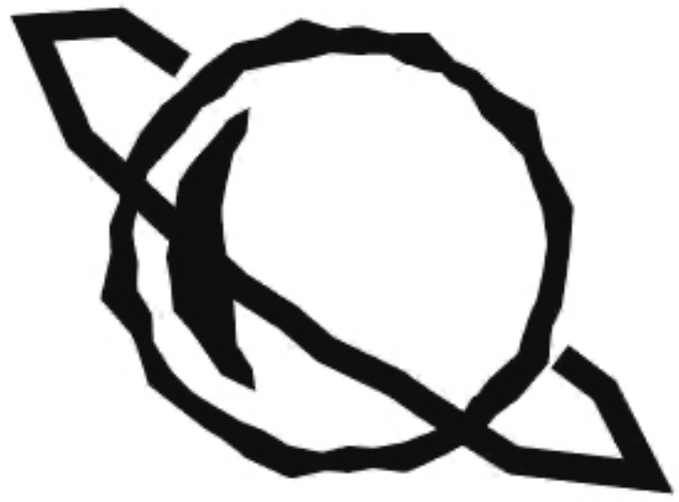
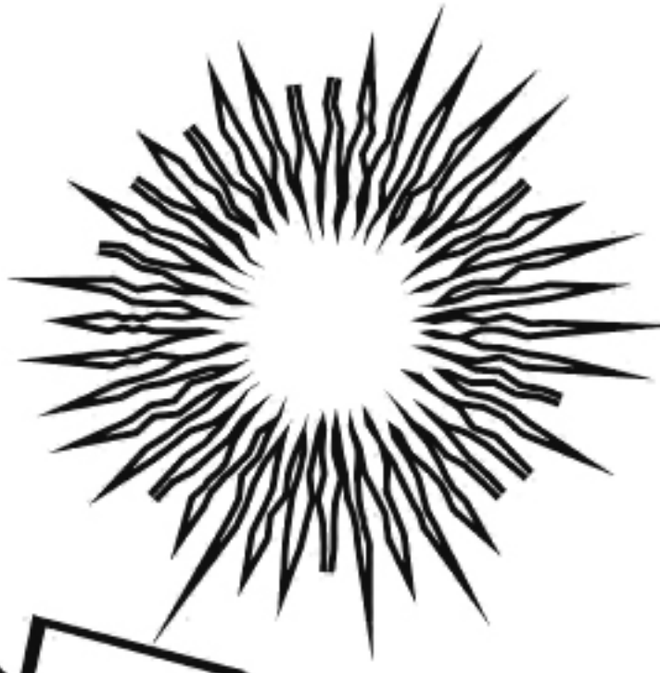
CLASSROOM ACTIVITY





Creating an Extraterrestrial

General Information

★ Level: elementary 2nd and 3rd cycles, secondary I to V.

★ Students per group: individual activity or 2-3 students per group.

★ How long: one to two weeks.

★ Where: in class.

★ When: after visiting the Planetarium.

★ Type of activity: multidisciplinary.

★ Key words: exobiology — living conditions on planets and satellites — solar system.

★ Skills honed: imagining, describing, reasoning, explaining, envisaging interactive systems, and creating models and simulations.

Starting Point

What would an extraterrestrial living on another planet or a satellite in our solar system look like? What would it eat? How would it have adapted to its environment?

Preconceptions

All students have surely imagined what an extraterrestrial might look like. More often than not, though, the creatures they conjure up are influenced by science-fiction books and movies. Rarely have students tried to visualize an extraterrestrial that has adapted to a genuine planetary environment.

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Basic Concepts

On Earth, life has adapted to very diverse environments, from burning desert sands to frigid polar regions, from muggy tropical forests to the dry air atop mountain plateaus. Microscopic life forms inhabit the scalding waters of hydrothermal vents on the seafloor and dwell within rocks buried kilometres underground. Indeed, life has evolved to survive practically anywhere on Earth. Every ecosystem, no matter how unfriendly, offers living conditions favourable to certain species. These species become specialists, flourishing where most other creatures would die. Thanks to mechanisms of adaptation, life has colonized all the ecosystems across our planet.

In the solar system, the Earth is the only planet that harbours all the conditions needed for life to spring up. These conditions include abundant liquid water, a dense atmosphere, and a mild, stable climate. Yet nothing prevents us from imagining how extraterrestrial life forms might have evolved in planetary environments other than the Earth's. This is in fact the focus of this student activity.

