NASA’s 2014 Sample Return Robot Challenge
18 teams will compete in June for $1.5 million

Click on a team to learn more!
LOCATION: Worcester, Massachusetts (Worcester Polytechnic Institute)
TEAM LEADER: Velin Dimitrov
LOCATION: Worcester, Massachusetts
TEAM NAME: AERO stands for Autonomous Exploration ROver. It was chosen because it describes what we strive to make our robot do by the end of the competition — be capable of exploring an unknown area on its own.

HOW DID YOUR TEAM MEET? We are all from the Robotics Engineering program at WPI, and we want to improve our robot and do better this year.

HOW DID YOUR TEAM BECOME INTERESTED IN ROBOTICS? We became interested because it combines principles from three different disciplines: electrical engineering, mechanical engineering and computer science. We were interested in a combination of all these topics and thus chose to pursue an education in robotics.

CHALLENGE STRATEGY: Mechanically and electrically, aside from a few small modifications, our rover is complete. We will focus this year on integrating existing software libraries and writing custom algorithms to complete the challenge with a relatively small software-oriented team.

FAVORITE POP CULTURE ROBOT: Wall-E.
LOCATION: Pittsburgh, Pennsylvania

TEAM LEADER: Pras Velagapudi

TEAM NAME: Cephal is Latin and Greek in origin, meaning “head.” We originally picked the team name for the DARPA Robotics Challenge, where we qualified and competed in the Virtual Robotics Challenge.

HOW DID YOUR TEAM MEET? We were all colleagues at the Carnegie Mellon Robotics Institute. We collaborated on several projects together in the past. We have a shared love of robotics and a great deal of experience building robotics together. Robotics challenges are a great chance to test our skills in the real world and learn about the latest fabrication techniques and software libraries.

TEAM STRATEGY: Our robot is designed to be fast and simple, because we believe the key to this challenge is robustness. We will be using tried-and-true strategies from the literature on autonomous ground vehicle navigation in natural terrain.

WHAT ARE SOME OF THE OBSTACLES YOUR TEAM HAS FACED? We’re doing this solely out of our own passion for robotics. Each of us is competing in addition to our full-time jobs, and we are operating on a shoestring budget. Our biggest challenge is making a state-of-the-art robot while being surgically precise in spending our funding and time.

FUN FACT: During grad school, we invented “Roomba Racing,” where we equipped iRobot Creates with embedded Linux computers and raced to get them far across campus as we could — without leaving our offices. Switching to new wireless networks on the fly and convincing passersby to push the elevator buttons were all part of the game.
LOCATION: Alexandria, Virginia

TEAM LEADER: James Leopore

TEAM NAME: The rover is designed to fetch items.

WHY DID YOU DECIDE TO JOIN THIS CHALLENGE? I’ve participated in other engineering and software challenges before, and the set of skills needed and the prize money offered made it worthwhile to compete.

WHAT ARE SOME OF THE OBSTACLES YOU HAVE FACED? Hardware failures are harder to recover from than software bugs. Getting used to that is a challenge.

WHAT DOES YOUR TEAM HOPE TO GAIN BY PARTICIPATING IN THIS CHALLENGE? One of those giant novelty checks.

WHAT WOULD YOU TEAM DO WITH THE PRIZE MONEY IF YOU WON? I’d commercialize some of the technologies developed for the rover.


FUN FACT: My worst former job involved filling in for a broken robot in an aspirin bottle factory.
LOCATION: Worcester, Massachusetts

TEAM LEADER: Marcus Menghini

TEAM NAME: Formicarum is Latin for “swarm of ants.” Naming the team was a democratic process with all team members as a result of a brainstorm session involving Google Translate.

HOW DID YOUR TEAM MEET? We met at our local hackerspace, Technocopia, and discovered a common interest in space and robotics.

HOW DID YOUR TEAM BECOME INTERESTED IN ROBOTICS? We were all at some point or another involved in the robotics engineering undergraduate degree at Worcester Polytechnic Institute as students, course material developers, and hardware designers.

