



# Imagining Life

Imagine what life could look like on alien worlds!

Life on Earth comes in an amazing variety of forms. Scientists study life on Earth to understand the conditions that support life, and to predict what kinds of life might be found beyond our planet.

## Materials Needed:

*Extreme Life* cards, drawing sheet, crayons (or colored pencils or markers).

## Instructions:

**Step 1:** Look at the *Extreme Life* cards. They show living things that thrive in extreme environments: places where humans cannot live. Think about how each one survives. What adaptations do they have?



**Step 2:** Imagine a planet with an environment too harsh for people. Is it too hot? Too cold? Too dry? Draw the environment you imagined on the drawing sheet.



**Step 3:** Draw a life form that could survive in your imaginary environment. It can be one you see on the cards or one you invent! You could also write a description.



Questions to consider:

- How big is your creature?
- Where does it live? What does it eat?
- How does your creature adapt to its environment?  
If it's dry, how does it find water?  
If it's cold, how does it keep from freezing?



## Think and Discuss:

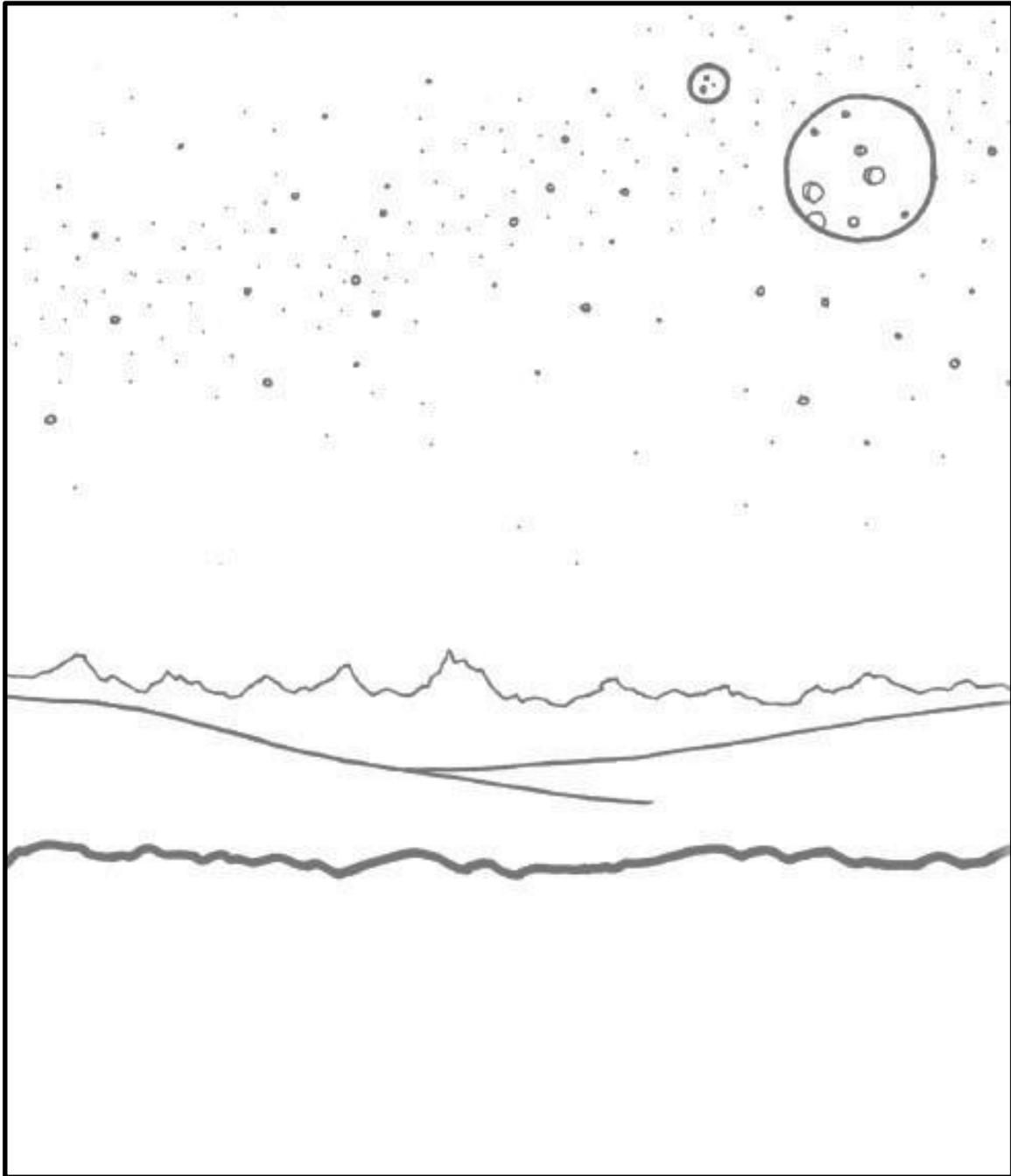
What do YOU think alien life would look like?

If we do find life in outer space, should we bring it back to Earth?

How important is it to find life in the rest of the universe?

# Imagine Alien Life: Drawing Sheet

Imagine an alien life form on a far-off world. Where does your alien live?  
How is it adapted to its environment?



**When you imagine life on another planet, you're doing science!**  
Scientists study life on Earth to make predictions about what kinds of life forms could exist on other worlds.

# Searching for Life

**Life on Earth comes in an amazing variety of forms.** Some living organisms, called *extremophiles*, thrive in very harsh environments, including volcanic vents deep in the ocean, dry deserts, cold ice sheets, dark acidic caves, and many more. Each of these living things have adaptations to help them survive in their environment.



