

# Original Work Assessment

It is no secret that life is fragile. A sudden change in our natural environment leads to our destruction. When I was younger, I always thought that life can only exist where the temperature is not too hot or cold, there is oxygen, water, and an abundant amount of food. While I was partially right about the majority of Earth's organisms being dependent on these needs, I did overlook one group. This particular group has made this planet home long before we did and they have shown me that life is not fragile for them, like it is for us. This strange group is none other than extremophiles. These microorganisms got their name because they live in extreme environments. You can find them from hydrothermal vents to the dry and cold Ace Lake of Antarctica. As a result, it has sparked a curiosity in many scientists' minds but extremophiles aren't just there to be put under a microscope. They have recently shown to be one of the tools to understanding if life could exist on the red planet.

The idea for my original work emerged in my brain during my internship at the Johnson Space Center in the summer of 2017. As I was working fourteen hours a day, designing and building a Martian Lab, I got the opportunity to research about extremophiles. I became fascinated by how they can allow us to better understand how life may have existed on prehistoric Mars and how life could be now on Mars.

As I began to put together my original work idea, I wanted to also show my understanding of the scientific method. The scientific method is essentially the "ten commandments" of science. Every scientist must and will follow it, in order to ensure

accurate results. Without a solid understanding of the method, there would be no progression in science. With that said, I decided to design an experiment the astronauts can do when they get to Mars. As an astrobiologist, I will be expected to come up with research designs to further push astrobiology forward. I believed that this original work would allow me to grow as a scientist and also understand how an experiment should properly be designed.

Before designing my experiment, I did a lot of research. I first studied the martian climate and atmosphere because I needed to know what type of environment the extremophiles will be studied in. In order to get efficient information, I contacted Dr. Mischna, who studies the climate and atmosphere of Mars at the Jet Propulsion Laboratory, to gain more information of the planet. Dr.Mischna provided me will a lot useful information. After speaking with Dr. Mischna, I began to thoroughly analysis the different types of extremophiles that are found on Earth. I specifically looked for the location where the extremophiles were found, the temperature range, the nutritional requirements, and the unique characterizes/adaptations that might potentially make them a worthy candidate. After doing for all the extremophiles, I looked at the chart selected the four candidates to go to Mars. The four extremophiles ended up being *Deinococcus radiodurans*, Tardigrades, cryptoendoliths, and cyanobacteria. All of these microorganisms have the ability to survey the cold and dry environment of Antarctica.

After research and selecting the extremophiles, I began researching the various lab instruments I would need in order to complete the investigation. One thing to note is that the Mars Simulation Chamber is relatively large and is really heavy.

Unfortunately, we cannot send an excessive amount of weight to Mars because it put all the astronauts at risk. One solution to this problem is reusing old rover equipment. In fact, the Curiosity Rover has the SAMS instrument, which simulates a martian environment in its chamber. If we could figure out a way to repurpose this instrument, we could save a lot of money and weight. By researching what instruments I need, I was forced to think both like a scientist and an engineer. This is crucial for a scientific mission to be successful

Through this process, I found that designing an experiment is no easy task because I wasn't formulating an experiment that will be done on Earth. I was formulating an experiment that will be done on Mars, which is obviously a completely different planet. I had to take in account the atmosphere, the gases that are present and not present, the climate, the radiation risk, and the soil composition. This made the task extremely difficult but I grew as a scientist by doing it. In science, nothing will ever be easy. However, that is what makes science beautiful and exciting.

With my original work done, I now look beyond into my final product. While my final product is really different from original work, I will still have to apply the scientific method. Additionally, through my original work, I have learned how to use many more complete lab instruments, which will help me be more successful with my final product.