WHAT ARE SOME OF THE OBSTACLES YOUR TEAM HAS FACED? Object identification is the largest of the obstacles that will need to be addressed, followed by robot localization and navigation.

WHAT WOULD YOUR TEAM DO WITH THE PRIZE MONEY? Invest in Technocopia as well as various personal robotics projects.

FAVORITE POP CULTURE ROBOTS: Johnny 5; “Mind (The Culture)” and Data from Star Trek: The Next Generation.
LOCATION: Lynnwood, Washington
TEAM LEADER: Mark Curry
TEAM NAME: The team name is derived from the name of a previous robot we designed a few years ago.

WHY DID YOUR TEAM DECIDE TO COMPETE IN THIS CHALLENGE? This is our third year at the challenge. Initially, the nature of the challenge and some previous experience were the main drivers to get involved.

TEAM STRATEGY: Our approach is to keep refining a basic design until it works robustly, and not to be afraid to make relatively large changes — sort of a one step back to get two steps forward method.

WHAT ARE SOME OF THE OBSTACLES YOUR TEAM HAS FACED? For us, the biggest challenges are sufficient time given our “day jobs,” and the other big challenge is the weather. We live in the Northwest where it’s fairly drizzly and cold for long stretches of the year. Finding suitable testing areas has been an issue.

WHAT DOES YOUR TEAM HOPE TO GAIN BY PARTICIPATING IN THIS CHALLENGE? Our main interest is demonstrating that the problem is solvable with modest investment and careful design.

WHAT WOULD YOU TEAM DO WITH THE PRIZE MONEY? We would take a vacation, and after that we probably be thinking of building more robots.

FUN FACT: We have a saying: No matter how big the robot playing field is, if there is one tree on that field, the robot will head right for it.
LOCATION: Tallinn, Estonia

TEAM LEADER: Ahti Heinla

TEAM NAME: Kuukulgur is “lunar rover” in Estonian colloquial child-speak. Some of us were kids when the Soviet Union had their rovers on the moon. Estonia was occupied by the Soviet Union at the time, and this stuff was talked about a lot, so it entered child-speak.

WHY DID YOUR TEAM DECIDE TO COMPETE IN THIS CHALLENGE? In the 2013 event, we got a respectable result among the other teams, but still fell short of accomplishing the Level 1 goal. This time we want to have a chance to correct this.

TEAM STRATEGY: We’re building a swarm of smaller robots cooperating with each other instead of building one larger robot.

WHAT DOES YOUR TEAM HOPE TO GAIN BY PARTICIPATING IN THIS CHALLENGE? Fame, glory and a challenging problem to work on.

FUN FACTS: Three of our group are a family of mechanical engineers — a father and two sons. Heinla was a founding engineer of Skype.
LOCATION: Mexico City, Mexico (National Autonomous University of Mexico)

TEAM LEADER: Jorge Isaac Cordero Enriquez

TEAM NAME: Last year, when we decided to compete at the 2013 Lunabotics Mining Competition, we wanted to mix the words UNAM (National Autonomous University of Mexico) and Lunabotics. At UNAM, the team became really popular, and everyone began to identify us as Lunambotics, so we decided to keep the name.

TEAM STRATEGY: Twofold. One: precise mechanics in order to traverse the terrain and be able to capture the samples. Two: advanced artificial intelligence, in order to move in the environment and recognize the samples. Our philosophy is if we can master these two aspects we will achieve the challenge’s goals.

WHAT DOES YOUR TEAM HOPE TO GAIN BY PARTICIPATING IN THIS CHALLENGE? We are all thirsty for knowledge; we want to push our limits further. We would like to test our capabilities in the field that we all love — robotics.
LOCATION: Dunedin, Florida

TEAM LEADER: Jerry Waechter

TEAM NAME: I spent many years in electrical communications design. Smaller components cause product design to be much more system-oriented. I want to build robotic systems. Thus, I need to transition into this technology. I find myself in the middle of this transition. I am “in the middle of a complicated plan.”