*Tardigrade. Image: NPS: Diane Nelson*



*Researchers studying microbial life in a volcano crater. Image: NASA/NAI, Dr. Jake Maule.*

**Scientists known as *astrobiologists* study life on Earth** to make predictions about what kinds of life forms could exist on other worlds. Studying extremophiles and their environments can help us understand the conditions that support life, and predict what kinds of life might be found on different planets. This information provides clues about where and how to search for life beyond Earth.

**If life exists elsewhere in the universe, it could look very different from life on Earth.** Right now, we don't have evidence of life in places other than Earth, but scientists continue to search. They expect that if alien life forms do exist, they will be specially adapted to their environment. Most of the alien worlds we've explored so far are very different from Earth, so any living things we find beyond Earth will probably be very different, too.



*Jupiter's moon Europa. Scientists consider Europa a promising place to look for life beyond Earth. Image: NASA/JPL-Caltech/DLR*



**When you imagine life on another planet, you're thinking like a scientist!** All scientific breakthroughs involve creativity. When we use our imaginations, it helps us understand what alien worlds might look like, and what kind of life might survive there.

**Watch a video about looking for life beyond Earth:**

[www.youtube.com/watch?v=Smeg1KUa3qU](http://www.youtube.com/watch?v=Smeg1KUa3qU)

# Imagining Life: Extreme Life Cards

## Wood Frog

**These frogs survive frigid temperatures by hibernating!**



*Flickr/Brian Gratwicke*

During the winter, wood frogs burrow into the ground. Their breathing and heartbeats stop, and their bodies freeze. When it gets warmer, they thaw out, wake up, and hop away! Wood frogs live in Interior Alaska, and are the only amphibian that live north of the Arctic Circle.

Scientists don't think we'll find complex life forms like frogs on other planets or moons in our solar system. We're more likely to find microscopic life forms.

## Lichen

**Lichens can survive almost anywhere.**



*CINMS, NOAA / Robert Schwemmer*

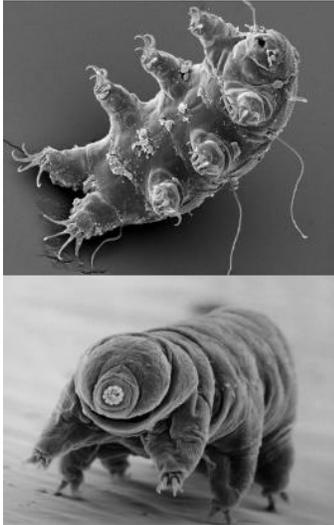
Lichens can live for hundreds of years in a wide range of environments, from arctic tundra to hot deserts to rocky coasts. They can grow on trees, rocks, walls, and even toxic slag heaps. Because lichens are so tough and versatile, they are found blanketing around 6% of Earth's land surface!

Lichens are a combination of more than one kind of life—usually a fungus with algae, bacteria, or both. Some scientists think that evidence for combination organisms could be discovered on Mars.

# Imagining Life: Extreme Life Cards

## Tardigrade

**This tiny animal is one of the most durable life forms on Earth.**



ESA: Dr. Ralph O. Schill / NPS: Diane Nelson

Tardigrades (also called water bears or moss piglets) can live in a variety of extreme environments, including high mountains, rainforests, and deep seas. They can endure freezing temperatures, high pressure, and very dry air, sometimes by entering a state of suspended animation. In one experiment, tardigrades were exposed to the radiation and vacuum of space for ten days—and they survived! Scientists are studying tardigrades to understand what alien forms of life might be like.

## Snottites

**These microbe colonies flourish in very acidic environments.**



caveslime.org / Kenneth Ingham

Snottites are single-celled bacteria that live in colonies in dark, wet caves. “Snotties” look like small stalactites but have the consistency of mucus. They get their energy from volcanic sulfur, and their waste is highly acidic.

Some planets, such as Venus, have toxic clouds and atmospheres. They may be the perfect place to look for life forms that love acidic environments!

# Imagining Life: Extreme Life Cards

## Emperor Penguin

**These birds have adapted to survive in bitter cold.**



*NOAA NESDIS, ORA / Michael Van Woert*

Many penguins live in the Antarctic, where temperatures are well below freezing. They often live in large groups, huddling together to keep warm. To get around in their chilly world, penguins swim, surf the waves, and use their bellies like sleds.

Penguins are an example of a complex life form adapted to an extreme environment. Beyond Earth, scientists think we're more likely to find microscopic life.

## Barrel Cactus

**These special plants are well suited to the high, dry desert.**



*Flowers Pictures*

Many different kinds of barrel cactus grow in the Sonoran Desert in California. Each one is adapted to its environment. They can withstand huge changes in temperature—very hot during the day and very cold at night—and they need very little water.

Scientists are learning about how some living things can survive the extreme environments found on other planets. But we haven't yet found signs of life anywhere other than Earth!

# Imagining Life: Extreme Life Cards

## Snow Algae

**Snow algae survive on mountaintop snow and ice.**



*Richard and Pam Winegar*

For many years people thought the reddish color on high alpine snowfields was caused by a mineral, but researchers have discovered that it's actually huge colonies of algae. Snow algae grow in the freezing water created by melting snow. The algae look and even smell a little like watermelon!

Scientists are trying to determine if Jupiter's moon Europa might have the right conditions to have forms of life that tolerate cold.

## Yeti Crab

**This crab thrives on the deep, dark ocean floor.**



*University of Hawaii Manoa,  
MoraLab / Enrique MacPherson*

Sightless, hairy yeti crabs live near hydrothermal vents deep in the ocean. Bacteria coating their hairs eat toxic minerals emitted from the vents. The crabs may eat the bacteria, or they may scavenge on dead things falling from above.

Scientists think life in other parts of the universe won't look very much like life here on Earth. But we haven't found any evidence of alien life yet!