potential landing sites using MOLA data and digital elevation models from stereo images. Work will also be related to measuring rocks on the surface of Mars and understanding their context. This will include analyzing rocks visible in high-resolution HiRISE images and quantifying their size-frequency distribution to better understand landing safety. HiRISE and CTX images will also be georeferenced to lower resolution images (CTX, THEMIS) and topographic maps (MOLA). Additional work may include analyzing craters on Mars to investigate rock distributions in their ejecta, how they change with time and their morphologic state as well as the geomorphology as a clue to the subsurface geology.

References: Information on the Mars landing sites and selection can be found at: Golombek, M. P., et al., 2003, Selection of the Mars Exploration Rover landing sites: Journal of Geophysical Research, Planets, v. 108(E12), 8072, doi:10.1029/2003JE002074, 48pp. Golombek, M., et al., 2005, Assessment of Mars Exploration Rover landing site predictions: Nature, v. 436, p. 44-48 (7 July 2005), doi: 10.1038/nature03600. Golombek, M. P., et al., 2006, Erosion rates at the Mars Exploration Rover landing sites and long-term climate change on Mars: Journal of Geophysical Research, Planets, v. 111, E12S10, doi:10.1029/2006JE002754. Golombek, M. P., and McSween Jr., H. Y., 2007, Mars: Landing site geology, mineralogy and geochemistry: Chapter 17, p. 331-348, in Encyclopedia of the Solar System, Second Edition, L. A. McFadden, P. R. Weissman and T. V. Johnson, eds., Academic Press/Elsevier, San Diego, 966 pp. Golombek, M. P., et al., 2008, Martian surface properties from joint analysis of orbital, Earth-based, and surface observations: Chapter 21 in, The Martian Surface: Composition, Mineralogy and Physical Properties, J. F. Bell III editor, Cambridge University Press, p. 468-497. Golombek, M., K. Robinson, A. McEwen, N. Bridges, B. Ivanov, L. Tornabene, and R. Sullivan, 2010, Constraints on ripple migration at Meridiani Planum from Opportunity and HiRISE observations of fresh craters, J. Geophys. Res., 115, E00F08, doi:10.1029/2010JE003628. Golombek, M., et al., 2012, Selection of the Mars Science Laboratory landing site: Space Science Reviews, v. 170, p. 641-737, DOI: 10.1007/s11214-012-9916-y. Golombek, M. P., et al., 2014, Small crater modification on Meridiani Planum and implications for erosion rates and climate change on Mars: Journal of Geophysical Research, Planets, v. 119, p. 2522-2547, 10 Dec. 2014 Golombek, M., et al., 2017, Selection of the InSight landing site: Space Science Reviews, v. 211, p. 5-95, DOI 10.1007/s11214-016-0322-8 Rock distributions and their importance in landing site selection can be found in: Golombek, M., and Rapp, D., 1997, Size-frequency distributions of rocks on Mars and Earth analog sites: Implications for future landed missions: Journal of Geophysical Research, Planets, v. 102, p. 4117-4129. Golombek, M. P., et al., 2003, Rock size-frequency distributions on Mars and implications for MER landing safety and operations: Journal of Geophysical Research, Planets, v. 108(E12), 8086, doi:10.1029/2002JE002035, 23pp. Golombek, M. P., et al., 2006, Geology of the Gusev cratered plains from the Spirit rover traverse: Journal of Geophysical Research, Planets, v. 110, E02S07, doi:10.1029/2005JE002503. Golombek, M. P., et al., 2008, Size-frequency distributions of rocks on the northern plains of Mars with special reference to Phoenix landing surfaces: Journal of Geophysical Research, Planets, v. 113, E00A09, doi:10.1029/2007JE003065. Golombek, M., Huertas, A.,

Kipp, D. and Calef, F., 2012, Detection and characterization of rocks and rock size-frequency distributions at the final four Mars Science Laboratory landing sites: Mars, v. 7, p. 1-22, doi:10.1555/mars.2012.0001.

Major(s) accepted: Planetary Science; Earth Science;

Suggested/Required Background & Skills: Most of the work will be done on personal computers utilizing mixed operating systems (Windows and Macintosh), so experience with them is important. The ability to measure and tabulate rocks, place the data into standard spreadsheets, and plot the results is required for the work on rock distributions. Experience with ArcGIS mapping software (10.x), especially georeferencing imagery, is preferred as our landing site data is specifically formatted to work with this GIS package. Additional knowledge of Integrated Software for Imagers and Spectrometers (ISIS 3.x), SOCET SET, or Matlab software would be a plus. Preference will be given to students with backgrounds in geology or planetary science and other related disciplines such as geographic information science, physics, chemistry, astronomy, engineering, and computer sciences. The students will spend most or all of their time at JPL. They may be supervised by one or two research scientists and may also work alongside other researchers and students.