HOW DID YOU BECOME INTERESTED IN ROBOTICS? I began reading Isaac Asimov stories nearly 50 years ago. This gave me the desire to build autonomous robots. My wife, Terri, was coerced into the field, since robotics is my favorite topic.

TEAM STRATEGY: We will incorporate the familiar technology we have used before in order to save design time. We are making much use of cameras to detect surroundings.

WHAT DOES YOUR TEAM HOPE TO GAIN BY PARTICIPATING IN THIS CHALLENGE? We expect to gain an expertise in robotics that will help to create a business. Also, the experience will provide useful contacts for our participation in future projects.

WHAT IS YOUR FAVORITE POP CULTURE ROBOT? R2-D2 is very persistent. It is very capable. Also, it is very much a robot-in-a-can.
LOCATION: Morgantown, West Virginia (West Virginia University)

TEAM LEADER: Yu Gu

TEAM STRATEGY: Our strategy is to keep everything simple. We have done extensive research in autonomous systems design, sensor fusion and navigation. We will try to reuse a lot of available resources and capabilities in designing our robot.

WHAT DOES YOUR TEAM HOPE TO GAIN BY PARTICIPATING IN THIS CHALLENGE? The challenge will be a great research and educational experience for us. During the process, we will develop technology for robot navigation within unknown environments. The hands-on experience will also be extremely valuable for engineering students to prepare for their future study and career.

WHAT WOULD YOUR TEAM DO WITH THE PRIZE MONEY? If we win, the prize money will be donated to West Virginia University. It will be used to create a scholarship that promotes robotics education and research at WVU.

WHAT IS YOUR FAVORITE POP CULTURE ROBOT? Terminator.
LOCATION: Corvallis, Oregon

TEAM LEADER: William Edwards

TEAM NAME: The team started out with the initiative to design robots that imitated the NASA Mars rovers because of their popularity among the mainstream public. Thus, the OSU Mars Rover Team was born.

TEAM MAKEUP: We are split up into four separate sub-teams based on our focuses: mechanical, electrical, software and business. Individuals join sub-teams based on their major or interest. Each sub-team has between 5 and 15 members of varying experience, culminating in a total team of more than 40 members.

TEAM STRATEGY: We hope to use stereo vision cameras combined with a smart searching algorithm to locate and acquire samples, while a radio-based localization method will allow our rover to guide itself back to the starting platform.

WHAT ARE SOME OF THE OBSTACLES YOUR TEAM HAS FACED? The large turnover of students graduating is usually our biggest obstacle. One of our goals is to create a system for the team so that any students, no matter their experience level, can easily join and participate.
STEAM LEADER: Robert Svec
LOCATION: Schenectady, New York
TEAM NAME: The goal of the challenge is to retrieve samples, and our chassis design looks like a dog house, so Retrievers felt appropriate.

HOW DID YOUR TEAM MEET? I read about the challenge and wanted the local high school students to team up to help NASA and win this challenge.

HOW DID YOUR TEAM MEMBERS BECOME INTERESTED IN ROBOTICS? All the members are interested in technology, and robotics combines so many facets of technology to operate as one large system.

TEAM STRATEGY: We are focusing on thorough testing of our hardware designs and the creating of advanced vision software.

WHAT ARE SOME OF THE OBSTACLES YOUR TEAM HAS FACED? Funding and time are two of the largest obstacles for this challenge. The largest obstacle in general robotics is thinking outside the box.

WHAT DOES YOUR TEAM HOPE TO GAIN BY PARTICIPATING? Experience with robotic design, assembly and software fusion in a team environment. We are excited that the challenge goal is to help NASA.

