

Nothing is Sacred in the Evolutionary Process

Science fiction is a genre that has been around for many years; some can date it back to early antiquity while others credit the scientific revolution of the late 19th century. Regardless, the stories of far futures and technological advancements have made humanity yearn for what could be with many of our own inventions being spurred on from the stories that we read. But what about speculative fiction? Could writers of today be able to tell us something about what humanity could look like millions of years in the future? With the ongoing research into genetic engineering as well as the contributions of researchers studying natural evolution, it shouldn't be hard to point out some parallels of even the strangest species of humans.

Speculative fiction and science fiction are not the same thing; rather, speculative fiction is the giant umbrella for which science fiction falls under. Author Derrick Craigie says that speculative fiction can take place in a world that is either not Earth or Earth reimagined with different technological advancements, history, and natural law (Girolimon, 2022). Science fiction is but one of the many specific genres that fall under speculative fiction. The first use of speculative fiction as a whole is complicated. Competing narratives have said that it originated in early history with stories like the Epic of Gilgamesh, though some attribute the origin to the scientific revolution of the 19th and 20th centuries. Author Ryan Vu contends that stories of antiquity about voyages and kingdoms on clouds (as shown in the *Odyssey* for example) are some of the earliest examples of speculative fiction; when worlds were so small to the human eye that stories of traveling to far away lands and their discoveries was considered speculative, something Vu claims are “stories that strongly resemble [science fiction] in their particulars but function according to the logic of myth and folklore” (Vu, 2019).

Others will talk of (industrial revolution and science revolution)

All Tomorrows by C. M. Köseman is a work of science fiction that explores the future path of human evolution in the near future to a billion years from the present. Speciation is the main focus of the book, with evolution occurring through natural means as well as genetic engineering, conducted both by humans and a superior alien race called the Qu. What originally started as a simple mission of colonization on sister planets, turned humanity upside down when they are met with other alien life forms that threaten their existence. The Qu remake mankind using genetic engineering, after which they eventually leave the planet and all of the inhabitants to fend for themselves. Some species go extinct, leaving behind the remains of the Qu's devastation on mankind; others adapt to their new forms and environment, evolving in ways that potentially can bring humankind back to the way it once was. Even though the story is set in a distant technologically advanced future, it's critical to understand the consequences and repercussions of such evolution - whether by natural means or genetic interventions. One thing that is important to note is that Köseman uses words such as "bred," "mated," "modified," "engineered," and "adapted" in loose terms; the story doesn't specify what kinds of adaptations or engineering has been done, so speculation on human species is needed in order to potentially understand their biological makeup.

One of the main contenders for evolution and speciation of mankind within the book is environmental adaptations to new planets and circumstances. The first example that the book proposes is the evolution of the Martians, a species of humans that have colonized Mars in the future. In the story, Mars had been terraformed to provide a stable environment for mankind which included genetically tailored microbes that generated a breathable atmosphere over many centuries. Much like Earth's early atmosphere, photosynthetic bacteria called cyanobacteria that live in lakes and shallow oceans helped to produce the oxygen abundant atmosphere that we

breathe today; one of the first correlations that can be made between the book and science.

Cyanobacteria have been found up to 3.4 billion years ago on fossilized remains (Kulasooriya, 2011). Additionally, the use of genetically modified organisms is already present in our lives; we see this mostly within agricultural disciplines to produce food that is more resistant to diseases, resistant to pests, as well as a higher yield percentage (Snow, 2005). Much of this is done with the intention of creating higher quality food so that mankind can continue. With the technology that is currently available on Earth, it is plausible that after a few thousand years, Mars would be habitable via a trial and error process of genetically modified organisms to help form an atmosphere as well as modified crops for growing in Martian soil.

After the colonization of Mars, many humans started noticing differences in phenotypes that would soon differentiate them from their original Earth humans. Because of the lower gravity on Mars, mankind developed “spindly, lithe frames” (Kösemen, 2006) to compensate for the lighter gravity. The place we see this the most are those of astronauts or those that spend a long time in a low gravity environment (much like Mars). Because of the lack of gravitation as well as the lower mechanical load on bones, it creates an increase in bone resorption and a decrease in bone formation which leads to calcium loss (Grimm, et. al., 2016). With the gravity of Mars being a third of what it is on Earth, it is entirely possible that humans would acquire this type of frame because of the decrease in bone density that can cause a “spindly” frame. In studies it is shown that bone formation is reduced partly because of impaired osteoblast function (Ibid, 2016). This can be rectified, however the time it takes to restore bone is longer than the period of unloading. Because of this, bones would be deteriorating more than they are able to rebuild, though after generations could come to the conclusion of still being able to live with a smaller frame and a lower density.

After a few generations, there is some unrest between the two species of mankind that results in interplanetary war. It is unclear if people of Earth had seen any change in genetics though it can be assumed that they might have experienced some kind of miniscule change via the trade that was occurring between Earth and Mars. In the story it is said that on Mars propaganda had started saying that Mars and its people were better than Earth and her people, which eventually led to all non-essential trade being cut off between the two. Because many environmentally demanding industries were moved to Mars, corporations that dealt with fuel and its supplies as well as modified food options were most likely the biggest industries that were cut off from Earth. This decision led to interplanetary war between Earth and Mars in which over eight billion individuals died collectively. This war and its ending effects reflect on the real world bottleneck theory. Bottlenecks occur when a population size is reduced significantly which constricts variation. It has been theorized that past humans have experienced the bottleneck effect because of the level of speciation that occurred 2 million years ago. With the population size dwindling, both the Earthlings and Martians decided to interbreed to produce a new species that would have the best qualities of both planets. It has been hypothesized that bottlenecked populations can produce new species because of the limiting variation; this in turn produces a genetic “revolution” that is the source of the new species (Mayr, 1963.) Though this thinking has been combated against (Nei, 2005), it is the case in the story.

With the war over, the two populations decided to create a better race of mankind. It is unclear if it was strictly interbreeding or genetic engineering, though it can be assumed that both occurred. Thus, the Star People were born. With the qualities to make them “equally and better adapted not only to Earth and Mars, but to the conditions of most newly terraformed environments” (Kösemen, 2006) it can be hypothesized first that interbreeding occurred to lay

the blueprints for what these new species should be capable of. First, they would need a flexible bone density that worked on planets that would have lighter gravity. Additionally, they would need bigger brains to account for being better than their predecessors. The use of selective breeding can be argued is a form of genetic engineering.

While “engineering” implies laboratory work and physically adding or subtracting genes that are not compatible, it can still be done on a less invasive scale with selective breeding. In both instances, there is a manipulation of genes or gene expression to have a desired effect and change the new generation. Selective breeding typically involves choosing organisms with specific traits and having them mate with the aim to propagate those traits in the future. Because of these similarities, it isn’t too far off to believe that humans would be able to crossbreed with another species that is similar to them to produce a new genetic offspring.

With ethics guiding the scientific community, it would be hard to even begin testing for these outcomes on humans. What can only be concluding is the work of science fiction authors and the human imagination. Case studies focused on plants and animals can be used to justify why some things might happen to humans, though we might never know for certain. With science fiction having a firm understanding of the most up-to-date scientific findings, it still presents itself as a fantastical world that is yet to be.

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