Hazard(s), if applicable: NONE;

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8875

Project Title: Machine learning for robot navigation (prototype for Mars robots)

Project Description: In this project, we would like to explore the application of deep learning-based methods to rover navigation on Mars. A lot of generic open-source libraries have been developed for deep learning and are freely available on the web. We would like to feed our data from the years of navigating rover on Mars to one of these open-source software. And try to learn the navigation rules and achieve a higher level of autonomy for the rover and avoid hazards and failures on Mars.

References: We might use openAI gym as the simulation and training system: https://gym.openai.com/

Major(s) accepted: Computer Science; Computer Engineering; Electrical Engineering

Suggested/Required Background & Skills: The SIRI students' role is to closely collaborate with Mars rover operators, gather the existing data from previous rover navigation on Mars. Then, the student will work on software development for machine learning algorithms based using existing open-source software on web. Finally, we test the trained navigation system by feeding the new images from the after-training runs and compare the generated path with the path, provided by the operator. If the progress is fast, we will port the method to a physical robot to test in JPL's Mars yard. We might use openAI gym as the simulation and training system: https://gym.openai.com/

Hazard(s), if applicable: NONE;

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8874

Project Title: Design and Control of prototype vehicles for Mars navigation

Project Description: In this project, we design particular vehicles that have two modes of flying in the air and moving on the Mars surface.

References:

Major(s) accepted: Aerospace Engineering; Mechanical Engineering; Electrical Engineering, Computer Science

Suggested/Required Background & Skills: The student will help with the mechanical design of the vehicle (based on an already-designed concept in JPL) or Electronics and embedded programming (depending on the student's background). Past experience with quadcopters is a plus. The student will collaborate with researchers at JPL fabrication shops; he/she will also help with basic calculations on the weight, material selection, etc.

Hazard(s), if applicable: Robotics;

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8872

Project Title: Graphics design and technical visualization

Project Description: The intern will support the robotic mobility group in creating high-quality graphics that depict complex robotic mobility concepts and concept space vehicles. The intern further will support the team on preparing high-quality technical art embedded in technical presentations, documents, and videos.

References:

Major(s) accepted: Computer Science; Information Systems/Technology; Mechanical Engineering, Aerospace Engineering

Suggested/Required Background & Skills: Required: Experience with software for drawing technical figures. Strong written and verbal communications skills. Suggested: Experience with graphic design software Web Development Experience Experience with Technical illustration, Word processing and document formatting Experience with Making Videos Experience with simulation and game environments

Hazard(s), if applicable: NONE;

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8870

Project Title: Create simulation environment for testing autonomous navigation algorithms

Project Description: In this project, we would like to explore the application of different simulation environments such as Gazebo or V-REP in creating realistic environments to test autonomy algorithms.

References: Gazebo simulator: http://wiki.ros.org/gazebo V-REP: http://www.coppeliarobotics.com/

Major(s) accepted: Computer Science; Computer Engineering; Electrical Engineering

Suggested/Required Background & Skills: The SIRI students' role is to develop software to create robot simulation environments or connect existing simulation environments (such as Gazebo or V-REP) to JPL's autonomy algorithms.

Hazard(s), if applicable: NONE;

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8761

Project Title: Occupational Safety Program Office (OSPO) Regulatory Training Development

Project Description: Collaborate with the Instructional Technologist mentor to design and develop engaging and effective online instructional materials that apply varying instructional strategies and techniques. As assigned, act as project manager/project coordinator for the eLearning process, write the project plan for the eLearning course assigned, and ensure that milestones are met, submitting deliverables as scheduled.

References: N/A

Major(s) accepted: Computer Science; Other; Instructional Design

Suggested/Required Background & Skills: Instructional design methods Adult Learning Theory Adobe Captivate Adobe Creative Suite

Hazard(s), if applicable: NONE;

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8734

Project Title: Thermal Vacuum Testing of High Power Hall Thruster Components

Project Description: The intern will assist in monitoring the component tests, analyzing and plotting data, and may have hands-on involvement with facility maintenance and upgrades. There will also be opportunities to learn about and potentially participate in other ongoing work in the electric propulsion group.

References: N/A

Major(s) accepted: Aerospace Engineering; Physics/Applied Physics; Electrical Engineering

Suggested/Required Background & Skills: Required: familiarity with mathematical programming and plotting using software such as Matlab, IDL, Mathematica, IgorPro, or Origin. Desired: Coursework in physics, aerospace engineering, and/or electrical circuits

Hazard(s), if applicable: Chemicals,Electrical Equipment (50V and above),Pressure/Vacuum Systems;

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8733

Project Title: Deep Learning and Pattern Recognition

Project Description: We are interested in sponsoring 2 - 4 intern students for the deep learning and image/speech analysis projects. The candidates will help to train intelligent computer programs to automatically detect, recognize, and track objects from various data sources. The autonomous target recognition (ATR) system helps the robots and autonomous vehicles to understand the environment, and perform autonomous maneuvers.

References: T. Lu, C. L. Hughlett, H. Zhou, T-H. Chao, J. C. Hanan, â€œNeural network post-processing of grayscale optical correlator,â€ Proc. SPIE 5908, Optical Information Processing III, 2005.

