The way development of medical devices and techniques guide us into the future

Health & Medicine

Bio Engineering is a very recent field involving the problem-solving and ingenuity of engineering and using the sciences of medicine and biology for the development of new medical devices and techniques (CBME, 2016). Bioengineering first became relevant in the late 19th century after German physicist Conrad Roentgen first discovered the X-ray using photographic plates. Since then, more and more developments have eventually lead to it now being taught as a major in many universities around the world. While biomedical engineering has made immense progress in the medical field, it is not a particularly desirable career choice and its ethics are often questioned.

To begin with, the basic concept of biomedical engineering is the application of the basic sciences of physics and chemistry on to living things. The ‘ bio’ in biomedical engineering denoting anything connected with living things. This intermarriage is called biophysics and biochemistry. The job of a bioengineer is to further and develop ideas on medicine to aid medical staff in their practice. They do this by inventing or progressing inventions to make jobs easier and more efficient. For example, the invention of the MRI scan in the 1970s. The idea behind the MRI scan came from the chemist Paul Lauterbur. This would be an invention of biomedical engineering as it uses principles of chemistry and engineering for the advancement of medicine.

As mentioned above, biomedical engineering combines the sciences of physics, chemistry, biology and medicine, so obviously chemistry plays a part in a biomedical engineer’s job. Students studying for it must take courses in chemistry to get a bachelor’s degree (Bureau of Labor Statistics, 2015). The human body is one, huge, chemical reaction, every minute of every day the body undergoes countless changes. The most important being

digestion, circulation, and respiration. As the goal of a biomedical engineer is to aid the natural systems of the human body, an understanding of basic chemistry is imperative to their job. For example, EpiPens. EpiPens inject epinephrine into the bloodstream, epinephrine is a chemical that narrows blood vessels and reverses low blood pressure, rashes or hives, and any other symptoms of an allergic reaction (‘ What is EpiPen’, 2014). Without chemistry, the EpiPen wouldn’t be possible, as scientists wouldn’t have any knowledge about the properties of the chemical Epinephrine and how to administer it into the bloodstream.

For my first argument for biomedical engineering, biomedical engineering has made a huge impact on modern medicine and technology. With more and more advancements happening every consecutive year. Life expectancy has doubled in developed countries over the past 100 years and that is all thanks to the innovations of the world’s first biomedical engineers (Max Roser, 2016). Examples include:

Tissue Engineering is the artificial construction of human tissue by scientists for humans. Scientists use the intact cells of the human body to make fully functional human body parts and organs to be implemented back into the donor of the original cells (Brown, Leclair, 2000).

Furthermore, scientists have been successful in making artificial skin that can allow patients to feel again. Right now only small patches of skin have been made but scientists are working on making even more ambitious breakthroughs in their research (Abate, 2015). The skin replicates human sensory functions with flexible electronic fabric (Abate, 2015).

Additionally, artificial eyes show a lot of promise for human beings. Scientists have been successful in constructing mouse eyes that can completely return the sight of mice (Gannon, 2012). These scientists have also stated they've been successful in deciphering the code in a monkey's retina, showing great promise for the development of human eyes (Gannon, 2012).

Additionally, over the last century, biomedical engineers have made huge developments for life support. Life support is the process of artificially keeping a person alive during surgery or after an injury by taking over the patient's vital organs, mainly the lungs, heart and brain (WebMD, 2014). The most common form of Life Support is the ventilator, originally invented in the 19th century. The ventilator moving breathable air in and out of the lungs of someone who physically cannot do so (WebMD, 2014). If a patient heart stops beating doctors will attempt to ' restart' the heart using CPR, to get blood and oxygen flowing throughout the body. Doctors may also use defibrillators or electric shocks to restart the heart. Life support has aided fatally injured people by giving them much needed time for doctors to operate, reducing the risk of being permanently disabled and given their body the time for its natural systems to kick in.

As well as this, biomedical engineers are responsible for the development of prosthetics. In the medical field, a prosthesis is an artificial invention that replaces a missing body part of the human body. When someone says ' prosthetic', they are usually referring to a prosthetic leg or arm as these limbs are the easiest to lose and replace with a prosthesis. Humans have been crafting leg and arm substitutes for hundreds of years and the

technology has evolved greatly over this period of time (Clements, 2016). The idea began with crude wooden or metal posts replacing a lost limb, currently, doctors are constructing prosthetic limbs that can allow the patient to feel again.

Over the past decade, hundreds of amputees have been aided by advanced prosthetic limbs. Those who once could not walk, use basic hand-held utensils or anything that an average human might take for granted every day, can now do these things with fairly efficiently. For these reasons the creation of the prosthetic limb is incredibly important in the history of biomedical engineering and would not have been possible without the ingenious minds of biomedical engineers.

As my first argument against biomedical engineering, biomedical Engineering is a relatively new career path, there are several problems students may encounter when studying for this job. Firstly, the amount of jobs available in 2014 was only 22, 000 and is estimated to rise by only 5000 by 2024 (Bureau of Labor Statistics, 2015). There are many careers very similar to Biomedical Engineering such as Biophysics, Biochemistry and Chemical engineering that have higher job counts and require similar degrees besides Biomedical Engineering (Bureau of Labor statistics, 2015). Compared to these, the idea of becoming a Biomedical Engineer is far less appetising, for good reason. As well as this, if working outside of a laboratory environment engineers might be at risk from all number of hazards. These include disease, radiation, burns, toxic fumes, and electric shocks to name a few.

Additionally, as the job description of a biomedical engineer is to aid the natural bodily functions of the human body and create artificial organs and body parts, the lines between robots and human and human and ‘ superhuman’ grow thinner (Brey, 2009). If medicine were to travel toward superhuman enhancement it would stray from its original intentions, to cure and protect (brey, 2009). This is why so many are against this profession. Oscar Pistorius was a Paralympian athlete who used carbon fibre J-shaped prosthetics when sprinting in competitions. In 2007, IAAF banned the use of “ any technical device that incorporates springs, wheels, or any other element that provides a user with an advantage over another athlete not using such a device” (IAAF, 2007) in their competition because Oscar’s legs were found to be more effective than the natural legs of other athletes.

This example is relevant as it shows a scenario in which a device meant to help humans with no legs run, exceeded the effectiveness of the natural human body. This is what the medical field is not supposed to want as it gives those with more effective limbs and organs and advantage over those who don’t. This all creates the problem of Ethics and whether humanity should be ‘ playing god’ and messing with the natural properties and features of the human body that have been evolving and developing since the Stone Age.

To conclude, biomedical engineering shows great promise both in its extraordinary innovation in the field of medicine, and the amount of progress made recently in prosthetics. Despite this, biomedical engineering is a very young and developing career and has very little job opportunities available.

Many also feel that their work is straying too far from medicine’s traditional views and intentions and that bodily enhancements have gone too far. All in all, the jobs of biomedical engineers appear to be very rewarding for humanity and that despite the flaws, biomedical engineering should most definitely be discouraged as a career path because of its astounding promise.