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Seneca the Younger, an ancient Roman philosopher, once said, "There is no easy way from Earth to the stars," and at the time this statement could not have been more true. However, between then and today, mankind has definitely made enough progress that this statement is only partially true. At this point in time, we have made technological advancements and explored more of deep space than those of Seneca's time could have ever imagined, yet the urge to discover is still just as strong in the scientists of today. However, although we may now have the technology, becoming one of the few elite who actually get to fly in space is still a very difficult feat. Only the smallest fraction of people have been granted this privilege, and it is not becoming any easier. As humanity continues to seek answers to the questions many have about the universe we live in, the process is becoming even more challenging. However, it has also created a greater need for scientists and those brave enough to face the unknown of space. Because a career as an astronaut is one of the most selective careers anyone can imagine, it takes a very specific type of person to make it as an astronaut: someone with extreme discipline, knowledge, and work ethic may be a likely candidate, but that alone is not enough. Despite this, "thousand[s]" of people every year apply for their chance to fly in space because the opportunity is such a once in a lifetime chance (Ennico-Smith). Overall, pursuing a career as an astronaut is by no means easy, but the end-result is, without a doubt, worth the effort.

"Astronaut" is an umbrella term that refers to anyone who travels in space, but what many don't know is that there are different types of astronauts who are professionals within different specialties, perform different tasks, and must meet different basic requirements within the Astronaut Candidate Program. The three main types of astronauts are commanders (who are also known as pilots), mission specialists, and payload specialists.

According to a NASA article titled "Astronaut Requirements," written by Brian Dunbar, a NASA official, "During the flight, the commander has onboard responsibility for the vehicle, crew, mission success, and safety of flight" (2). Because of their high level of responsibility regarding flight safety and maintenance, commanders and missions specialists also have the highest requirements to meet when applying to be an astronaut. The education requirements for these two positions are the same: "[A] bachelor's degree from an accredited institution in engineering, biological science, physical science or mathematics. An advanced degree is desirable." Unlike mission specialists, though, pilots also need "[a]t least least 1,000 hours [of] pilot-in-command time in [a] jet aircraft" (2) so they are prepared to take on situation that may arise during a flight.

Commanders and missions specialists also have to pass physical exams, including vision tests, blood pressure tests, and height tests to ensure that they are healthy enough to spend an extended amount of time in a zero gravity environment. Pilots must have vision that is "20/100 or better uncorrected, correctable to 20/20 [in] each eye," blood pressure that measures "140/90" or better, and must be between "62 and 75 inches" in height, most likely so they fit comfortably in a shuttle and space suit. Missions specialists have somewhat less strict requirements than their other crewmates: their vision must be "20/200" or better uncorrected, correctable to 20/20 [in] each eye," blood pressure that measures "140/90" or better, and must stand between "58.5 and 76 inches" (3). In addition to these strict physical guidelines, anyone who wishes to fly with NASA must also be a citizen of the United States of America.

Payload specialists, although technically still astronauts, are not part of the Astronaut Candidate Program and therefore have much more lenient requirements, which usually depend on the specific mission they are selected for. They still "[m]ust have the appropriate education and training related to the payload or experiment...[which have] varying standards depending on classification" (3). Overall, it is much easier to become a payload specialist over a pilot or a mission specialist; they do not even have to work for NASA or be a citizen of the United States in order to secure their position.

According to QS University rankings (a website that ranks colleges around the world), published in *The Guardian* in 2011, the best university in the world for those pursuing a career as an astronaut is the "University of Cambridge" ("Top 100 Universities in the World for Physics & Astronomy 2011" 1). Some of the other top-ranked schools for physics and astronomy are also in Europe, including "University of Oxford, Imperial College London, and ETH Zurich (Swiss Federal Institute of Technology)." Fortunately, five of the remaining colleges on the top ten list are much closer to home, including "Harvard University, the Massachusetts Institute of Technology, the University of California, Berkeley, Stanford University, the California Institute of Technology, and Princeton University," which may be one of the reasons that NASA (an American association) is one of the leading space exploration administrations in the entire world.

Dr. Kimberly Ennico-Smith, a NASA astrophysicist and astronaut hopeful who I interviewed, "received [her] bachelor's degree in physics from Johns Hopkins University in 1994, then...received [her] Ph.D in astronomy from Cambridge University in England in 1998, and after a few years of doing postdoctoral work [she] joined NASA's Ames Research Center in California in 2000. Once [she] joined NASA, [her] training wasn't official and [she] learned more through [her] experiences" (Ennico-Smith). In the interview, Dr. Ennico-Smith made it very clear that credentials are not the only aspect that can secure a person a job with NASA; according to her, coming to work for NASA was "total luck." Dr. Ennico-Smith also described the difficulty of the astronaut application process: "I've applied four times...I still don't know what the magic recipe is." Mae Jemison, who was the first African American woman to fly in space, had a similar experience: "I would like to say that NASA found out how wonderful I was and they came and found me, but it was as mundane as calling Johnson Space Center and asking for an astronaut application and having them not laugh at you" (Porter 2), which only further reinforces the fact that a career as an astronaut may only ever be a dream for even the most qualified of people, of which there are already very few.

