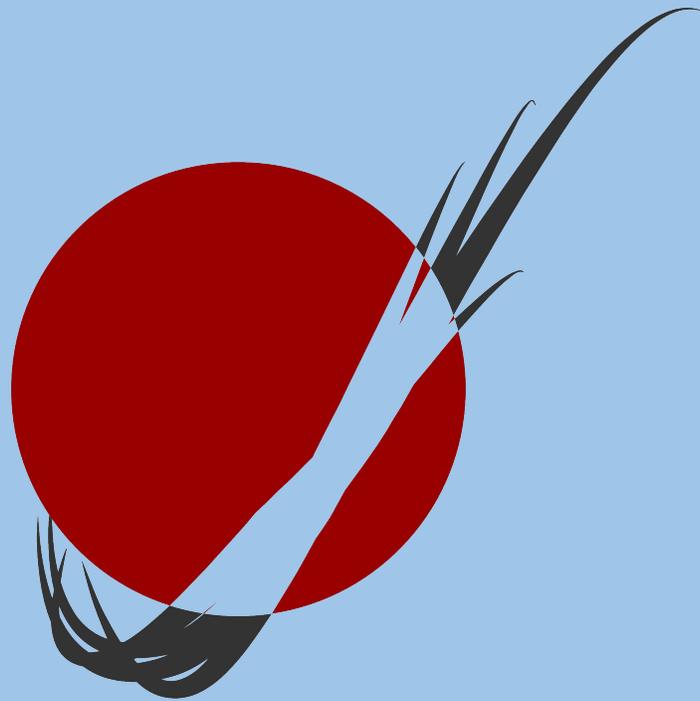


Mars Rover Design Team

2019 Post Competition Newsletter



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From the Desk of the CEO

It has been an exciting time for the Mars Rover Design Team this past summer, complete with competition, transitions, and a busy school year ahead. I am very eager to announce that our 2019 rover, Valkyrie, placed 5th in the world! Our members returned to Hanksville, Utah from May 30th to June 1st in order to compete in the University Rover Challenge (URC). URC held moments of triumph and suspense as our team worked hand in hand to complete the extensive tasks in new ways.

This time of year is also bittersweet, because we are saying farewell to the seniors on this team. These teammates built the structure that this team follows and took first place with Gryphon, our 2017 rover. Saying thank you doesn't seem enough for what these peers have done for us. The team can, however, carry on the constant pursuit of our vision for Today, Tomorrow, and Forever. Together we are ready to #Rovesohard!

Best regards,
Jacob Tuchschildt
CEO - Mars Rover Design Team



Competition Tasks

Every year URC features four different missions: Equipment Servicing, Autonomous Traversal, Science, and Extreme Retrieval & Delivery. The missions change every year to varying degrees. These changes take place in order to steadily increase the level of complexity.

Equipment Servicing

URC is a three-day exercise. We started with the equipment servicing mission where the robotic arm module was pushed to the limit. Protocase, a company that sponsors the competition, created a specialized lander with various challenges that each team was required to complete. The arm was well prepared for the first challenge: opening a drawer, aided by the use of a specialized gripper designed for such tasks. Steadily, the rover overcame multiple obstacles. The team's first challenge arose when Valkyrie took nearly ten minutes to successfully open the lander's door. Working through the challenge, we maintained a productive disposition as we swiftly moved to finish as much as possible before our 30-minute time limit was up. We recovered from our slow start to place sixth out of the collective 36 teams.

Autonomous Traversal

During the ten-minute break after Equipment Servicing, we swarmed the rover to transition the robotic arm to the autonomy system. The rover also needed to be weighed to comply with the 50 kg limit before the start of the Autonomous Traversal mission.



We consider autonomy to be the toughest mission because Valkyrie's brain is created through the collaboration of computer engineering and computer science. Valkyrie's brain lets the rover traverse free from any outside input. This task can be one of the most suspenseful at URC because base station, our rover-monitoring team, transfers control of Valkyrie's movements to the autonomy system for much of the mission. The rover uses GPS point-to-point navigation and executes search patterns. However, this year the task was cut short when the suspension jammed into a locked position when the rover attempted to turn on a steep hill. Despite this Valkyrie's 30 points out of 100 tripled Atlas's effort from 2018, earning S&T the second highest score in the mission!



