SOUTH DAKOTA
Space Grant Consortium

Jesse Hinricher awarded $10.7K for NASA internship

Jesse Hinricher, a Chemical Engineering and Chemistry double major at the South Dakota School of Mines & Technology (SDSM&T), was awarded a $10,700 stipend from the South Dakota Space Grant Consortium for a 16-week NASA internship at Kennedy Space Center (KSC) during the spring 2014 semester. Prior to leaving for KSC, Hinricher, a junior from Pipestone, MN, said: *"I have always been fascinated with space, and NASA has always appealed to me. I grew up being a fan of Star Wars and when I found out that I could apply for an internship with NASA, I jumped at the chance. This internship will allow me the opportunity to contribute to the space program and gain valuable research experience."* With a full semester internship, Hinricher's was the largest award among 38 students who received NASA Space Grant funding during the 2013-2014 school year from among the six universities in South Dakota that had students selected for Space Grant funding. *"We are very proud of Jesse and our other students who are continuing our long-established relationship with NASA,"* said SDSM&T President Heather Wilson. After Jesse returned from his semester-long NASA internship, he wrote the following about his experience: *"I had the privilege of working on the first Class D Mission that was conceived and managed at the NASA Kennedy Space Center. While there, I worked under four NASA mentors. In order for manned deep space missions to be successful, resources must be harvested along the journey. The most important resource is water. The necessary quantity of resources cannot be taken along due to weight restrictions for space travel. I worked on the RESOLVE Payload that will explore the polar regions of the moon in search of water for potential use as rocket fuel. Water is made into hydrogen and oxygen by hydrolysis and can be used to refuel spacecraft destined for deep space exploration."* Specifically, Jesse worked on NASA's Resource Prospector Mission (RPM), which is a robotic lunar rover that is planned to launch in 2018. A simplified schematic of the rover is shown in Figure 1 below. The following is taken from a report that Jesse wrote at the end of his internship, and it explains the complex nature of the RPM rover.

> Resource Prospector Mission (RPM) will determine the viability of developing and sustaining human colonies on the moon and other planetary bodies. Part of NASA's in-situ resource utilization (ISRU) initiative, RPM will utilize the Regolith and Environment Sciences & Oxygen and Lunar Volatile Extraction (RESOLVE) Payload to extract regolith (lunar soil) and analyze its water content. First, the Neutron Spectrometer System (NSS) that is mounted at the front of the RPM rover, will detect the highest abundance of hydrogen which is indicative of water. Secondly, the Sample Acquisition and Transfer System (SATS) will drill into the regolith and collect samples. While SATS is operating, the Near Infrared Volatile Spectrometer Subsystem (NIRVSS) will analyze the components near the drill site to provide real-time feedback on any change in harvested materials. From SATS, the regolith will be transferred to the Oxygen Volatile Extraction Node (OVEN) which heats the regolith until all volatiles have entered the vapor phase. From there, the volatiles enter the Lunar Advanced Volatile Analysis (LAVA) subsystem. In LAVA, the volatiles are transferred to, and stored in, a surge tank. While in the surge tank, the volatiles are analyzed by a near-infrared spectrometer. From the surge tank, the volatiles are transferred to the gas chromatograph – mass spectrometer (GC-MS) instruments. If water is detected, the volatiles are transferred to the Water Droplet Demonstration (WDD) assembly. In the WDD, the volatiles are cooled using a thermal-electric cooler (TEC) to condense the water out of the vapor phase. Once liquid water appears, a camera will take an image of the first liquid water found on another planetary body.

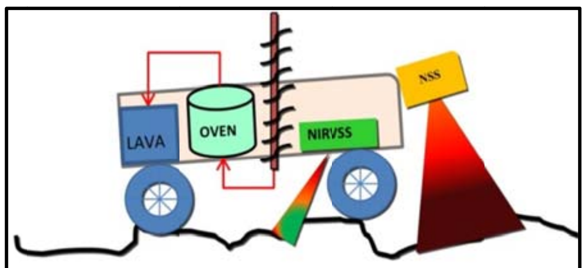

Figure 1. Simplified schematic of RPM.