

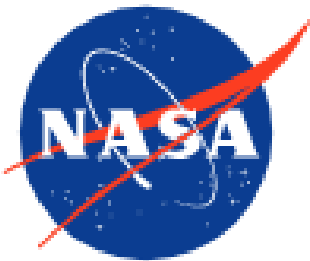
## ***Astronomy and Space Exploration***

### **Introduction**

Did you know that the Sun weighs 330,000 more times than the Earth? Have you ever thought about how vast our universe is? Do blackholes really turn you into spaghetti? What are light years? Astronomy is all about answering these questions and learning about our universe. Astronomy is a science that studies the motion, evolution, origin, and composition of planets, stars, moons, and any body or scattered matter in our universe. It uses math, physics, chemistry, and various types of engineering to do so. It is one of the most ancient sciences that has been studied by many different civilizations.



Modern Astronomy falls under two categories: Observational Astronomy and Theoretical Astronomy. Observational astronomy is the study of planets, galaxies, and other bodies in the universe. Theoretical astronomy is more about studying, analyzing, and representing the evolution of these systems.



Space Exploration is exploring space through technology, science, engineering, and astronomy. This can be in the form of sending astronauts into space, studying the sky with telescopes, sending space probes (spacecraft that are sent to collect information), satellites, and rovers.

You might have heard about the first person in space, Yuri Gagarin, and the first person to step on the moon, Neil Armstrong. But did you know that as of today, 550 people have been in space and yet only 12 so far have been to the moon? Even though the number of people that have gone to space may seem low, over 40 countries have released around 9,000 satellites. NASA has also sent 4 rovers to Mars and plans to send a fifth one soon.

## Northeastern Connections

### Faculty Connection

What if we started sending small robots into space? Assistant Professor of Electrical and Computer Engineering at Northeastern, Alireza Ramezani, has worked on developing a robot that can walk and fly. Imagine this: the robot walks on the surface of a planet, even flies around for a bit. It can use its sensors to scan the planet and send data and information back to Earth.

“It was developed with the idea of designing explorers—systems that can combine legged mobility and fast aerial mobility to do autonomous explorations,” Ramezani said.

This robot is strong but light, to make sure it can still fly. The legs are strong enough to be able to jump and sturdy enough to be able to navigate uneven surfaces -- imagine how well it would be able to navigate unknown planets!



### Student Connection

At Northeastern, students engage in Space Exploration on Earth. How do they do it? AerospaceNU is a student-run Northeastern organization that was founded in 2012. They look into aerospace development, rockets, fixing wing planes, rocket engine development, and AI drones. This group of self motivated students love to learn about new things and enhance their skills.



One of their projects, Project Karman, started way back in 2015. Their goal is to launch a rocket above the Karman line-- 100 kilometers into space. AerospaceNU has completed many tests to learn about how to launch rockets into space. They now have a vehicle that has been designed, and will continue their development in hopes of crossing not the finish line, but the Karman line!

To learn more about them, check out their website:

<https://aerospacenu.com/>

Northeastern also has an organization for students specifically interested in Space Exploration, known as Students for the Exploration and Development of Space (SEDS). Their focus is to

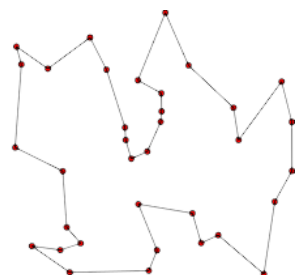
empower the youth to take an interest in and make an impact in space exploration. They have had several projects such as the “Mars Rover Challenge”, the “Mars Ice Challenge”, and even one that focuses on International Space Law.

