SCIENCE MUSEUM OKLAHOMA

SPACE DAY

Science Museum Oklahoma

Space Day

What an amazing time for space exploration! The last couple years have seen astounding advances in our understanding of the universe. With more discovery, often comes more wonderful mysteries to solve.

Join us May 5, 2023 in celebrating Space Day, supported by Allied Arts. Through a variety of hands on activities at Science Museum Oklahoma, we will explore how current and future science missions work together with the goal of finding signs of life beyond Earth. “The search for life” requires great care and starts with the knowledge gained from understanding our own planet. Let’s take a look at what is needed to sustain life, investigate microscopic samples, create our own extraterrestrial creatures, and much more.

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Space Day Teacher's Resource Guide

Still wanting more intergalactic fun? Bring science into your classroom by checking out these activities on the following pages. They can be facilitated in a classroom or at home using common household items.

Educational Resources:

1. On July 12, 2022, NASA's James Webb Space Telescope, a partnership of the European Space Agency and the Canadian Space Agency, released its first full color images and spectroscopic data during a live televised event. The images were amazing!
The James Webb Space Telescope continues to provide stunning pictures and information of the universe. You can keep up with these discoveries at https://jwst.nasa.gov (Webb Image Release- Webb Space Telescope GSFC/NASA)

2. On September 26, 2022 NASA's Double Asteroid Redirection Test, or DART, successfully moved an asteroid in space on its first attempt! You can watch the impact that was transmitted from the camera on board here: https://nasa.gov/feature/dart-s-final-images-prior-to-impact (DART's Final Images Prior to Impact | NASA) Talk about a hit!

3. On April 3, 2023 NASA announced the crew for Artemis II! These four astronauts will perform a lunar flyby, testing the capabilities of the SLS rocket and Orion spacecraft for future space exploration. This will pave the way for lunar surface missions, including landing the first woman and the first person of color on the Moon. These explorers are Commander Reid Wiseman, Pilot Victor Glover, Mission Specialist Christina Hammock Koch, and Mission Specialist Jeremy Hansen. Find out more about them at: https://nasa.gov/specials/artemis-ii/ (NASA: Artemis II Crew)

4. Technology is letting us play our own role in this exciting stage of space exploration. Did you know that citizen science allows you to be part of the action and contribute to new discoveries? NASA GLOBE Observer https://scistarter.org/nasa/globe-observer-nasa invites you and your community to help scientists studying Earth and the global environment. This is just one of many ways to be part of citizen scientist. For more opportunities check out https://science.nasa.gov/citizenscience

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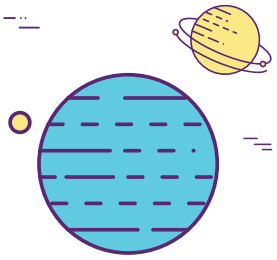


Grow Your Own Microbial Art

Imagine creating artwork that grows and changes over time. With a few simple supplies from around the home you can. In fact, the American Society for Microbiology has an art competition every year where they do just that. ASM Agar Art Contest | Overview | ASM.org

WHAT YOU'LL NEED:

- Sealable storage bags
- Sliced bread
- Latex gloves or tongs
- Cotton swabs

WHAT TO DO:

1. Wash your hands and the tongs.
This experiment will work best if you introduce microbial life in a very controlled fashion. Since microscopic living organisms are everywhere, start by washing your hands and tongs very well.

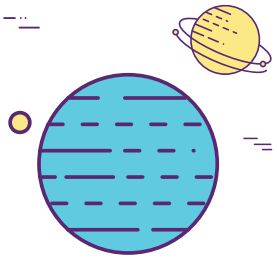
2. Pick one slice of bread.
Take a piece of bread out of the bag without touching it if possible. Use tongs or gloved hands. I like to use fresh white bread from the bakery. Mold shows up on the white bread well and bread from a bakery has fewer preservatives to inhibit growth.

3. Collect samples to grow.
Take a cotton swab and rub it on surfaces around your home. They don't even have to be dirty surfaces. The places microscopic organisms live may surprise you. The bottom of your shoe, or through your pet's fur. Different surfaces may hold a type of microscopic life no one has ever seen before.

4. Draw an imaginative picture on the bread.
Take the cotton swab and rub it gently across one surface of the bread. You can try a pattern if you wish or you can let the growth determine the pattern.

5. Put the bread into a sealable storage bag.
Seal the slice of bread securely into the bag and put it in a safe place. Be patient while the bread mold grows. This could take several days.

6. Photograph your art.
When you see growing things remember it will continue to get bigger and bigger so if you want to capture an image as it is, take a picture quick, the next time you look, it will be different.



