

The Butterfly Effect in Kim Stanly Robinson's *Aurora*

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Abstract

Aurora is a novel by Kim Stanley Robinson, describing a voyage in a starship. Space colonisation has been a fictional element over a century since NASA started investigating Mars with scientific speculations. This article aims to highlight the butterfly effect in Kim Stanley Robinson's *Aurora*. It also specifies the ecological imbalances due to the lethargic behaviour of the human race. The motive of this theory is to make people understand that even a small droplet can make much difference in an ocean. Beginning with less production of prosperous ends in Cryosleep. Cryosleep technology logically undermines most of the problems in the novel. But, Robinson's point about the shortcomings of interstellar travel. Through which the butterfly effect of a small cause is added by him.

Keywords: Biomes, Butterfly effect, Geobacteria, Ecological ramifications, hibernation

“You could not remove a single grain of sand from its place without thereby ... changing something throughout all parts of the immeasurable whole.” Fichte, *The Vocation of Man* (1800)

The butterfly effect, derived from Chaos Theory, is a scientific theory. The motive of this theory is to make people understand that even a small droplet can make much difference in an ocean. This sounds funny but the truth is unpredictable. And as John Gribbin writes in his cult-classic work 'Deep Simplicity', “some systems ... are very sensitive to their starting conditions, so that a tiny difference in the initial ‘push’ you give them causes a big difference in where they end up, and there is feedback, so that what a system does affects its own behavior.” Each action has a reaction either in a positive or negative manner. This is appropriate to apply in ecology as well. For example, a minimal change in the environment creates hazardous effects. This article aims to highlight the butterfly effect in Kim Stanley Robinson's *Aurora*. It also specifies the ecological imbalances due to the lethargic behaviour of the human race.

Robinson is an American Science Fiction writer who shows concern towards the present state of ecology and forecasts its future with his scientific knowledge. *Aurora* published in 2015, forecasts the future. The novel is set from the year 2175. So it is evident that the novel is imaginary. Still it holds a deeper meaning. “Ever since they put us in this can, it's been a case of get everything

right or else everyone is dead . . . being told whether or not they could have children, and when and how many” (Robinson 69). The Starship is a miniature of the Earth, set to travel beyond the galaxy to find a place equivalent to our Earth. “. . . the ship is a zoo, or a seed bank. Or one could say it is like Noah’s Ark” (Robinson 51). Everything about the Starship is scientific. A nano change would lead to mass destruction. In chapter seven Robinson marks “no starship voyage will work”.

Paul Gilster, in his article “A Science Critique of Aurora by Kim Stanley Robinson” explains the structure of the Starship.

The Ship’s structure is given in Chapter 2. The Ship consists of a central spine 10km long, around which 2 rings of habitable ‘biomes’ spin, torus-like. Each ring consists of 12 cylindrical biomes, each 4km long, 1km diameter. There are also spokes and inner rings. The rings rotate around the spine to give a centrifugal gravity of 0.83g. The 24 biomes contain samples of ecospheres from 12 climatic zones: The total habitable space is allocated as 70% agricultural; 5% urban / residential; 13% water; 13% protected wilderness. The wilderness areas are meant to be complete ecologies. (Gilster)

The Starship’s ecosystem is a confined, long-term ecology. Biomes suffer as a result of closed-loop ecological buffering problems. the crew micromanaging the biospheres and coping with issues like unforeseen chemical reactions. This is an intimidating barrier to interstellar exploration than propulsion.

The Ship’s biomes also lack a Stanford-like cloak of radiation-shielding material. Robinson in the beginning of the voyage says “Under the biome floors, fuel, water, and other supplies are stored which also create shielding” (52). Later Robinson says that during the voyage, the fuel is ‘deployed as cladding around the toruses and the spine’ (2). Devi, chief scientist, bothers about “nematode infestation, the missing prosperous, the bonded minerals, the corrosion, and all the other metabolic rifts” (101). Shortage in prosperous supply, faster evolving of bacteria, shorter life time, smaller bodies, longer disease duration, lower IQ are the problems emerged one by one in the ship.

The Ship has significantly smaller biomes, to support substantial numbers of species. The wilderness requires a lot of space. For instance, In the biome Labrador, “In the flanking hills sometimes a wolf pack was glimpsed, or bears” (63). This is not informed earlier to the people in the biome. Similarly each biome has certain problems brought out by the people during the wanderjahr of Freya. Aurora becomes the new hope to the voyagers. The people who start exploring Aurora without proper protection get infected by an unknown virus and lose their life. Jochi the survivor is isolated outside the ship. Social and ecological disasters lead to abomination. Revolutions break due to mutants.