WHAT WOULD YOUR TEAM DO WITH THE PRIZE MONEY? Fund future robotics programs for our school district and the entire local area.
LOCATION: Troy, New York (Rensselaer Polytechnic Institute)

TEAM LEADER: Brayden Hollis

TEAM NAME: We noticed there were a lot of R’s related to this challenge (robot, return, RPI, etc.) and thought it would be fun to have a name that could be simplified to a bunch of R’s. We changed it slightly so that our name now can be simplified to the equation of the volume of a cylinder where the height and radius are the same. We also came up with Rock Raiders, as this challenge simulates taking rocks from a big rock (the moon or Mars). Lastly, everyone on the team currently is related to RPI.

HOW DID YOUR TEAM MEMBERS BECOME INTERESTED IN ROBOTICS? Hollis: I always loved science fiction. In addition, I have always loved math, which lead me to pursue computer science in college. But I also enjoyed high school physics, so I pursued it in college as well. I wanted to find a place to use both my computer science and physics and with my love of science fiction, so I decided on robotics.

TEAM STRATEGY: We are trying to use the idea of “keep it simple.” We are hoping to use vision for most of our sensing and have fairly simple hardware, using a lot of what others have done and integrating it all together.

WHAT ARE SOME OF THE OBSTACLES YOUR TEAM HAS FACED? For this challenge, the challenges will likely be vision and grasping the objects.

WHAT IS YOUR FAVORITE POP CULTURE ROBOT? R2-D2.
LOCATION: Pittsburgh, Pennsylvania

TEAM LEADER: Ryan Cahoon

TEAM NAME: All of our preliminary documents were labeled “SRC” for Sample Return Challenge, which is a commonly used abbreviation for “Source [Code]” in programming projects, so this is a variation on “source” that we came up with.

TEAM STRATEGY: Our overall strategy is “as simple as possible, but no simpler.” We are not averse to choosing custom designs, but will use as many “off-the-shelf” components (both in hardware and software) as we can.

WHAT DOES YOUR TEAM HOPE TO GAIN BY PARTICIPATING IN THIS CHALLENGE? The experience of building a fully autonomous robot that can complete a fairly complex task.

WHAT WOULD YOUR TEAM DO WITH THE PRIZE MONEY? Recoup expenses of the robot, put it towards further research and development of the sample return robot, participate in other robotics competitions, and/or pay off college loans.

WHAT ARE SOME OF THE OBSTACLES YOUR TEAM HAS FACED? Working in two distant locations — Pittsburgh and Seattle. We have 25 years combined experience tackling difficult robotics challenges in short time frames from our involvement in FIRST Robotics.
LOCATION: Marietta, Georgia

TEAM LEAD: Robin Kosoris

TEAM NAME: It is a take-off on a business a partner and I started in 1992. We named it Stellar Controls. We later realized that Stellar Automation was a more accurate name, since we did fully integrated SCADA systems, but we never changed it. Using this name is homage to my friend and former partner. Plus, it's a cool name.

HOW DID YOUR TEAM MEET? The team consists of my wife, son and daughter-in-law. We are all technology professionals who enjoy it as a hobby, as well. My son told me about the challenge and we decided it is something we would enjoy and could succeed at.

HOW DID YOUR TEAM BECOME INTERESTED IN ROBOTICS? I have worked with factory automation and robotics for more than 20 years. My son has a degree in mechatronics and has been interested in robots for most of his life. His senior project was a ball-bot (a tower robot balancing on a basketball).

FUN FACTS: A) We’re all family. B) We are all into medieval reenactment (despite the fact we are technophiles) C) All of us are avid science fiction readers. This challenge is way too cool to pass up.
LOCATION: Los Angeles, California

TEAM LEAD: Jascha Little

TEAM NAME: It’s short, simple, and what the robot spends a lot of its time doing.

HOW DID YOUR TEAM MEET? We work together, and we all thought the challenge sounded like an excellent way to solve the problem of what to do with all our free time.

HOW DID YOUR TEAM MEMBERS BECOME INTERESTED IN ROBOTICS? We are all engineers and software developers who already work on robotics projects. Reading too much sci-fi when we were kids probably got us to this point.

