

Name: \_\_\_\_\_

Class Period: \_\_\_\_\_

## Are we alone?

Since people have looked up at the night sky, they have wondered if we are the only ones here. Are we the only intelligent beings? Do others have the advanced capacities to contact us? The argument that has been proposed considers that if other intelligent beings are out there then we should be able to detect their signs of civilization.

Those signs of civilization might come from the TV and radio waves used in electro-magnetic communication devices. In fact, since the early 1950's different organizations have launched projects in order to find life and communicate with it. One organization SETI (Search for Extra-Terrestrial Intelligence), sends signals out into space to try to communicate and listens in for those tell-tale signals.

Using advanced technology ranging from telescopes to space probes, we can see many galaxies scattered in the universe. In fact, it is now thought that there are billions of galaxies, each containing billions of stars. What is the possibility that one star might provide the resources needed for life on another planet?

So far, nothing has been found. But with the extreme vastness of space, perhaps it is only a matter of time and patience.

What are the possibilities that there is life out there? Well, one man formulated a way to figure this out. Frank Drake came up with the now called "Drake Equation" to mathematically answer that question.

Drake Equation:

$$N = R * f_p * n_e * f_l * f_i * f_c * L$$

What does all of that mean?

**N** = The number of broadcasting and communicating civilizations.

**R** = Average rate of formation of suitable stars (number of stars/year) in the Milky Way galaxy

**f<sub>p</sub>** = Fraction percentage of stars that form planets

**n<sub>e</sub>** = Average number of planets that could support life per star (habitable planets)

**f<sub>l</sub>** = Fraction of habitable planets (**n<sub>e</sub>**) where life emerges

**f<sub>i</sub>** = Fraction of habitable planets with life where intelligence evolves

**f<sub>c</sub>** = Fraction of planets with intelligent life capable of interstellar communication

**L** = Average lifespan of communicating civilizations

Still don't understand it? Let's watch a few videos! The video links posted on my website.

1. The Drake Equation – after the video, reflect on what you have seen. Write a sentence describing your connection or wondering after watch this.

2. The Fermi Paradox – This video adds a bit more to the idea and discusses types of civilizations that are possible.

What is the Fermi paradox?

3. Neil deGrasse Tyson video on possible life in the universe:

What is the most common element in the universe?

What are the most common elements in humans?

Why is Carbon the best element to build life from?

What are the “stowaways” that Tyson mentions?

Again, reflect on what you have just seen. What sort of questions does it raise for you?

4. Video on Tardigrades:

Since tardigrades can survive such extreme conditions... (complete the sentence with your own thoughts). Give at least three:

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