Humanity is Very Small
(But We Can Change That)

An Essay About the Universe by James Lienert

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"In the beginning, the Universe was created. This had made many people very angry and has been widely regarded as a bad move."

-Douglas Adams.

This quote sums up most of what humans are. A curious creature, and commonly angry at the universe. But, in the long run, we are very small. Small enough that in the grand scale of the universe, nothing that any of us ever do will ever be significant. But, that is beyond the point right now. We may not matter in the long run, but right now we are here, on earth, the only place we have ever known, and for many of us the last.

Although, there are many problems. Humans are quite often mean and abusive, and kind people are uncommon at this point in time. Think to yourself: when was the last time you have truly felt safe from other people? There is the threat of nuclear war between the US and North Korea, there is the threat of World War III, with tensions between the US and the Middle East getting tighter.

The second problem is that there are a lot of us. With a population growth rate of 1.1% (according to worldometers.info), the world's population will surpass eight billion this year. The population will continue to grow, and yet the Earth will never.

A third problem is climate change. We have demolished our environment to the point where winter is being threatened, and so is the Arctic and Antarctica. Severe floods could ravage the Earth. If we do not find a way to stop climate change, this will soon become a large problem.

Our options as a species are limited. Our only chances of long term survival are population control (which I have spoken about before and will later write another paper about) or colonizing other planets. We can colonize the planets of our solar system, sure, but in the long term, we will eventually run out of areas that are not completely destroyed beyond the point of terraforming. We can live in space stations, but that would be a short term fix. Our only option then will be to leave our solar system. But where will we go?

We will go to the only place that we can: our closest star, Proxima Centauri. This star is our closest star, being 4.243 light-years distant. It has one confirmed planet that was discovered in 2013. The planet is in Proxima Centauri's habitable zone, and theoretically, humans could survive there. We do not know whether it has an atmosphere of oxygen, but it has an atmosphere. Eventually, we would need to go there to survive, and we could.

When humanity is on its last legs, we will need to have the technology ready, because we likely will not have the time to develop it. So, why not start now? We need to account for the ship getting to the right location, having enough fuel to get to the right location, having the equipment to preserve people's health both physically and mentally, and preparing to build a base of operations on the planet when we arrive.

First, let's focus on how to get the ship to the right place. We could just try to set a course and let inertia do the work for us, but then there is the chance of the ship getting too close to another body of mass and being pulled off course, or worse, the ship *hitting* another body of mass and being knocked off course and losing momentum, as well as the obvious consequences of this scenario. To solve this, we have the options of warp drives (which are mostly theoretical at this time), antimatter engines, and solar sailing, along with some other less probable solutions.

I am not going to go in-depth about warp drives, because we do not know whether they are physically possible. So, to start, let's talk about antimatter engines. Antimatter engines are an interesting concept because it utilizes antimatter - the strongest fuel that we know of at this point in time. The means of obtaining this is still classified information, but it is no secret what we could do with it when we obtain enough.

When we obtain a considerable amount of antimatter, we would be enabled to use it as a fuel that would overpower any fuel that we have now. However, it would be quite risky. For one example, there are some reactors powered by antimatter that release large quantities of gamma rays, which will break down matter, which, no need to mention, will be very dangerous to humans. However, there are some safety precautions that will stop this. The old design for an antimatter reactor would use anti-protons, which would release very high amounts of gamma rays with very high energy. However, NASA is funding a research team to design a new rocket design powered by positrons, which would emit a lower amount of radiation with a considerably lower energetic charge. This would be much safer.

More safety advantages include the fact that a positron reactor would be much simpler than a nuclear reactor, meaning there would be a much lower chance of something going wrong during launch. Also, even if something does go wrong, it is much less dangerous. As opposed to a nuclear reactor exploding, where there would be a magnitude of radioactive particles released that would stay present for a long time, there would just be a blast of gamma radiation, which would fade within seconds. The danger zone would be approximately one kilometer, or 0.621371 miles.

