

Evidence of Learning #4

Date: February 16, 2017

Sources:

- 1.) *Seager, Sara. "The Future of Spectroscopic Life Detection on Exoplanets." Proceedings of the National Academy of Sciences of the United States of America. National Academy of Sciences, 02 Sept. 2014. Web. 07 Nov. 2016*
- 2.) *"Fast Facts - NASA Spitzer Space Telescope." NASA Spitzer Space Telescope Image. NASA, 2003. Web. 07 Nov. 2016.*
- 3.) *"Spitzer Space Telescope- Mission Overview." NASA. NASA, 30 July 2015. Web. 07 Nov. 2016*

Analysis:

The hunt to finding another Earth is underway. For quite a while, we have been thinking that Earth has been the only planet to be capable of fostering life but that doesn't seem to be the case anymore. There are an increasing amount of studies showing that Mars would have been habitable. We have also found countless amount exoplanets that are similar to Earth through satellites. With that said, I decided to take the time to come up with satellite properties that would help me find exoplanets that can be habitable for life.

I would like to obtain information pertaining to an exoplanet's atmosphere because the chemical makeup of an atmosphere will tell us a lot about the planet's ability to hold water and defend the surface from harmful solar radiation. For example, if the planet's atmosphere is too weak and thin then it lower its ability to hold liquid water, which is essential for life to form and evolve. I also hope to obtain data about organic molecules that may be present on the planet. Additionally, it would be highly beneficial if we could see the configuration of the star the exoplanet is orbiting. For example, is the planet orbiting a white dwarf, red giant, brown dwarf, or a regular star?

All of these things would give me and my team a better perspective on the planet's biological/chemical aspect.

To obtain all information listed above, I would resort to using the Spitzer Space Telescope. This telescope is capable of imaging our cosmos to give scientists a detailed view of our cosmos. Spitzer also uses spectroscopy and spectrophotometry (NASA JPL.2003) Spectroscopy analysis the collaboration between matter and the electromagnetic spectrum. For instance, scientists could take a look at the slope of the wavelength graph and determine if there are clouds on that exoplanet (Seager.2014). In addition to that, scientists could use spectrophotometer to measure how much a substance absorbs light. Scientists can figure out the star:planet ration through this. To make it more clear, if a planet is close to its star, it will have a higher rate of absorption. If the telescope gives us data that shows a earthlike ratio then we can infer that the planet is probably in the habitable zone. Spitzer's ability to take infrared images will let us identify space phenomena that was once thought to be impossible to detect. This will give us a big clue on finding habitable planets.

Apart from Spitzer, we could use the Kepler Space Telescope to find exoplanets outside our solar system. The Kepler Telescope has so far found 3,397 exoplanets. This gives us a wide range of planets to analyze. We could also try and find the radius of our targeted exoplanet to see if it will be habitable. In one instance, scientist calculated a possible scenario for the exoplanet, Proxima b. If the radius of that planet was 5,543 miles then there would be a high possibility for it to be habitable for life. To be more specific, with this radius, we will know that Proxima b is 50% rock and 50% water. It

was also concluded that there will be a single 124 mile ocean and a thin atmosphere for this situation. This gives us an abundant knowledge on exoplanets.

As humans, we have this drive to further explore the planet and our universe. As we discover new things, we learn more about ourselves and also our surroundings. But, how does this affect us? By learning about other planets, we understand Earth better. Our expansion of knowledge is not the only reason why this research would be important. We all know that our sun will one day expand into a red giant and end life on Earth as we know it. You might think, well humans won't make it that far but what if we do? What will we do then? That is when the habitability of exoplanets comes in handy. Another reason is the fact that our population is growing at such a rapid rate. At one point, we will reach our carrying capacity and the our planet will not be able to sustain all of us. With these research, we will revolutionize our thinking in the astronomy community and we will give hope for the general public when it comes to having a better life.