One of the most prominent international associations for those who do manage to make it as an astronaut is the elite and exclusive Association of Space Explorers (ASE), which was founded in 1985. It is described as "...a professional and education organization composed of current and former Astronauts and cosmonauts...[which] offers networking opportunities and other professional resources and services" (Echaore-McDavid). Every year, the ASE, comprised of about 400 members, hosts what is called the Planetary Congress, which "is designed to promote the exchange of space flight experiences and technical information concerning space operations, scientific research, mission development and astronaut training" ("Planetary Congress" 1). This wealth of information comes from the ASE's four divisions around the world, which are located in the United States, Russia, Europe, and Asia. In the United States, the membership fee is $35 for active astronauts, $65 for inactive astronauts, and a lifetime membership is $1,000 ("Association of Space Explorers"). Despite the fact that some of these prices may seem high to a college student studying to become an astronaut, most astronauts have no issue paying for it: according to the U.S Bureau of Labor Statistics' *Occupational Outlook Handbook*, the 2014 median pay for physicists and astronomers (those who usually become astronauts) was "$109,290 per year, [or] $52.54 per hour" (Physicists and Astronomers). Although this may seem extremely desirable, many argue that the salaries of astronauts, along with the cost it takes to send them into the depths of space, is too astronomical.

One of the longest-standing controversies regarding space exploration is if space exploration

is worth the cost that it incurs. It is no secret that space exploration comes with a high price tag, so various influential figures have argued against it: "'If our nation can spend twenty billion dollars to put a man on the moon, it can spend billions of dollars to put God's children on their own two feet right here on earth'" (Dr. Martin Luther King, Jr. qtd. in Timisoara 1). Although this argument may resonate with many, the cost built up by space exploration may not be as high as these people are determined to believe. According to Virgiliu Pop Timisoara, a writer for the astronomy website *SpaceDaily*, "The high profile of space exploration makes it appear more expensive than it actually is...The real dimensions of the social needs are, in reality, out of proportion with the money spent in space" (1). Essentially, cutting the cost of space exploration would not come close to being enough to solve the rest of the world's problems. Even within this topic of controversy, there is further disagreement: if we continue spending money to explore space, should we spend it on human exploration or robotic exploration? Steven J. Dick, another NASA official, wrote "Why We Explore: Exploration, Discovery, and Science," an article that briefly explores this controversy. According to Dick, "decisions must be made about the balance between human and space exploration. Critics of human space exploration...point out that robotic spacecraft are generally much cheaper and generate more science" (2), effectively making missions like the recent #YearInSpace (which will be elaborated on later) completely redundant. However, Steve Squyres, an investigator for the Mars Exploration Rovers, states that "even though science may be a motivation for exploration and a product of it, human exploration is more than the sum of all science. As I have argued in past essays, it is individually a primordial human urge, and in a larger sense the mark of a creative society" (Squyres qtd. in Dick 2). Overall, it seems to be the opinion of most that the human desire to explore will triumph over the burden of the cost and that most landmark missions will still be led by humans.

However, even though the idea of exploring space will always be highly appealing to many, being an astronaut still has its ups and downs, much like any other career. According to the article "So you want to be an astronaut? Here's what it takes" by Rachel Nuwer of *USA Today*, "Spending time in space is 'like living in a phone booth with six other people'" (Foreman qtd. in Nuwer). Space constraints are so strict that astronauts are extremely limited in what they are allowed to bring while on their travels: "Astronauts can bring 20 small personal items packed into a zipper pouch about the size of a soda can" (Nuwer). For example, astronaut Mae Jemison brought "a flag from the Organization of African Unity...a poster of Judith Jamison...and a banner for Alpha Kappa Alpha, the oldest African-American sorority in the country" (Porter 2). However, the limited personal space does not seem to be much of a sacrifice when one weighs the pros and cons of working in the aerospace industry. According to Dr. Kimberly Ennico-Smith, an astrophysicist who works for NASA, said that her job has "been very rewarding. I...get to work with a team of over one hundred scientists, and it's been a joy to integrate and learn from my fellow scientists" (Ennico-Smith). Again, Mae Jemison shares a similar opinion; when asked about her trip to space, she said, "It was beautiful. I felt like I could be a part of everything else in this universe...It was an absolutely fascinating time - I learned so much" (Porter 2). This again reinforces the fact that the human desire to learn and explore will most likely prevent robotic exploration from becoming the norm, because robotic exploration just does not yield the same knowledge and experiences that human exploration does.