Major(s) accepted: Electrical Engineering and Computer Science; Computer Engineering; Applied Math

Suggested/Required Background & Skills: Critical thinking, creativity, curiosity, good communication skills, C/C++, Matlab programming, Labview, Verilog and FPGA; Courses: normal undergraduate math, electrical and computer engineering Useful, but not required: knowledge of image processing, neural networks, computer vision.

Hazard(s), if applicable: NONE;

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 8724

Project Title: Analysis and Archiving of Visible and Infrared Observations of Jupiter and Saturn

Project Description: a. We will be working with a large-volume set of observations of Jupiter, both imaging and spectroscopy, that are designed to support observations of Jupiter scheduled from various instruments on the New Frontiers Juno spacecraft. It will be important to reduce and, if possible, analyze these results and report them to the Juno science team during the course of the mission. b. We want to examine long-term behavior of planetary temperatures and distribution of minor constituents using archival through current thermal images that were taken from 1995 to the present. These include some of the behaviors noted below, but the data are to be examined also in a more general sense for unexpected events or phenomena unrelated to changes that are detectable in the visible. A substantial amount of this work was completed through 2010 data by a previous student, and the task will involve corrections to the calibration of the data, combined with their interpretation to be put immediately into a publication in the open literature. c. The last few years have found Jupiter in a state described as one of "global upheaval", during which substantial and rapid changes are observed in the state of its visually prominent axisymmetric regions. Most recently Jupiter's normally dark North Temperate Belt (NTB) turned bright around 2002-2003 and in 2007 suddenly darkened again, coupled with the activity of two massive atmospheric plumes. Its normally dark South Equatorial Belt (SEB) lightened early in 2007 and then darkened later that year; late in 2009 it lightened again. This task will be to examine whether there are temperature changes associated with these visual metamorphoses, even preceding them, along with variations of their dynamical states - tracked through clouds and chemical species - as a means of understanding whether large-scale dynamics are responsible or whether they can be explained by small changes of elevation that induce phase changes in the chemicals that color the clouds. d. An effort related to (b) above is to note whether there are temperature or compositional changes associated with the narrowing of the prominent dark band north of the equator, Jupiter's North Equatorial Belt (NEB). e. For Saturn, besides the long-term response to seasonal variations of radiation, we are investigating the appearance of thermal wave trains in the atmosphere. f. For Saturn, we are examining the persistence and frequency of 'patchy' thick clouds in its upper atmosphere that were detected by observations of thermal emission from deep clouds. g. We are looking to find and categorize a variety of phenomena in close-up images of Jupiter by the Juno mission's JunoCam instrument.

References: Data reduction and the retrieval process are described by Fletcher et al. (2009, Icarus 200, 154). a. Little work has been done on Jupiter in the past, but we did a similar study for Saturn, discovering a long-term (~15-year) wave phenomenon (Orton et al. 2008, Nature 453, 196). b. See Sanchez-Lavega et al. (2007, Nature 251, 437) for an introduction to our initial work in this area. c. See Fletcher et al. 2017. Icarus 286 94-117. (http://arxiv.org/abs/1701.00965) d. See Fletcher et al. 2017. Geophys. Research Letters 44, 7140. e. See Fisher et al. 2016. Icarus 280, 268. f. Our initial work in this area was described by Yanamandra-Fisher et al. (2001, Icarus 150, 189). g. See Orton et al. 2017. J. Geophys. Res. Lett. 44, 4599.

Major(s) accepted: Planetary Science; Astronomy/Astrophysics; Computer Sciences

Suggested/Required Background & Skills: The data reduction programs are written in the Interactive Data Language (IDL, which is close to Matlab in format). The analysis code is written in FORTRAN. At least rudimentary knowledge of these (or willingness to learn before the beginning of the research) is

highly recommended. At least some programming experience is required of serious candidates. With a significant level of contribution, students are welcomed as co-authors on papers emerging from this research.

Hazard(s), if applicable: NONE;

<end of record>

JPL Student Independent Research Internship (SIRI)
Announcements of Opportunity (AO) List – Fall 2018

AO#: 7927

Project Title: From Innovation to Flight

Project Description: 2018 pilot studies will involve fast development and prototyping, with regular flight tests at the end of the summer, or a plan to test it soon after. Prototypes will be mechanical, electrical or robotics systems, and would would be tested in a atmospheric platform, some in balloon and some in UAVs.

References: N/A

Major(s) accepted: Aerospace Engineering; Electrical Engineering and Computer Science; Mechanical or Electrical Eng,

Suggested/Required Background & Skills: The candidates will assist in preparing technology for flight tests and validation and improve flight . Skills in the areas of systems engineering, mechanical, electrical, power, communications or computer engineering. Skills in programming for micro-aerial vehicles such as quadrotors using Arduino, Raspberry PI or similar, and in 3D printing. Desired experience in algorithm development, in particular for path planning and navigation. Prior experience with balloons or UAVs is desired.

Hazard(s), if applicable: NONE;

<end of record>