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In today's day and age, technological advancement is at the forefront of human development. There is not a single thing on this earth that can be improved upon and revolutionized as much as technology. This is why this is such an important topic to research and discuss. I am currently committing to a college to study science as an undergraduate and will then continue honing my knowledge in medical school. I think an infinitely interesting component of technological advancement is in the field of medicine and biology. How can the human race improve its own survivability and longevity through technology? This is the question being answered in these current times.

Technological development in healthcare is present in so many different areas. Scientists and engineers are always developing newer and better solutions to age-old problems around the human body. One such field is in robotic surgery. It's been shown that robotic assistance in the operating room is a safe alternative to full or partial in-person procedures. Surgical robotics are currently being used to undergo minimally invasive surgeries or ones that don't require a large volume of technicality and danger. However, as I expressed earlier, these things are always being improved. Currently, scientists are experimenting and developing joystick-driven robotic equipment to enable full robotic operations, or even remote operations! (MIT). When a patient experiences a severe medical emergency, like a stroke or aneurysm, the time frame that they're operated on is crucial. It is important that those patients are operated on within an hour to minimize permanent brain damage. This has created a tough situation for people who don't live

near large hospitals with on-site surgeons. MIT has sought out a way for robots to be installed in smaller, more rural hospitals and then operated remotely by qualified surgeons in other areas of the world. Controlling a joystick and viewing the patient through a live imaging feed, surgeons can use their already adept hand-eye coordination to successfully operate the robot. The places that this kind of remote technology can go are truly amazing to consider.

Another field that can't be ignored is, of course, Artificial Intelligence. Researchers are using AI to automate many areas of healthcare. The most important ones I've seen include streamlined diagnosis and treatment plans, and increased pharmaceutical efficiency. A team at Monash University in Australia is in the early development of a computing model that can predict the correct medication for someone being treated for seizures. This would make the inefficient process of trial and error medication become obsolete. AI is also applied in the field of medicinal chemistry. Machine learning systems pull from endless databases to help design new drugs without preclinical trials and costly development plans. Computer science bleeds into healthcare more than anything in some cases.

Another field in which technology brings widespread advancement is in manufacturing. I've had some personal experience on this topic. Last summer I interned at a biomedical engineering company called Laminar. They specialize in creating and manufacturing an implantable device that effectively closes the left atrial appendage in the heart. This left atrial is responsible for blood clot buildup in patients who have atrial fibrillation (irregular heartbeat resulting in blood clotting in the chambers of the heart). I was able to see the software and technology being used to invent this device. I also had the opportunity to spend time with qualified scientists and engineers and assist in manufacturing different components of their special insertion catheter. Toward the end of my internship, I was able to review medical

processes and procedures. This experience proved extremely valuable to me as I was able to witness firsthand an example of the increasing connection between the machine body and the human body. These kinds of developments are what makes me so interested in the future of biotechnology.

Another field in which technological development is present is in the field of neurology. Scientists are actively bridging the gap between machines, and minds. The most evident example is Elon Musk's Neuralink. The Neuralink is an in-development "implantable brain-computer interface to let you control a computer or mobile device anywhere you go." (Neuralink) This device would be robotically implanted with electrode threads to monitor and impact brain activity. Installing any foreign object into the area of the brain is extremely difficult and dangerous, so robotic installation of the device is the only option. A phone app is being developed in tandem with this that would track brain responses through Bluetooth. It would give you a set of lessons and games to slowly develop your ability to control devices with nothing but your thoughts. This kind of software could radically improve the life of the physically disabled. Something like this that allows, to be blunt, technological mind control, would change the field of science forever.

Not all of these developments are wholeheartedly welcomed. With these more abstract approaches to technological evolution come certain humanity, morality, and privacy issues. When we enter the realm of cybernetic enhancement, it raises questions about the sheer extent of it all. How far will we go in terms of artificially enhancing ourselves? What are people willing to modify/replace before we start losing our humanity? Will we become addicted to the machine-assisted evolution of our bodies and minds? The further we go, we also invite more privacy leaks. Anything that is manufactured can collect data, and everything that collects data

has the possibility of sharing/leaking that data to external sources. Implementing this new age of brain tech invites major issues of cybersecurity into the fray. Groups like “governments, security agencies, and other major institutions may want to use it to manipulate people or corporations” (Presence Secure).

Navigating the inevitable new age of human cybernetic systems is a slippery slope, but it's absolutely essential to the continued growth of the human race. We've come to a crucial point in time. One where improvements and inventions people are developing can only go so far. A new age of invention is coming, in which we push our boundaries that were previously thought unbreakable. The evolution of computer science, AI, biology, climatology, chemistry, engineering, etc. will all shape the expansion of our feats as a planet. The only way we can achieve the goals of the future is with technology. It is unequivocally essential to the functionality and prosperity of our kind.

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