Very early in the semester, we learned that humans are made from stardust. In other words, humans are made from some of the same elements that are present in the solar system. These atoms include Hydrogen, Oxygen, Carbon, Nitrogen, and many others. However, when Earth was first created, the galaxy only contained large amounts of Helium and Hydrogen. Nuclear fusion in the stars created the more massive elements that Earth, and now humans, are made of. With these same elements that created Earth and humans present in space, the Cosmological Principle remains true in stating that Physics occurs on Earth the same way that it does on other planets. That being said, with the elements which humans are made of being present in space as stars and stardust, humans should exist on other planets. The Drake Equation further confirms this theory of life on other planets as it computes the probability of life in the Milky Way. This equation compares the numbers of planets, stars, and instances of intelligent life in the Milky Way in order to determine how many civilizations like Earth exist in the galaxy. In this paper, I will connect how these concepts relate to one another and prove the existence of life on other planets in the galaxy.

When the universe was first created, the only elements in abundance were Helium and Hydrogen. So how did other elements come into existence? Nuclear fusion of stars helps to create larger elements by combining smaller ones. This is how heavier elements like iron and nickel came into existence. Nuclear fusion occurs in the core of a star, where it is the hottest, as atoms of different elements fuse together to create new
elements. The hotter the star, the more kinds of elements the star can create. The authors of the book *21st Century Astronomy* state that “When a star exhausts its nuclear fuel and nears the end of its life, it often loses much of its mass – including some of the new atoms formed in its interior – blasting it back into interstellar space” (7). These elements helped to create the planet Earth. If Earth was created from these elements that were thrown back into space, it is very possible that other planets have been created like Earth in other parts of the universe.

Humans are also made from stardust. The authors of the book simply state, “We are stardust” (5). As stars explode, they throw elements back into space as a giant cloud of dust and gas. It is these elements that form humans. These elements include Hydrogen, Carbon, Nitrogen, and Oxygen. Stars are constantly going through different stages and combusting at the end of their lives, so if this statement is true, other life forms like humans should be in existence somewhere in the universe, made from the same stardust materials.

The Cosmological Principle states that the location of Earth was something that was created by chance. There is no logic behind where the planet was placed. The principle also states that physics on Earth exists in the same way that physics would on other planets. So, with the same elements that make up Earth and humans present in the universe through nuclear fusion of elements, other life-sustainable planets like Earth must be present somewhere out there. It is well known that the more massive elements that make up Earth were created in space, not on the planet itself. If this is true, it is possible for these elements, or other elements, to come together to form other planets.
The Cosmological Principle plainly states that the planet Earth is not a one of a kind coincidence. Going back to the creation of humans and the stardust materials we are made from, the Cosmological Principle also confirms that it is possible that forms of life like humans can exist in other parts of the solar system because of the abundance of stardust present. The principle also states that, like the Earth, it was no one of a kind coincidence that humans were created.

To further confirm the theory that life exists on planets other than the planet Earth, the Drake Equation can be used to solve for the probability for life in the Milky Way. In this equation, Dr. Frank Drake estimates that many planets in the Milky Way might contain life like that of humans. He compares the number of stars in the Milky Way to the fraction of those stars with planets, the number of Earth-like worlds per planetary system, the fraction of those Earth-like planets where life actually develops, the fraction of those planets where intelligence develops, the fraction of those planets where communication technology develops, and the fraction of a planet’s lifetime that has a technological civilization. The equation looks like this when the values are substituted, N representing the number of communicative civilizations in the Milky Way:

\[ N = 400 \text{ billion } (1/4) \times 2 \times (1/2) \times (1/10) \times (1/10) \times (1/100 \text{ million}) \]

\[ N \approx 10 \text{ technological civilizations in the Milky Way} \]

This equation is able to confirm the previous predictions that life like humans on Earth exists in other parts of the solar system. It works with prior observations to create a mathematical equation to validate the idea that Earth and humans were not a one of a kind coincidence. This equation and evidence provides a very convincing argument for
me because while I could always imagine that life exists on other planets, I never actually had any proof to believe this theory. This equation was able to supply me with the concrete evidence I needed to make this argument completely convincing. Mathematical evidence is hard to ignore.

The idea that life exists in parts of the solar system other than Earth may be a hard concept to grasp, but it is one that is backed up with substantial amounts of evidence. Not only are humans made from stardust, materials that are present in abundance in space, but Earth is made of elements created through nuclear fusion of stars, a common occurrence in a stars life cycle. The nuclear fusion of Helium and Hydrogen helped to create the more massive elements that now make up most of our Earth. These elements are made in space. If these same materials are present in space, it is very possible that planets and other life forms like humans have also been created using the same materials. The Cosmological Principle backs this theory up stating basically that there is nothing special about Earth. Humans and Earth were not a one of a kind coincidence according to this principle. The Drake Equation is way to take these observations and theories and prove them with mathematical evidence. If the numbers used in this equation are accurate, ten other Earth-like planets exist in the Milky Way! Although it may be years before we ever communicate with these other life forms, it is comforting to know that we are not the only ones out there.
Works Cited