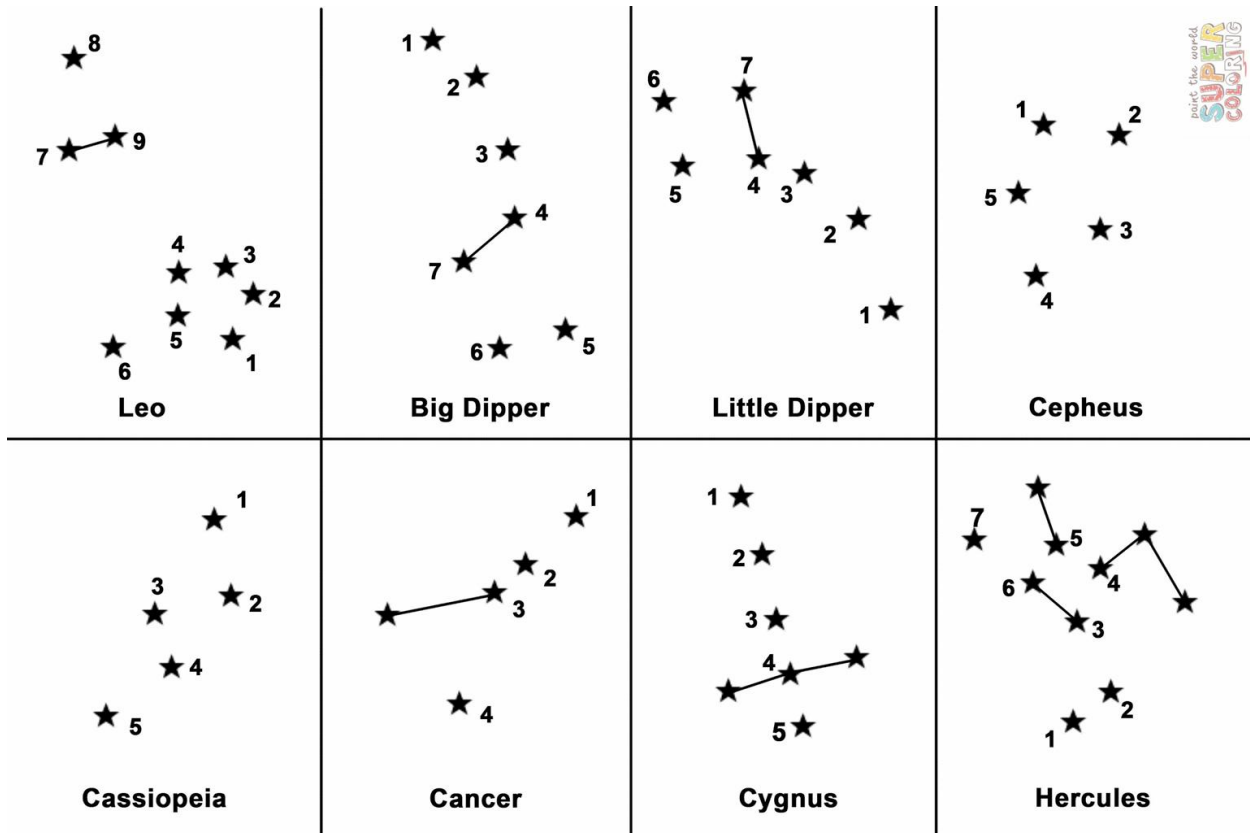
Their website: <https://web.northeastern.edu/seds/>

## Do Now

Have you ever looked at the night sky and thought about how these are the same stars our ancestors looked at? Constellations are certain groupings of stars that have helped astronomers locate certain stars or track artificial satellites. By having ways to locate specific stars, astronomers can find the position of the Sun and track the motion of planets. This has been used to help travellers during navigation, as well as creating calendars that were used to regulate agriculture.

Connect the dots to draw out some of the most popular constellations (Or copy them on a piece of paper):





## Activity

Space Rovers are crucial in space exploration. They land on other planets by being released from a spacecraft once it reaches a planet. Rovers collect information and data about the planet they land on, through collecting samples of the surface. Soil, dust, rocks, and even liquids can be collected. Time to make your own space rover!

Source: [http://www.patspaperprojects.co.uk/ppp\\_space\\_buggy.php](http://www.patspaperprojects.co.uk/ppp_space_buggy.php)

### Materials Needed:

You can use any materials you want but here are some suggestions:

- One egg box (for 12 eggs)
- Two cardboard tubes (such as kitchen roll tubes), one just small enough to fit inside the other.
- Cardboard
- Glue (such as Elmer's School Glue) and glue brush.
- Hot glue gun.
- Masking tape
- Scissors

Decoration:

- Small soap box
- Thin card
- Two plastic domes (such as ones from fruit boxes)
- Thick tinfoil
- black felt tip pen
- Poster paints and brushes.
- Pipe Cleaners or similar



**Steps:**

1. Cut six discs out of the cardboard; these will be your wheels.
2. Glue 3 discs on top of each other, twice. Press until dry to make a wheel. You should have 2 wheels now.
3. When dry, glue a circle of white paper on the front and on the back of the wheel to make painting easier.
4. From the wider tube, cut two equal length tubes. Tape both to the bottom of the egg box. Make sure the tube is wider than the egg box so that the wheels don't get stuck.
5. Cut the thinner tube in half as well. Snip both edges of the tubes so that once folded outwards, it looks like a flower. Make sure these tubes are longer than the wider tubes.
6. At one end of the thinner tube, flatten the tabs and glue (using hot glue gun) it to a wheel (similar to the image on the right). Making sure the other end is untouched, place it through the wider tube.
7. Once done to both tubes, glue the other wheels to the other side of the tubes, using the same technique as before.



8. Use the rest of the items to decorate, then paint it! Take a look at a real image of a rover or at the model above.

### Discussion Questions:

- How can you adjust your rover to allow easier navigation on bumpy surfaces?
- What features make rovers successful at navigating new planets?
- How do we learn about different planets by using rovers?

## Share Your Results

We'd love to know how the activity and/or the "do now" turned out! What worked and what didn't work? Please share with us something you learned and/or send us pictures! Email us at [stem@northeastern.edu](mailto:stem@northeastern.edu).

## Related links/Extensions

[NASA's official Website](#)

[NASA Kids' Club](#)

[NASA - Solar System Exploration](#)

[Space News -- Space.com](#)

[History of Space Exploration](#)

[National Geographic - Space Section](#)

[NOVA Lab - Sun Lab](#)

[Space Exploration Fun Facts](#)

[Brief History of Space Exploration](#)