The Stagnant Darwinian Evolution Within Humans

Fran Dorey, a writer for the Australian Museum, who majored in archeology and ancient history at the University of Sydney, states that human brains are the smallest they have been in the last 100,000 years (Dorey). On the other hand, research by Dorey also shows a steady increase in height in European males over 10,000 years. For example, European males had an average height of 5 feet 4 inches 10,000 years ago, while today, their average height is 5 feet 9 inches (Dorey). With this information, it is implied evolution plays a significant role in the circumstances of humans; although Dorey's research shows signs of evolution, this research paper will focus on the status of Darwinian evolution in humans.

Darwinian evolution is Charles Darwin's theory that evolution is driven mainly by natural selection (*Darwinism*). When looking back at prehistoric humans, research by Emma Groenveld, a researcher for the World History Encyclopedia, shows that humans were hunter-gatherers who had to adapt to their environment, which could have lacked resources and survive against more dominant animals (Groenveld). However, research indicates that modern humans have become less adaptable than their prehistoric ancestors, and this Darwinian evolution is not currently occurring. According to Dorey, the size of human teeth and jaws has also become smaller, caused by dietary changes and technology in the last 30,000 years, although with the introduction of fluorine (a substance that thickens enamel), human teeth have got slightly thicker in the previous century. (Dorey). Regardless of the positive and negative adaptations shown, research by Guitele Rahill, a researcher with a Ph.D. in Social Welfare, and her colleagues, who mainly consist in Master of Public Health and Masters in Social Work degrees, report, "Some… were waiting for the election and new government, others… were waiting for more aid from international aid organizations, and still others, by the town hall meeting, were waiting for God to answer

prayers"(Rahill). Rahill and her colleagues report the helplessness of the Haitian survivors after the 2010 earthquake, stating that they were waiting for external help rather than adapting to their circumstances. Rahill and her partners show an example of a case where the adaptation skills of humans are necessary for survival and how, due to the lack of adaptation skills, the Haitian people suffered helplessness. This information begs the question: What is the best way to encourage Darwinian evolution in humans?

The most prominent issue with the stagnant growth of Darwinian evolution in humans is the loss of physical strength and durability. Habiba Chirchir, an anthropologist at George Washington University, argues that the bone density of humans has steadily decreased as humans have evolved. Chirchir reported that "...trabecular density remained high throughout human evolution until it decreased significantly in recent modern humans, suggesting a possible link between changes in our skeleton and increased sedentism."(Chirchir). In this context, Chirchir is talking about the relationship between the decreased bone density of humans to the sedentary lifestyle humans have evolved to live. Decreasing bone density could make humans more susceptible to bone diseases such as arthritis. Likewise to Chirchir's research, Dan Vergano, a science reporter for National Geographic and a Nieman Fellow at Harvard in 2007, researched the decrease in muscle mass in humans and claimed that humans evolved punier muscles to attribute to the growth of human brains. Earlier, Dorey stated that the brains of humans have been decreasing in size, this is still true, given that the evolution of the brain cannot be evaluated directly by its size. Vergano reported the results of a study that compared the strength differences between chimps, macaques, basketball players, and rock climbers; the results showed that the chimps and macaques were two times stronger than the humans (Vergano). In other words, this study showed that throughout the evolution of humans, the brain evolved much faster than the

rest of the human body, leading humans to develop punier muscles than primates.

In contrast to Chirchir and Vergano's research, Dorey claims humans have increased in height due to the evolution of diet and health. Research by Dorey shows a steady increase in height in European males over 10,000 years. European males had an average height of 5 feet 4 inches 10,000 years ago, while today, their average height is 5 feet 9 inches (Dorey). This increase in height was said to be caused by improvements in diet and healthcare. Although Dorey makes the point that humans have evolved to be taller, which translates to bigger, she overlooks that bigger doesn't necessarily correlate to strength anymore. When taking Chirchir and Vergano's research on humans evolving to have more fragile bones and weaker muscles compared to Dorey's research on humans growing to become taller, it can be concluded that humans have evolved to become weaker.