There would also be the advantage of speed and amount of fuel. Using an antimatter engine would cut the travel time to Mars in half, and maybe reduce it further, only using about ten milligrams of antimatter. Antimatter would currently cost millions of billions of dollars to create, but with new technology being developed, it would only cost two hundred and fifty million dollars to create the antimatter. As NASA stated in this article, it would only cost about ten milligrams of antimatter to get to Mars, which is approximately the size of one of the common M&M candies. That being said, I did the math:

The distance to Mars is 167,650,000 miles away, while the distance to Proxima Centauri is 7,232,934,863 miles, or 4.243 light-years. M=10 milligrams of antimatter.

$$167,650,000 = 1M$$

$$7,232,934,836 \div 167,650,000 = 43.14M$$

This shows that it will take approximately 43.14 M&Ms worth of antimatter to get to Proxima Centauri. That means that with one cup of antimatter M&Ms, we could get to Proxima Centauri nearly six times over. Also, assuming that antimatter engines travel at a constant rate and don't pass any time-warping bodies (eg. black holes), it would only take 189.9 days.

Now, we have spoken in-depth about antimatter engines, but let’s not forget about our other method - solar sailing. Solar sailing is an interesting concept - it uses photons as a sort of “wind.” Though photons have no mass, they do have momentum, which means they can hit a reflective surface, therefore trapping the photon. Every time the photon bounces, it will generate more momentum, eventually gathering a lot of speed, with the beauty part being that, unlike

Earth sailing, there will never be a shortage of “wind.” Now, you may be thinking, “That’s all well and good, but how could you steer it? Would it not be pushed solely in the opposite direction that the photons are coming from?” Well, it is possible to use a similar method to a sailboat, where we angle the sail away from the light source, but still at an angle where photons would be able to push the sail. Using this, we can manage to change direction efficiently enough that we may even be able to change the orbit of our little spacecraft. This means that steering will not be a very large problem.

Another bonus to solar sailing is that it wouldn’t necessarily rely on the Sun’s light emissions. Since light travels at a very high speed, no matter what is emitting it, we would be able to power it using flashlights or some other cheap source of light. We do not currently have an estimate of how much this would cost, but we can imagine that eventually, it would be very cheap.

So, overall, solar sailing would be cheaper, yet much slower, and antimatter reactors would be more expensive, yet much faster. I would personally choose the antimatter reactors, but I am also widely (Widely means as far as these three people believe) regarded as a “Mutant of the Human Race”, and two words to best describe me are “Ew” and “No.”

Now, let’s change the subject. Let’s discuss how we can keep people’s physical and mental health in a safe area, as so that they do not die or go into a murderous rage due to schizophrenia. If this happens, then humanity could just entirely die. So, what can we do? To preserve both forms of health, we could use a method called “Torpor.” Torpor is essentially cryogenics, but without nearly as low temperatures. Instead, we lower the body temperature by about ten degrees, making it roughly eighty-five degrees fahrenheit. This would put our subjects into a sort of hibernation. This will work in turn with experimental drugs that would shut off the metabolism controlling part of your brain. This would make it so that you would not digest, meaning vitamins could be injected directly into your bloodstream, meaning we would just have to use an IV full of the raw vitamins and nutrients. It has also shown that muscle dystrophy and other physical health issues would be less frequent in a state of torpor. To wake the subject up, we just need to heat up their body back to their original body temperature. This is in essence what torpor is, and I believe that it would work well for preserving health. Obviously we would need to do more testing, but that is something that I cannot provide information about.

Now, finally, I am going to talk about what kind of base of operations we could have, and what it would be made of. I have prepared a 3D model of my design, and it will be linked for download here (You will need to install a viewer for that type of file if you haven't, and I recommend 3DView). Each shape at each end is one different room, and the large bulb is the storage space for machinery. Everything below the bulb is underground, just dug in tunnels, and at the bottom there is a water pump. Other than that, there is not anything else. Just take a look.

And with this, our adventure has come to a close. I am sad to see it end, but I have covered everything. We would create a rocket powered by an antimatter reactor, 442 milligrams of antimatter, torpor hibernation chambers, and the materials to create and dig our base of operations.

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