

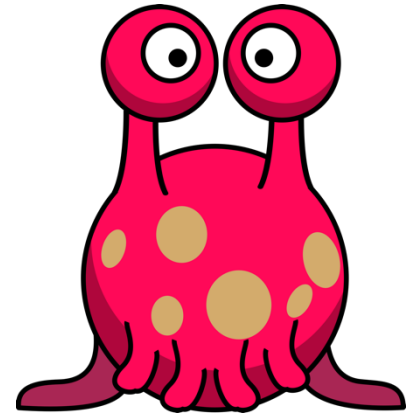
Paper 2 Build Your Own Alien

The Project

For the second paper, you will work in groups of two or three and develop an alien ecosystem with organisms that are well-adapted to their environment. The more different your life is from terrestrial life, the better. On earth we have vertebrates and invertebrates, internal skeleton/exoskeleton, bird/reptile/amphibian/mammal, plant/animal. Most of those distinctions are accidents of terrestrial evolution, so life doesn't have to be that way on your planet.

Originality is important. Space crabs will get a low score. So will Barbie with wings. A cross between a crab and a wasp won't do well either. The creatures will have to make sense in terms of evolution. How did they get to be that way? How do they fit into their web of life.

Develop an ecosystem for an area of your planet that includes a top predator, its prey and the scavengers who pick up the scraps. Use the principles of evolution we've been discussing in class, and ideas from the ecology of the stories we're read to make a believable ecosystem. Instead of writing a paper for this project, you will make a presentation.



Important Details Of An Alien

Ecosystem

How does your creatures fit in the web of life? Predator, prey, scavenger? What eats it? What competes from the same food? What kind of parasites live on it, or off it? What resources does it use? What does it provide? What resources are the most scares? How does that affect how the creature lives? What type of climate does it prefer? What ranges can it tolerate? How does it handle the changing seasons? Hibernation? Migration? Endospores?

Reproduction:

There are a lot of ways of doing this on earth. Even if you stick with male and female, there are a lot of variations. Fertilization doesn't always take place inside the body. Male sea horses keep the eggs in a pouch until they hatch.

Do your creatures have lots of offspring, most of which don't survive (r strategy), or do they have a small number, which they protect fiercely?

Where do the babies get their food? Hatch on the right food (be it leaf or dead or living animal) Does the mother produce food (mammal) or do the parents partially digest it for them first (birds) or do they just have to figure out how to hunt fast (reptiles) or something else?

Anatomy

Use the principles of convergent evolution to describe how your creature takes in nutrients, how it breathes, the structure of its body and its sensory organs. Is it Endothermic or Exothermic. Are the various parts more like a hose or a balloon? Does it combine parts what we have separate—like breathing and eating or liver and kidney. Does it separate functions that we have as a single organ for—Two hearts maybe, or blood production outside of the bones. Does it have senses we lack, like electric field detection, or see in different range of colors. How are the sensory organs arranged on the body? It doesn't have to have a face.

Some of the features you develop must be the same across species, others are important variations that allow different species to flourish in different conditions. The common features will be due to the features the common ancestor had, while the differences are more recent evolutionary adaptations.

Your report will be a fifteen-minute presentation using either PowerPoint or a series of movie clips. In your presentation you should discuss the common features of the plants and animals, and their differences. The power point or movie file that you use will be due at the start of class.

Keep track of when you work on this presentation. Each time you work on the project, brainstorming, drawing, filming, write down what you do and who you are doing it with.

The Planets

Gleise 667 C c, 3.8 times the mass of Earth—with gravity 56 percent stronger than Earth—is tidally locked to a red dwarf star, and has a year that is only 62 days long. Being tidally locked, it has no day/night cycle and no seasons, so there is no natural unit of time. One hemisphere, with a large continent, is in constant unrelenting sunshine, while the opposite hemisphere has never seen the sun. In the location directly under the sun, the temperature is a nearly constant 180°F, and at the far side it is -25°F. The twilight zone (where the sun hovers on the horizon) has temperatures in the 60°F range and highly variable weather. Six-thousand km from the twilight zone, in the daylight, there is ring of constant hot rains.

This planet, other than directly under the sun, is mostly ocean with scattered islands as large as New Zealand or Greenland. This sea is covered in ice on the night side, but is liquid beneath the ice. The large continent directly under the sun, is an inhospitable desert, and has no seas or lakes. The lake district starts several thousand miles from there, where the sun sits 15° above the horizon. In the Twilight Zone, where the sun sits near the horizon, never moving, is a region of highly variable, highly unpredictable weather.

There are other objects in the sky to see, even on the daytime side. There are two other nearby stars, but they are too far away to affect the weather. There are 6 other planets—four are always visible in the daylight (unless they are behind the sun or in front of it) and two can be glimpsed from the night side of the planet.

Planet **Kepler 452 b** is the nearly the opposite of Gleise 667 C c. It orbits a sun-like star in 384 days, but instead of having a 23° tilt, with its widely separated tropics, arctic and temperate zones, this planet has a 90° tilt. The arctic, which has constant daylight in the summer and constant darkness in the winter, extends from the poles down to the equator. The tropics, where the sun passes directly overhead twice a year, extend all the way from the equator to the poles. There is no Temperate Zone. The summer temperatures can get up to 140°F, and the winter temperatures can drop to -100°F.

The poles have the most extreme weather with the sun sitting still directly overhead on the Summer Solstice, and 6 months of total Darkness in winter. The equatorial region is more steady but still like nothing on Earth. In the Spring and Fall, when the sun gets directly overhead, there is a cooling off period at night, but then there is a short period of total darkness around the Winter Solstice, and a period around the Summer Solstice when the sun is above the horizon (but not very high) for weeks on end. There is one large landmass stretching almost pole to pole.

Gravity on this planet is only 80% of earth's gravity, and a year is 384 days.

Planet **HD 40307 g** is weird one. This planet is in a highly elliptical 200 day orbit. This planet's seasons are not caused by the tilt of the planet (as on Earth, Mars, and Saturn). The whole planet has winter when it is farthest from the sun, and the whole planet has summer when it is closer to the sun. Summers are brutal since the planet skirts the inner edge of the habitable zone. Large lakes can completely evaporate, and the ocean levels drop by hundreds of meters. The weather is hot and humid and full of thunderstorms, but the rain evaporates back into the air before it ever hits the ground. In winter the rain is heavy and steady. Ocean levels rise, rivers rage, and lakes form all over the planet. It snows in the mountains, and the more northern Latitudes. This is a very massive planet—7 times more massive, twice the radius, and almost twice the gravity of Earth.