Imagine it is the year 5555. Due to the ever increasing population of human beings, the earth’s resources have almost depleted. It seems inevitable that we should soon abandon Earth and find an alternative habitat somewhere outside in space before it is too late. But where would you go? At first, it seems most sensible to move to another nearby planet, such as Mars or Jupiter, which are also planets just like Earth. However, in the book The Starship and the Canoe, Freeman Dyson, an American physicist and mathematician, suggests that, in fact, comets, rather than planets, have more suitable environment as our potential future habitat. Recent studies by missions such as Stardust and Deep Impact confirm most of the ideas that Dyson used to support his hypothesis. It needs further research, however, to decide whether comets are truly suitable as our next home.

Our current habitat, the planet Earth, is 12,756 km in diameter, but it is only one hundredth times the size of the Sun (Gorgone). Comets, our potential habitat, are, however, even smaller in size. In the night sky, when a comet quickly passes by the earth, it seems that comets are very long in length, but what we see is the comet’s dust tail, which can extend up to one hundred billion kilometers (Jewitt, “The Cometary Tail”). However, the actual size of the nucleus of the comet is very small. As Dyson describes them as “small worlds” only a few miles in diameter, the size of most comets are observed to be only a few kilometers to 20 kilometers in diameter (Brower 6; Jewitt, “The Cometary Nucleus”). For example, the size of the comet Tempel 1 is estimated to be 8.7 by 2.5 miles, which is only half the size of Manhattan (Schirber).

One may wonder now, how it is possible to fit so many human beings to live on that tiny piece of land. This problem, however, is very easily solved. Dyson thinks that comets number in thousands of millions, whose combined surface area can be a thousand or ten thousand times that of earth. Based on the observation that almost every year for the past million years, at least one comet has been entering the region near the sun and disintegrates, Dyson’s reasoning sounds plausible, and recent observation by the Hubble Telescope confirms his thoughts. The number of comets that originate in the region called the Kuiper belt is thought to be around 200 million comets (“Kuiper Belt Comets”). As it turns out, there are even more comets, estimated to be in trillions, in the region called the Oort Cloud, which is located even beyond the orbit of Pluto (Myers). The mass of all the comets combined in the region is estimated to be 40 times that of Earth, and the average distance between each comet is approximated to be 100 million miles, equivalent to the distance from the Sun to the Earth (Myers). This comparatively short distance, at least in astronomical terms, confirms Dyson’s hypothesis that it is possible to travel between the comets in “the order of light day or less” (Brower 7). Based on this relatively short distance between comets, we can conclude that it is not impossible
for human beings to live in the sea of islands of comets and still communicate with each other freely.

As we establish that there is more than enough space for us to build our new homes in the sea of comets, another question that comes up is the availability of resources on comets. Are there enough basic resources for us to sustain our living in the distant space? Dyson answers yes with his hypothesis that comets are “rich in water” and in other chemicals, such as carbon and nitrogen, which are essential to life. Based on the observation of water vapor in the coma that forms as the comets approach the Sun, scientists have agreed that water must exist on comets. One of the most recent missions by NASA called Deep Impact confirmed this speculation as it sent back the temperature map of the surface of the comet Tempel 1, the first evidence of water on comets (“Deep Impact Team”).

The temperature map showed that there were thee regions of thin ice on the surface. However, out of 45 square miles surface area of the comet, only 300,000 square feet, was covered with ice. And only 6% of that region was pure water ice while the rest was dust (“Deep Impact Team”). However, scientists speculate that there must be much more water under the surface of the comet, since this observation contradicts the apparent abundance of water vapor in the coma (McFadden). Studies also verified that other chemicals such as carbon, nitrogen, hydrogen, and oxygen exist on comets as non-volatile dusts (Thomas). Although we still do not know whether the comets are truly “rich in water” as Dyson described, we know that water does exist, potentially in large amount under the surface, and that basic chemicals necessary for life do exist.

In order to stay alive, however, human beings need more than water, carbon, and nitrogen; we also need air and warmth. Since there is no atmosphere on comets, there is no air for humans to breathe and no heat is stored on the surface of comets to keep us warm. Since there is no atmosphere, comets are directly exposed to the harmful sunlight when near the Sun. Also since most of the comets are located in the Oort cloud, which is light years away from the Sun, the temperature can be as low as negative 400 Fahrenheit degrees when they are not traveling close to the sun (“The Edge of the Solar System”). In order to solve this problem, Dyson suggests that we grow genetically engineered tree that can generate oxygen and warmth even in such harsh conditions. He suggests that the tree must be engineered so that it has opaque leaves, which will protect itself from far ultraviolet radiation. It also must be impervious to water to prevent itself from losing water and must have low tendency to emit heat to keep itself from freezing. He theorizes that if the genetically engineered tree meets all these requirements, it will be able to root itself to the comet and find nutrients there to sustain itself. Also, since the gravitational force of the comet is very weak, he theorizes that the tree can grow miles and miles out into the space to absorb sunlight, eventually turning the comets into “a small potato sprouting an immense growth of stems and foliage” (Brower 7-8). It may be possible to produce such trees by means of genetic engineering. However, even if the tree has such abilities to grow in the harsh environment, since the comets spend most of
their times in the distant space, it may not even have the chance to be exposed to the sunlight to start out with; the length of the tree would have to be extremely long, maybe even longer than the diameter of Jupiter, since comets are far away from the sun. It is also questionable whether there would be enough nutrients to sustain both such extremely long trees and human beings at the same time.

Although Dyson's ideas about comets are consistent with the more recent findings, whether comets are truly habitable needs further consideration. It is true that, as Dyson says, there is water on comets, potentially in a large amount under the surface, and that the enormous number of comets can provide enough surface area for us to settle. It is confirmed that there are plenty of non-volatile dusts consisting of carbon, hydrogen, oxygen, and nitrogen on comets. In the distant future, it may even be possible to produce genetically engineered trees that would grow miles and miles into space. However, there are so many obstacles that need to be overcome if Dyson's ideas are to be put into realization. First of all it takes years to travel to the comets located in the Kuiper belt and even longer to travel to the Oort cloud. We would have to constantly keep moving from one comet to another comet, since the sizes of the comets are not big enough to provide much resource for a long time. There is also a danger of comets colliding into other planets as the comet Shoemaker-Levy did with Jupiter in 1994 (Baalke).

It seems most reasonable just to stay on Earth and not move out. In order to avoid the dreaded scenario like that of the year 5555, we should cherish and care for Earth, because there is no place like home anywhere else in the entire universe.