Students will first do research on the celestial bodies to identify the characteristics of the environment where their extraterrestrial lives. They'll then share the findings of their research and exploration using their skills in language and art. The description of their extraterrestrial needn't be scientifically accurate. What's most important is the reasoning students use in developing their creature.

This activity is a fun way to teach the distinguishing features of the planets and their satellites and to dispel myths. Also, the activity can easily be adapted for writing assignments or art projects. Students should be encouraged to reflect on the characteristics of an extraterrestrial before they create their own. They should prepare a drawing of their creature or write a description before building their model. This activity is a good end-of-term project to do after students have spent a few weeks learning about the planets and satellites.

Students are also given a chance to imagine how humans would live and work on the Moon or another planet in the solar system. This activity is always popular with students, probably because it lets them use their imagination as they learn about the conditions existing on the surface of other worlds.

For older grades, break the class into groups so the students can solve problems together. Then suggest that students present their creatures to the younger grades in the school.

Goals

This activity will give students a deeper understanding of a celestial body in our solar system, whether a moon or a planet. Students will also learn to use resources in the library or elsewhere (books, encyclopedias, CD-ROMs, Internet).

Students must apply their knowledge of the conditions existing on other worlds to develop an extraterrestrial life form that has adapted to the temperature, gravity, soil, radiation exposure, composition and atmosphere of a moon or planet in the solar system.

Using their creativity, students will then present their creature to their classmates by doing an oral or written report or making a model or drawing.

Steps in the Activity

Preparations

Write the names of the planets and moons listed below on small strips of paper.

Mercury	Venus	Mars	Pluto	Triton
Jupiter	Io	Europa	Saturn	Charon
Titan	Uranus	Titania	Neptune	The Moon

You can add other celestial bodies to this list such as asteroids, comets or other moons in the solar system. It's best to create more than one label per celestial body. Different students will come up with different extraterrestrials for the same environment. This will help students realize there may be several solutions to the same problem. Place the labels in a box or bag.

Inform the head librarian that students will be doing research on the planets in the solar system. In addition to books, the library may have other documentation students can use in their research. As a rule of thumb, the newer the publication is, the more updated the information will be. Since planetary astronomy is a rapidly evolving science, avoid reference material over five years old. The internet is an exellent resource, especially at accredited web sites (NASA, JPL, etc.). Start from www.planetarium.montreal.qc.ca where you'll find links to all these sites.

Supplies

- Small box or bag.
- Labels bearing the name of a planet or satellite (one per student).
- Research material.
- Arts and crafts material.
- Paper and pencil.

Assignment

❶ Each student picks a label from the box or bag. Students shouldn't disclose which world they've chosen.

❷ Explain to students that the goal is to build a model of a creature that could live on the world they've chosen. The three-dimensional models will be made out of arts and crafts material. Allow one to two weeks for doing the research and building the model. Also ask students to write a half-page description of their extraterrestrial that explains why the creature has certain features but that doesn't reveal which world the creature comes from.

❸ Discuss the points for students to consider when they're inventing a creature that inhabits another world. Help students draw up a list of basic needs for their creature to survive. For example, their creature needs a way to:

- Find food.
- Move around.
- Breathe.
- Reproduce.
- Maintain proper body temperature.
- Assimilate the environment (the equivalent of our five senses).

As well, students should consider other factors, such as the presence or absence of an atmosphere or the effects of gravitational pull, which may be much stronger or weaker than on Earth. Ideally, prepare this list of factors as a group so you draw on the ideas and suggestions of all students.

Note: *It might be useful to repeat this type of discussion a few times after students have begun their research on the nature of their world and also before they actually begin assembling their creature.*

In carrying out this activity, students should use the resources at the library in their school or community to help them grasp the characteristics of their planet or moon. If possible, verify the type of reference material at your local libraries. In particular, check out:

- Encyclopedias (the most recent possible).
- Sky & Telescope*.
- Astronomy*.
- SkyNews*.
- National Geographic*.
- Web sites.
- CD-ROMs.
- Books and videos on planets.

**Magazines.*

❹ Once students have completed their research, they'll build their model and write a description of their extraterrestrial.

Wrap-up

The day that the models are presented, ask students to display their creatures around the classroom and to place their description next to their creature. Remind students not to mention the name of the planet or moon their creature lives on.

Give students time to examine their classmates' creations. An oral report can also be used for this part of the activity. Next, ask students to guess which world each creature comes from and to explain their reasoning.

Once the extraterrestrials have been examined and their homes revealed, ask students to discuss the problems they encountered in developing a creature that lives in such a strange environment. Talk about why space probes have found no proof of the existence of life elsewhere in our solar system.