7. Dispose of the bread carefully.
Don't open the bag. Dispose of it by throwing the unopened bag into the trash. You have grown a large amount of unknown microbial life. Most of it is harmless, but you never know. So be safe and keep it sealed.

WHAT'S GOING ON:

When you touched a surface with a cotton swab, you probably picked up thousands of spores in a hundred different varieties. Some of those spores then rubbed off onto the bread. When the spores are placed in contact with the nutrients they need, they begin to grow slowly and invisibly at first. Over time, they reproduce and get bigger and bigger until the organism is visible to the eye.

The fuzz growing on bread is mostly mold. Mold is a type of fungus. The fuzzy visible part of mold are the fruiting bodies that hold spores and allow it to reproduce. Most of the organism though is made up of invisible filaments that spread through the bread like tiny roots to extract the nutrients.

TAKE IT FURTHER:

The spores are what determine the mold's color, and this color can change depending on the environment in which the spores grow. For different colors, try this activity again while experimenting with different temperatures. The refrigerator or on a windowsill are great options.

TEACHER TIP:

You can relate this activity to how scientists study microorganisms on Earth to gain insight into what life was like in our planet's early stages and to help spot life on other celestial bodies. Mars, in particular, is a favored destination for life due to the planet's proximity and similarities to Earth. Following the confirmation of the past existence of surface liquid water, the search for evidence of habitability, fossils, and organic compounds on Mars is now a primary objective for space agencies.

Mars is not the only candidate for microbial life. The outer solar system contains a cornucopia of icy ocean worlds, such as Jupiter's moon Europa. This moon will be visited by NASA's Europa Clipper mission and ESA's Jupiter Icy Moons Explorer (JUICE) in the next decade. Both space crafts will study the moon's chemistry and potential habitability to support life.

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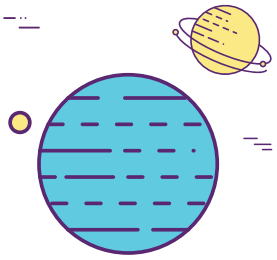


Egg Drop Engineering

Get ready to break some eggs! Become an engineer in a challenging contest to design and build a lander that can safely drop your payload to the surface.

WHAT YOU'LL NEED:

- Household supplies to build your lander (ex. paper bowls, cotton balls, coffee filters, tape, string, straws, popsicle sticks, bubble wrap)
- Cleaning supplies (ex. trash bags, paper towels)
- Eggs
- Pencil and paper
- Tarp (optional but recommended)

WHAT TO DO:

1. Collect your materials.
You will need a container, some internal padding, and external padding to safely land your craft.

2. Make a plan for your device to hold the egg and survive being dropped.
Draw up your design on paper. What does your lander look like? What materials did you use?

3. Build the device and place the egg inside.
Experiment with different materials. What materials would work best to make a parachute? What do you think makes for great padding the inside of your lander? Record your predictions.

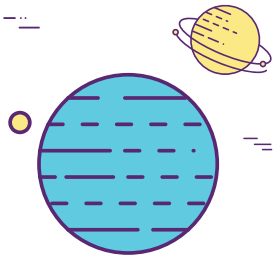
4. Examine the device carefully.
Make sure the egg is securely fastened inside your lander.

5. Test it out by dropping the lander from up high.
If the egg survives, try dropping it from up higher or throw it down with more force until the egg breaks. For easier clean up, place a tarp below your drop site.

6. If the egg breaks, design a new device.
Determine what changes will benefit your new design. Testing and improving is part of the engineering design process, which helps us find better solutions among many possibilities.

WHAT'S GOING ON:

Gravity is a force of attraction by which a planet or other body draws objects toward its center. When you drop the lander, gravity pulls it to the ground. It doesn't take much force to break the egg inside. Dropping the egg without breaking it is a real challenge.



There are many ways to make the egg harder to break. Adding the internal padding that surrounds your egg cushions the payload inside structure. Think about how airbags in a car protect the passengers in an accident. The external padding protects the egg by absorbing the impact felt when the lander hits the ground.

Building an egg drop is a great example of the engineering design process. This requires testing, analyzing the failure, making improvements, and then testing again. This repetitive process is the heart and soul of engineering. So go break a lot of eggs and become an expert engineer!

TEACHER TIP:
You can relate the activity to the challenges NASA scientists have in landing their rovers safely on the Martian surface. Previous missions like the Mars Exploration Rover and Pathfinder used a familiar airbag landing system, while newer heavier rovers like Curiosity and Perseverance were lowered down using a sky crane touchdown system. Both methods require these vehicles to withstand the heat of entry into the Martian atmosphere as well as the impact of landing.

