

# *Is there Anyone Out There?*

## *Planetary Habitability Art Project*



In order: Captain Kirk & Tribbles (Star Trek), Neytiri (Avatar), Luke Skywalker & Tuan Tuan (Star Wars)

### ***Introduction***

What would you say if someone told you there was just life discovered on Mars? How about Jupiter? Enceladus? Any of the potential habitable planets we have discovered?

What would you imagine?

Would it be a microscopic creature? A massive one? Would it be something that could swim or something that could fly? Would it, or could it, look like something we have on Earth?

We have high hopes for discovering life on other worlds. There have been several which we believe could very well host life, but we still don't know what that life might be like, which is one big reason as to why we study *exoplanets*.

An exoplanet is a planet that orbits a star outside the solar system, The discovery of exoplanets, particularly those that orbit in the *habitable zone*, where it is possible for liquid water to exist on the surface (and therefore also life), has intensified interest in the search for extraterrestrial life. However, the search for exoplanets is no cake walk. In order to start, one must first take into account *planetary habitability*, which considers a wide range of factors in determining if an exoplanet is suitable for hosting potential life.

Planetary habitability is the measure of a planet's or a natural satellite's potential to develop and sustain life. Absolute requirements for life are an energy source and implications that many other geophysical, geochemical, and astrophysical criteria are met. For example, maintaining a safe distance away from an energy source (such as our relationship to our own sun), or if a planet is even capable of sustaining an atmosphere. These factors must be considered before an astronomical body is in consideration to have the potential to support life.

NASA has defined the principal habitability criteria as "extended regions of liquid water, conditions favorable for the assembly of complex organic molecules, and energy sources to sustain metabolism."

In determining the habitability potential of a body, studies focus on its bulk composition, orbital properties, atmosphere, and potential chemical interactions. Stellar (fancy word for star) characteristics of importance include mass (weight) and luminosity (luminous, or brightness quality), stable variability (brightness of a star as seen from Earth), and high metallicity (relative abundances of chemical elements other than hydrogen and helium). Rocky, terrestrial-type planets and moons with the potential for Earth-like chemistry are a primary focus of astronomical research.

To get us started, let's think about where one may find life using this example: where would you be more likely to find life, in a murky puddle or in a tube of helium gas?

Think about it. A tube of helium gas is a contained pure element. It is unlikely that any organism could grow and develop here due to its lack of composition and variability. A puddle on the other hand can be a natural habitat. They can provide essential moisture for small wildlife, such as birds and insects; many even contain nutrients such as salts and amino acids.

So that is what we are going to do. We are going to become the astronomical researchers, and we are going to research a potential habitable exoplanet and take it to the next level, by imagining and then creating the life that would inhabit it.

## ***Assignment***

Your assignment will be broken up into **three parts**.

1. You are to establish yourself in a group with your fellow peers. In your group, your task is to research at least **three** different exoplanets using the exoplanet database website provided  
[http://www.planetarybiology.com/exoexplorer\\_planets/](http://www.planetarybiology.com/exoexplorer_planets/).

Once you choose three planets, learn as much as you can about each one. You are **not** limited to this site, search for your planet elsewhere, explore!

Some questions you may want to consider and notes you may want to make include but are not limited to the following:

- What is the mass of your planet?
- What is the planet's composition like? What's the surface like?
- What is the planet's atmosphere like? What gases are present?
- What is the temperature like? Is it hot or cold? Is it similar to Earth's?
- Do you think life could be possible here? Why or why not?

2. The next step is more individually based. You are to pick one of the exoplanets you have researched and based on whether or not you believe it could have the potential to sustain life, come up with your own interpretation of a creature that would inhabit this world.

At this point you would want to discuss with your teacher why you chose this exoplanet, and how you are going to go about creating your creature.

A couple questions you may want to consider and topics you would want to discuss with your teacher include but are not limited to the following:

- Why did you choose this planet? What stuck out to you in order for it to work?
- What is your plan to create this creature? How will it be constructed? (Drawn, painted, crafted, etc.)

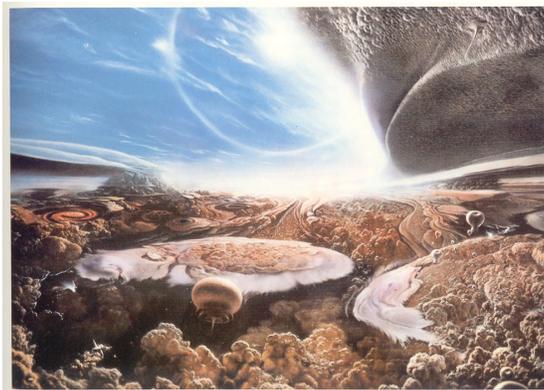
3. The final step is to imagine potential life on another world and illustrate this to an audience. There will be two parts to this, one which is visual, the actual construction of your creature, and the second being verbal, a brief 1-2 page essay explaining your creature. The main task being **to illustrate clearly what you think this life would be like, and more importantly, why it is this way**. Make sure you are able to explain it your audience and back up your reasoning.

Some questions to consider while designing your creature and questions to think about for your brief write up may include, but are not limited to:

- What would your creature look like? Is it in a hot or cold environment?
- How would it thrive? How does it adapt to its environment?
- How does your creature interact with its environment or other creatures? Is it a predator or prey?
- What does your creature eat?
- What would a day in the life be like for this creature?
- What is its significance on its world? Why is your creature there?

Be creative and specific. Give your creature life!

Here are some examples to take a look at as you are pondering your potential creature.



Salpeter and Sagan's Jovian aerialists, as imagined by the artist Adolf Schaller.



Possible life in the atmosphere of a gas giant, as illustrated by a painting by Adolf Schaller in Carl Sagan's Cosmos.

***Food for Further Thoughts:***

Why do you think studying potential life on other planets is important? What are the benefits of searching for life on other planets? Are there pros and cons in your opinion? This is a question regarding opinion, so don't be shy, be honest with what you think! There is no right or wrong answer!