Similarly to humans evolving to be physically weaker, they have become mentally and internally weak. When advancements in technology and medicine made life easier, humans became much more lenient. Mohammed Nadir, a writer for Medium, argues from his own perspective that the modern gifts of comfort have made humans lazy, "We got used to life being easy. Everything is one click, touch, or call away. Want food? Why cook when you can get fast food? Why go there yourself when you can just order? Need to buy anything? Why physically go to the store when there's Amazon?" (Nadir). To put it bluntly, Nadir elaborates on the advancements in technology removing the difficulties in life, causing humans to become comfortable and, in turn, much lazier. In addition, he states that humans are built to work, not to sit around and that the modern gifts of comfort have made humans frail. The Harvard T.H. Chan School of Public Health argues that processed foods with unhealthy additives cause obesity and chronic diseases. The Harvard T.H. Chan School of Public Health states, "processed foods are

suggested to be a contributor to the obesity epidemic and rising prevalence of chronic diseases like heart disease and diabetes." (*Processed Food and Health*). With this information, Harvard T.H. Chan states that modern-day food is unhealthy. When comparing modern-day food to food during prehistoric times, it can be concluded that prehistoric food may not have been as safe as modern-day food. Still, purity helped with the natural selection of humankind. Modern-day food does not build immunity but causes illness; although prehistoric food was also unsafe, it played a crucial role in keeping the fittest alive and encouraging Darwinian evolution.

In contrast to the fact that Darwinian evolution is currently stagnant, Elizabeth Pennisi, a biologist with a Master's degree in science writing from Boston University, argues that human development is speeding up with the different mutations in genes and reproduction. Pennisi states, "Mutations in one copy might increase height; those in another copy, or allele, might decrease it. If changing conditions favor tallness, then tall people will have more offspring, and more copies of variants that code for tallness will circulate in the population."(Pennisi). Pennisi argues that humans are evolving rapidly with the new variants of genes and the passing down of these genes. Pennisi talks about humans becoming more genetically diverse. This research paper is not focusing on the problem of humans not being genetically diverse but rather on the issue of newer generations inheriting weak and strong genes. This research paper focuses on finding a solution to encourage Darwinian evolution, which could prevent weaker genes from being passed down, as stronger genes reflect how well one can survive (*Introduction Into Human Evolution*). Given that advancements in technology and health are making humans genetically weaker and that these genes, alongside strong genes, are being inherited, it can be resolved that comfort makes humans frailer.

Given that humans will not and should not return to their prehistoric lifestyle, the best

way to encourage Darwinian evolution is gene editing. But before that, one possible solution to the stagnant growth of Darwinian evolution in humans is to encourage space exploration. Although the idea seems far-fetched, the encouragement of space exploration would lead to the colonization of other planets, revealing different conditions compared to the ones on Earth. As it has been established that humans have used technology to make life easier, the harsher conditions and new problems arising from colonizing another planet would jump-start Darwinian evolution in humans as humans would have to adapt and persevere. For example, Eric Bender reports the findings of Bernard Kettlewell, a geneticist who won the Darwin medal and Mendel medal, on " the English peppered moth whose coloration darkened… this was a case of natural selection in which darkness helped the moths evade bird predation as they rested on sooty tree trunks"(Bender). In this example, Kettlewell shows how natural selection occurs, killing off the moths that could not adapt to their dark environment. This example shows how given the fact that the option of using technology to make life easier isn't an option for living things such as moths, adaptation is the only way to survive. This directly relates to the idea that when humans are exposed to newer conditions on different planets, natural selection and adaptation will be necessary.