TEAM STRATEGY: We are trying to solve the search-and-return problem primarily with computer vision. This is mostly to reduce cost. Our budget can’t handle high quality IMUs or LIDAR. We have completed the mobility platform for our robot, and tested it on actual terrain extensively.

WHAT DOES YOUR TEAM HOPE TO GAIN BY PARTICIPATING IN THE CHALLENGE? A lot more knowledge in the field of stereo vision and mapping.

WHAT WOULD YOUR TEAM DO WITH THE PRIZE MONEY IF YOU WON? Probably build more robots.
LOCATION: Santa Cruz, California

TEAM LEAD: Sean Crutchlow

HOW DID YOUR TEAM MEET? We have all been classmates for the past few years, often working together on school projects. The challenge came up as a possible Senior Design (Capstone) Project. All interested students met for a team-forming session. We discussed our backgrounds and experiences in depth and five final team members were chosen through a vote.

HOW DID YOUR TEAM MEMBERS BECOME INTERESTED IN ROBOTICS? All team members encountered some sort of robotics from an early age. A majority of us started playing with LEGOes and erector sets, building different structures. As we grew up, we learned to assemble pre-made robotics kits and models. Once we got to high school, we started venturing off into different robotics clubs, hobbyist kits and personal projects. Now in our final years of college, we are combining our knowledge of robotics to fulfill a common goal we all have — succeeding in the NASA Sample Return Robot Challenge.

WHAT DOES YOUR TEAM HOPE TO GAIN BY PARTICIPATING IN THIS CHALLENGE? Success in this challenge will prove our ability to apply our knowledge and skills on a real-world engineering project. Not only will this serve as the capstone project of our undergraduate education, but it will also kick off our careers by giving us a major accomplishment for our portfolios.
LOCATION: Ontario, Canada

TEAM LEAD/ACADEMIC ADVISOR: Steven Waslander

WHAT ARE SOME OF THE OBSTACLES YOUR TEAM HAS FACED? Detection in all conditions of all samples remains a serious concern, and we are dramatically altering our sensor suite to detect faster, sooner and further away. Collection and storage have been our Achilles heel to date, and we have very exciting designs currently undergoing rigorous testing. Finally, ironing out all bugs for the extreme reliability required in the competition is a major challenge, but we came a long way last year thanks to a one-month hardware freeze with a major testing push all the way to the event.

WHAT IS YOUR FAVORITE POP CULTURE ROBOT? Curiosity.

FUN FACTS: One of our hardware experts loves to spend 90 percent of his time working on the robot. This may not be surprising, except that he is not your typical engineering student — he is studying finance and actuarial sciences. Also, most of the team members are younger than 25. Whenever there is a chance to play hockey or to kick things around in the bay, they jump at the chance. These guys drive the vision team crazy since the most interesting objects to kick around are the samples. Unfortunately, after playing soccer one time last year, the guys could not remember where they left the samples.
LOCATION: Topanga, California

TEAM LEADER: Jim Rothrock

TEAM NAME: The German term “wunderkammer” means “wonder room.” The word was used to describe the popular — and peculiar — mid-16th century cabinets of curiosity where science and superstition united in eccentric collections. “Laboratory” was added to give it a scientific feel and distinguish it from other businesses.

TEAM STRATEGY: We are constructing a single robot that finds the samples and stores them in compartments. The robot returns to the starting platform when it has found all the samples. Machine vision is used to avoid obstacles, identify samples, and determine the robot’s position in the environment.

WHAT ARE THE BIGGEST OBSTACLES YOUR TEAM HAS FACED? Having enough time to create the robot’s mechanisms, electronics, and software.

WHAT DOES YOUR TEAM HOPE TO GAIN BY PARTICIPATING IN THE CHALLENGE? Coolness, glory, and money.

WHAT IS YOUR FAVORITE POP CULTURE ROBOT? Giant Robot from the 1960s TV series “Johnny Sokko and His Flying Robot.”

FUN FACTS: Rothrock worked for nearly two decades in visual effects for the motion picture industry on films like “Titanic” and “Tron: Legacy.”