The objective of a Mars rover is to study the planet in-depth directly from the Martian surface. Perseverance's goals include identifying ancient Martian environments capable of supporting life and seeking out evidence of formal microbial life existing in those environments by collecting rock and soil samples.

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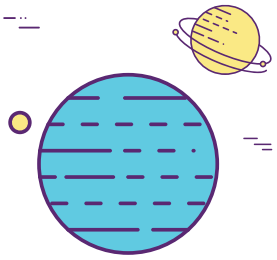

Extraterrestrial Creature Creation

Astrobiology, also called exobiology or xenobiology, is a multidisciplinary field dealing with the nature, existence, and search for extraterrestrial life (life beyond Earth). Research in astrobiology comprises three main areas. The first of which is the study of habitable environments in the Solar System and beyond. Next is the search for planetary bio signatures of past or present extraterrestrial life. Finally, researchers study of the origin and early evolution of life on Earth.

While the search for compelling evidence for life on other planetary bodies is still ongoing, we can look to life that has existed on earth throughout its history as a guidepost for what life might look like on other planets. In this activity, using your knowledge of existing biology, you will create a model of an extra-terrestrial life form using recycled materials.

WHAT YOU'LL NEED:

- Recycled materials (ex. cardboard, straws, paper, cartons, plastic bottles)
- Decorations (ex. markers, feathers, yarn, fabric, foam, googly eyes)
- Hot glue
- Tape
- Scissors
- Paper and pencil
- List of planetary biomes (included)

WHAT TO DO:

1. Pick from the list of planetary biomes.

Once you have decided on the type of planet your organism comes, think about what an organism would need to live there. How do they get food? Where do they take shelter? What do they look like and why? You might want to jot down your ideas on a piece of paper.

2. Research.

If you have a rough idea of what your creature is or does but aren't sure where to go from there, you can always look up organisms that have lived on earth as references. Creating something that lives on an ocean world? Look up creatures like the Anomalocaris that lived on earth when our planet was covered in oceans. Sometimes looking to science fiction can give you inspiration as well. Popular culture is filled with creatures that take elements of real organisms and fuse them together to make something unique. Create a rough sketch on a piece of paper to help fully realize your creation.

3.Start building.

While building, keep in mind all of the questions you have answered about your organism. Make sure what your building fits the environment and has a purpose in your organism's survival.

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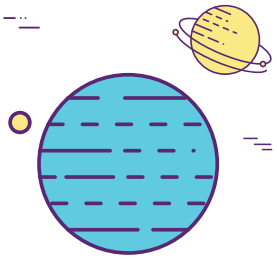

WHAT'S GOING ON:
When you did this activity, you were thinking like an astrobiologist. These scientists study the origins and distribution of life in the universe. Astrobiology is a relatively new field of research when compared to biology, geology, and astronomy, but scientists who study this must have a good understanding of all of these fields and more. There is a lot yet to be discovered in our world, and your future career may be part of making these discoveries.

PLANETARY BIOMES

GIANT EARTH:
A giant earth-like planet would have a similar biome to Earth. However, the gravity would be much higher. Organisms here would most likely be short and squatty in stature, making injuries from falls quite severe. This could attribute to animals on this type of planet living in underground burrows or on forest floors.

TINY EARTH:
A tiny earth-like planet would have a similar biome to earth but the gravity would be much lower. On this planets, organisms would likely grow tall and large. Jumping or flying animals could also be common, taking advantage of the lower gravity.

DESERT PLANET:
A desert planet is a place where water is scarce. The temperatures remain hot during the day but could fall during the night. Sand or clay based soils would cover the majority of the planet. There may be multiple suns or other unique phenomena that account for the extreme heat. Organisms here focus on escaping heat and conserving water. Organisms that live partly or completely underground would most likely be common.

ICE PLANET:
This would be a planet covered in ice or frozen tundra for a majority of the time. This could be due to an extremely elliptical orbit. The planet would be far away from its star most of the time, while only moving closer for a short part of the year. This planet may also have geothermal activity that heats under the ice or even cave systems underground. Organisms here would most likely be adapted to the cold, possibly going dormant for long periods of time, or stay near heat sources coming from inside the planet.

OCEAN PLANET:
An ocean world would be an entire planet of water with little to no large land masses. This planet would probably mimic earth long ago when all life was underwater. Aquatic organisms similar to those found during the Cambrian period could be common.

GAS GIANT:
Gas giant planets have large thick gas bands with high gravity. Organisms here would have to deal with high pressures as well the fact that there is no solid surface. Organisms here would have had to adapt to moving through the soup-like atmosphere as well as gaining nutrients from it.

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