The crew decides to return. They are in need of a huge oil supply. This affects the average sleep time. “Average sleep time dropped by eighty-four minutes a night. By the time the ship had cleared Tau Ceti’s thick Oort cloud, 128 of the 204 women of child bearing age were pregnant” (269). Analysing the situation of the ship, they are in an emergency to start farming intensively in all biomes. At the backdrop shortage of fuel does exist. The whole crew works on the farm.

The ship notices changes in the birth weight of the newborns. Weight is less compared to the birth during the voyage out. Along with this more indifferences are found. “. . . there was a higher percentage of stillbirths and problem births, and birth defects” (272). The reason is unexplained and is difficult to carry out research due to less sample size. This affects new parents and leads to emotionally significant changes. “People were apprehensive, Average blood pressure, heart rate, sleeping time: all shifted in the direction of increased stress, of increased apprehension and fear” (272). Everyone in the ship is confused without knowing the reason.

Electric shorts are another issue faced by the ship. The reason for the same is left unknown. “For a period of about three months they experienced a series of electric shorts in the tropical biomes” (272). Finally the group of scientists engage in search of the issue and find a floating droplet of water. It is white in colour with unidentified bacterial life. “On examining the bacteria turned out to be a form of *Geobacteria*” (272). They are bacterias that feed on electrons. The electric short is unavoidable in the ship.

The scientists while conducting research on the above issues find microflora and microfauna everywhere among them. “The ship had always been stuffed with such life-forms” (Robinson 273). The whole ship is filled with microbial life. Followed by the problems in newborn, their crops also reduce yields. Birth weight of newborns is less and miscarriages are noticed among animals. The whole ship is sick. Many harmful bacterias, viruses, archaea, protozoa, ameba, fungi, and prions consume the physical substrates of the ship. It is dangerous to kill them too. “Every change in the biomes had ecological ramifications that could not be fully modeled” (285). Investigating the solution in the analoges, Devi has marked “Bayesian methodology”. After so many challenges, the ship came to a situation that food is more important than biodiversity. Agriculture is maximised. “The tropical forest biomes were cooled a bit and considerably dried out, and many of their trees cut down. . . forest terraced for rice and vegetables. . . many animals were killed and eaten, or frozen for later consumption” (287). This makes certain pathogens move to nearby biomes and affect orchards. Biomes are locked and quarantined yet, *Cytospora* cankers kill the stone fruit, citrus are affected by green disease, club roots and rotten roots among plants. Pathogens get mutated faster than genetic engineering termed “ripostifers”. To convince the people, they announce:

All these plant diseases they were seeing had been with them from the start of the voyage, carried on board in the soil and on the first plant. That so many were manifesting now was of course much remarked, and many regarded the phenomena as a mystery, even some kind of curse. People spoke of the seven plague of Egypt, or the book of Job. but the pathologist on the farm and in the labs said it was simply a matter of soil imbalances and genetic inbreeding, all aspects of island biogeography, or zoo devolution, or whatever one called the isolation they had been living in for 200 years. (288)

Aram and Freya know that they are drowning. “We are drowning in our own shit” (Robinson 288). Lights on the ship goes down, again crops get affected due to less light, leading to growth delay, resulting in delayed and decreased harvest. The outcome is less food. People get affected by high blood pressure and insomnia. Now only 953 humans are on the ship. “People

began to go hungry . . . A group of five young people had put plastic bags over their heads and suffocated themselves. One had scrawled a note: *Because we are too many*” (294). To stop this in future rabbit hutches and tilapia ponds are expanded. But the point is ‘how to feed them?’ Soybeans are the only source to protect and get protein. So they dig the soil in the shop to clean the pathogen. Still they experience crop failures and the pH level of ponds change.

People kill and have eaten almost 90 percent of the cattle, only 10 percent of each species is allowed to live . There are suicides due to famine. The survival rates of species are reduced to 5 percent later. As the Ship’s systems collapse, the crew plans to build a cryogenic cold sleep method, which allows people to survive until they reach the Earth. This technology is otherwise called hyper hibernation. In the next four months 714 hibernation couches were established. People live in pseudo life form. Around 600 people survived at last.

Cryosleep technology logically undermines most of the problems in the novel. Robinson’s point about the shortcomings of interstellar travel. Through which the butterfly effect of a small cause is added by him.

Reference

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