Science

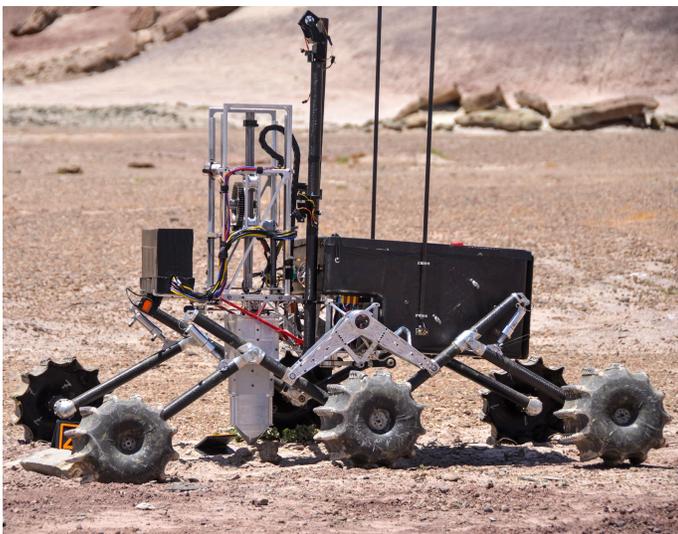
The science task changed the most from the previous year. For 2019, URC judges gave us various soil and rock samples and they challenged us to determine if life was or had been present. The new rules created a task with three distinct sections, where the first was to analyze the various soil and rock samples. In this new challenge, Valkyrie conducted the analysis in the field because no team was allowed to retrieve any samples for analysis. We worked through several difficulties when designing our system because of these new rules. Furthermore, Valkyrie's custom Raman spectrometer, the main source of data collection, proved to be incapable of providing useful data. After analyzing the soil and rocks, we carefully returned the rover to the base station without contaminating the samples. We prepared a ten-minute presentation on the rover's findings. We identified fluorescence at the first two sites and visually examined samples through an on board camera.

With all the data gathered, we labeled the samples as containing extant life, no life, and extinct life. Although our extant and no life identifications were incorrect, we finished with an incredible 91 points out of 100, based on the quality of our explanation for what went wrong.



Members prepare to compete in the science task, making small adjustments to the Raman spectrometer.

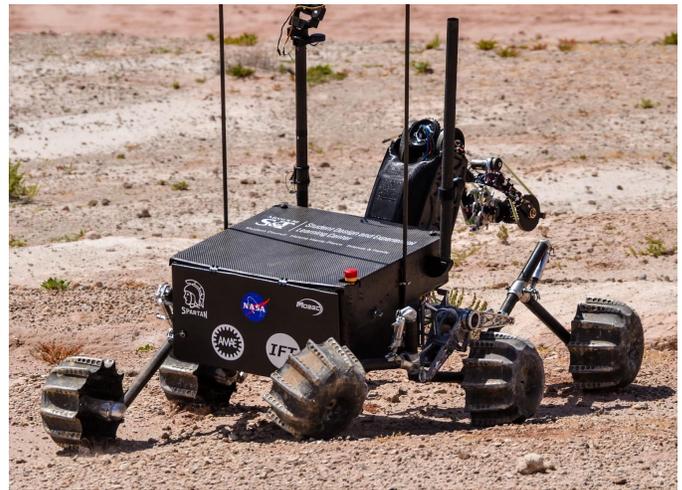
Valkyrie avoids contaminating samples as the Raman spectrometer is used for a detailed analysis of the samples..



Extreme Retrieval & Delivery

Certain moments at URC define the team, painting images in the minds of members and future students alike. Perhaps principal among them is when a system fails. Our Mars Rover Design Team was forged with a purpose of learning and inspiring. The team is not here simply to compete or win, but rather to become better engineers, learn from our failures, and to further the technologies of space exploration so that a unified humanity may step beyond its cradle and embrace its birthright among the stars.

Extreme Retrieval and Delivery held one of these defining moments. We made fine adjustments the night before that ensured Valkyrie performed at its top level. The auxiliary mounts which attached the robotic arm to the rover's body, were turned upside down so that the arm could reach into deep holes and crevasses. We also rewired the arm to use two grippers, each suited to pick up different objects. Together, the team presented a well-prepared mars rover. The morning of the task, the rover was loaded and transported to the site. Everything was in place and Valkyrie's time began. From one obstacle to another, base station technicians were speeding through the mission. Valkyrie successfully relocated a specific rock and delivered a tool to another location. These actions earned enough points to qualify us for stage two of the mission.



The second stage's first task was to deliver a water bottle to a stranded astronaut. Here, two unfortunate events occurred. First, Valkyrie's wheels touched the astronaut so we did not earn any points for this portion of the task. Second, as Valkyrie rotated, one of the main load-bearing structures on the suspension snapped, which stranded the rover. The team jumped into action, repairing Valkyrie in the field nearly a quarter mile from the base station. A spare part was manufactured prior to task, so operators installed the replacement in under 20 minutes, a process would usually take much longer in the shop. Base station decided to call an end to the mission when the piece broke again. Valkyrie placed 11th in the task. This moment was very important to the team. Naturally, our mechanical engineers took note of the necessary modifications, but the team learned something far more important: through adversity our members are strong. Everyone sticks together and continues to both learn and inspire. As difficult as this moment was for us, it will now be a driving force toward a new year and another competition.



A New Year

2019 is over and the new leadership team has been planning for next year! The Mars Rover Design Team is excited to announce that the new executive board for 2020 will consist of Jacob Tuchs Schmidt as CEO, Andrew Van Horn as CTO, Aaron Turner as CFO, and Hollis Hervey as CAO. Team leads have also been selected and have been preparing to lead their individual systems to success. There are also plans made for our distant future to visit schools and STEM events in order to excite and inspire the next generation. In the past few months, Andrew and Aaron have worked with Wrike, a company that provides project management software, which will help organize our initiatives in the future! Together, all four officers plan to expand and improve the team where they look forward to serve on the 2020 executive board.

Join us!



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