Although space exploration is a full-proof solution to evoke Darwinian evolution within humans, time is a massive limitation. Rose Eveleth, a writer for the British Broadcasting Corporation, an impartial public broadcaster, reports that companies such as SpaceX believe that they can get humans on Mars by 2026, while the National Aeronautics and Space Administration thinks they can get humans on the red planet by 2039 (Eveleth). As shown by Eveleth, the journey to get humans onto another planet, Mars, is said to take between three to sixteen years. This number is different from the amount of time to make Mars habitable for large amounts of

humans but to start colonizing the red planet for future generations, which could take many more years. Although space exploration is a proper solution to the stagnant growth of Darwinian evolution in humans, time is its largest restraint.

Since space exploration is not the most efficient way to encourage Darwinian evolution in humans, awareness would be a more efficient way to promote Darwinian evolution. The significant aspect of awareness is that awareness is accessible to anyone from anywhere. Awareness can take the form of an advertisement on a website or a billboard on a building. With awareness, the more people support an idea, the farther that idea will reach. For example, the Centers for Disease Control and Prevention (CDC), the United States' leading science-based, data-driven, service organization that protects the public's health, reports that "From 2012–2018, CDC estimates that more than 16.4 million people who smoke attempted to quit and approximately 1 million successfully quit because of the *Tips* campaign"(*About the Campaign*). As shown in the CDC's example of the *Tips* campaign, awareness can be effective and cause immediate behavioral changes in others. In addition, the *Tips* campaign consisted of previous smokers giving their tips to present smokers to help them quit smoking, which had no cost, just humans helping other humans. However, even though awareness can be effective and cause direct behavioral changes within people, awareness can only be effective if it reaches the correct audience.

According to Yelena Mejova, a senior researcher at the Institute of Scientific Interchange with a Doctorate, and her colleague Victor Suarez-Lledo, a research assistant and doctorate student, report that "Both campaigns engaged women at around 40% and men 17%, supporting previous research showing women to be more likely to share their experiences with eating disorders. Further, women were more likely to mention other health topics" (Mejova).

Essentially, Mejova and Suarez-Lledo propose that women are much more likely to be engaged in health-related issues such as eating disorders than men. With this information, it can be said that awareness is a gamble, given the problem that the message could either reach the right audience and excel in engagement or reach the wrong audience and lose all importance entirely.

In conclusion, the best way to solve the issue of the stagnant growth of Darwinian evolution within humans is the gene-editing tool CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats). The gene-editing tool CRISPR-Cas9 uses a Cas9 enzyme to act as a pair of molecular scissors to cut DNA. This enzyme is paired with a guide RNA which can be programmed to carry out a particular task (*What is CRISPR-Cas9*). Therefore once the technology is further developed, CRISPR can be used to replace weaker genes with stronger ones. Furthermore, Rob Stein, an award-winning science journalist for National Public Radio, reported what Victoria Gray, a sickle cell disease patient, who had undergone CRISPR treatment, had to say after her operation, “Since my treatment I've been able to do everything for myself, everything for my kids. And so it's been joy not only for me but for the people around me that's in my life” (Stein). In short, Stein’s research shows an example of what gene editing can do for humans and how it can cure genetically related illnesses. This reveals all the possibilities of gene editing after further development of this technology.

However, one major limitation of using CRISPR as a solution is the price of the treatment costs. Allison Irvine, a science writer, and educator for the Innovative Genomics Institute, reports that each gene therapy treatment is priced at around 2 million dollars per treatment (Irvine). This limitation is a major one as it will end up causing a socioeconomic divide, as only the wealthy can access this treatment. Although the founders and developers of CRISPR have partnered with Rockland to make the “CRISPR In-a-Box,” this cheaper version of CRISPR is only sold to

educational institutes (*CRISPR in a Box Educational Kits*). But these kits will allow students interested in CRISPR technology to work in that field when ready, providing enough support to the technology to drop the prices over time. Moreover, Bridget Balch, a staff writer for the American Association of Medical Colleges, reported the founders themselves have stated that they are working on making CRISPR more accessible (Balch).

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