Although humanity has only recently been able to explore the universe from space, even ancient civilizations created their own tributes to the concept. For example, "The Chinese used rockets for ceremonial and military purposes centuries ago" ("A Brief History of Space Exploration" 1), which coincidentally foreshadows the use of aeronautical technology later on in history: "In the 1930s and 1940s Nazi Germany saw the possibilities of using long-distance rockets as weapons," which marked the beginning of these advancements being used for a more wide range of purposes, and eventually the beginning of the space race between the United States and Russia. The first astronaut that made a significant achievement in space exploration was the Russian cosmonaut Yuri

Gargarin, who "On April 12th, 1961...became the first man to go into space" (Williams 1); he was also "part of the Sochi Six, an elite group of cosmonauts." A few years later, the United States fired back when "'[l]anding a man on the moon and returning him safely to Earth within a decade' became a national goal set by President John F. Kennedy in 1961. On July 20, 1969, Astronaut Neil Armstrong took 'a giant step for mankind' as he stepped onto the moon" ("A Brief History of Space Exploration" 1). Armstrong is still arguably the most famous astronaut of all time, and at the time, his great achievement lead to an even fiercer competition between international space agencies. However, the same cannot be said today: "The International Space Station is a research laboratory in low Earth orbit. With many different partners contributing to its design and construction, this high-flying laboratory has become a symbol of cooperation in space exploration, with former competitors now working together" (2) towards bringing humanity farther into space and to find new ways to understand our own planet.

One of the newest realistic space movies is *The Martian* (2015) – a movie in which an astronaut is stranded alone on Mars and must find a way to survive. Although the premise of this movie is not a possibility yet, it could be in the somewhat near future: "NASA is developing the capabilities needed to send humans to an asteroid by 2025 and Mars in the 2030s" ("NASA's Journey to Mars" 1). One of the biggest issues preventing this from happening today is the fact that the technology simply is not ready yet, but "[e]ngineers and scientists around the country are working hard to develop the technologies astronauts will use to one day live and work on Mars, and safely return home from the next giant leap for humanity" (2). To learn how prolonged amounts of time in space damage the human body to prepare for the two and a half year round trip to Mars, NASA recently sent astronaut Mark Kelly into space for almost a year, which was known on social media as the #YearInSpace. The purpose of this was to "[study] the extent of that damage - to the heart, the eyes, the muscles, the bones, the immune system and more - in a one-year, close-to-home mission [that] can help scientists to reduce, if not eliminate, the harm" (Kluger 1). However, there are still many obstacles in the way before NASA can actually send humans to Mars: many more missions like the Year in Space must be conducted, NASA must gain the proper funding, and most importantly, much more advanced technology must be developed to properly sustain human life in space.

In order to develop this much needed technology, countries all around the world have come together to create the Global Exploration Roadmap, which "reflects the collaborative effort of twelve space agencies to define a long-term human space exploration strategy which provides substantial benefits for improving the quality of life on Earth and is implementable and sustainable" (Laurini 1). Much like the ASE's Planetary Congress, the countries participating in the Global Exploration Roadmap also exchanges information to help bring mankind further into space and to also learn more about our own Earth. By comparing the atmospheres and compositions of other planets in our solar system to Earth, we can discover new ways to sustain our planet and protect it from issues such as climate change and global warming.

Perhaps one of the most exciting advancements in the field of aerospace exploration is the new concept of space tourism. Being an astronaut is the childhood dream of many, and it may finally become a reality. This year, many companies are competing to become the first commercial company to send civilians into space. One of these companies is Virgin Galactic – a space flight division of Virgin Group: "Virgin Galactic is one of several privately owned companies racing to commercialize new technology for spaceflight. Elon Musk's SpaceX has focused on delivering cargo to the International Space Station with its Dragon capsule, while Jeff Bezos' Blue Origin is also planning to offer the 'astronaut experience' to paying customers" ("Virgin Galactic's New SpaceShipTwo Vehicle On Today" 1). Very recently was the reveal of Virgin Galactic's first spacecraft intended for tourists - however, the first model was destroyed along with its pilot. The second ship was revealed on April 7th, 2016, but between the cost of a seat, which "will run you $250,000" (2) and the ground

testing that still needs to be done, it will still be a very significant amount of time until this opportunity is actually accessible to the average person.

Overall, despite the fact that becoming an astronaut may be one of the hardest careers to secure, the need for them is greater than ever. Many people think being an astronaut only involves flying around in space, but in reality, it is so much more. Without astronauts, mankind would not know even a fraction of what we know about the universe today – and in learning about our universe in this hands-on profession, we have also been able to learn more about our very own planet and how to sustain it, amongst other things. Additionally, although the profession has made an exceptional amount of strides in its brief existence, it is not even close to being done. With goals such as sending humans to Mars and allowing ordinary civilians to fly in space for more affordable prices, the aerospace career industry is always expanding. Although becoming one is astronomically difficult, astronauts may soon make the next giant leap for mankind to continue as they add to the rich, incredible, and extraordinary history and accomplishments of this profession.

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