Alaina Cope

The topic of chemical engineering interests me because it has many branches, and most interestingly the biochemistry branch. Math and science are two core subjects that are used often in this field, and as an individual with advanced mathematical abilities, who is also interested in the medical field, biochemistry is a logical career to pursue. Biochemistry is a field of chemical engineering that I aspire to enter because it helps our nation and those who protect it. The Navy's biochemical and forensic toxicology division is crucial because they analyze how several different toxic substances react in both the human body and our environments. These fields of science also create equipment for a multitude of military operations, inevitably improving amphibious warfare performance of both the Navy and Marine military branches. The responsibilities of chemical engineers in the Navy are listless but important all the same and would be interesting careers to have in the future.

Chemical engineering is a branch of science with countless opportunities. In simplest terms, a chemical engineer designs and creates equipment for processes such as refining and mixing materials, or breaking down already made compounds. A good example of a commonly broken-down product is bleach. Often associated with chemical engineering are chemical plants, which create products on a large scale and break down products made from combining elements or materials. Chemical engineers are well known to work with gas, oil, and petrochemical industries as well, providing our nation with precious materials necessary for everyday life. Those who choose chemical engineering as a profession are often expected to understand other types of engineering, like mechanical and electrical engineering. Although normally a specialist in certain areas, chemical engineers generally touch every industry. They impact industries relating to but not limited to, pharmaceuticals, food industries, environmental health and safety, biotechnology, and electronic materials.

Chemical Engineering is very important to the Navy and Marine Corps in many ways. One of the more well-known ways is creating nuclear weapons for warfare. This in turn created the more analytical part of nuclear chemistry where they look for signs of nuclear test areas to stop any rapid spread of unregulated nuclear weapons. Another important contribution is the creation of clothing products and processes that will protect soldiers from biological and chemical weapons. Some chemical engineers that are part of the Navy Technology Center for Safety and Survivability work with fuels and ship damage control, making sure they are safe for use. Submarine atmospheres are also taken care of by the chemistry division. Submarines must have atmosphere regulators to keep oxygen levels high enough for the occupants of the vessel, and therefore it must be made with the utmost care. Biochemistry is a branch of chemical engineering that has a vast amount of subcategories, such as medicine, forensics, plant sciences, microbiology, and the list goes on. It’s an integral part of the chemistry branch that is always subject to improvement. By creating Vaccines and analyzing diseases, this branch not only protects soldiers but civilians across the nation.

Dr.Sandra Chapman inspires me because she is looking for new innovative ways to further the Navy and Marine Corps' ability when transitioning from water to land and vice versa. It’s fascinating that they

are developing ways to solve problems in the field of diving medicine, no matter how small it is. They are currently working on better visibility for divers. The career itself inspires me because innovative solutions to almost impossible problems are an amazing feat. Being able to better a whole work field and further science exploration is important for society as a whole. With the potential to pursue a career in biochemistry, all new scientific discoveries are important. Dr.Chapman has her researchers performing comparative physiology, looking at the adaptations of mammals that live in water, and drawing conclusions on what could further our aquatic abilities. She inspires me because she was also into biomedical science before and during college, and worked hard to be able to produce solutions to all the questions on how to solve our current problems when going undersea.

Undersea medicine in the Navy and Marine Corps is about enhancing safety, mobility, and health underwater by researching and developing ways to achieve the best possible performance. Decompression Sickness(DCS) is being researched to look for ways to identify and treat it while in the work field. Decompression Sickness is caused when nitrogen dissolved in blood and tissue from high pressure starts to form bubbles in the body as pressure decreases. Type 2 DCS, the more severe version, is life-threatening, affecting our vital organs, circulatory system, and respiratory system. Finding a way to safely treat and identify this Illness in both peace and wartime can be extremely beneficial for everyone who works in deepwater diving. A way to help treat DCS is through Hyperbaric Oxygen(HBO), though the use of this pure oxygen may have its downsides. Such complications could be sinus problems, eye damage, or in rarer cases, oxygen poisoning. Oxygen poisoning can lead to lung failure, seizures, fluid in the lungs, and other problems. The work in this field is very important for the advancement of our abilities as humans because there is very little still known about the ocean and its creatures. More than 80% has yet to be mapped, touched, or seen by a human before. In a way, this work field inspires me because it's about getting in touch with what's unknown on our planet, it's furthering the Marines and Navy’s abilities to interact with our oceans.

Additive manufacturing, like 3-D printing, can make a huge impact in the next twenty years. Small objects necessary for a lot of machinery would be extremely difficult to make without the ability to be made layer by layer. Furthering the range of motion in 3-D printing will greatly improve the military’s abilities. Parts made from additive manufacturing are used in the marines and Navy’s helicopters too. In the future, producing large 3-D printers will lead to the ability to create new, large machinery that can help the military itself advance. The future of 3-D printing is making it easier for the Marine Corps and Navy to get ahold of objects or machinery that can’t be easily attained. Right now they can only produce smaller products, but in 20 years they may be able to produce a whole vehicle layer by layer.

3-D printing will slowly advance to becoming faster, stronger, and move better. Making massive 3-D printers in the next twenty years will make it possible for the Navy to fix large-scale problems on ships so they do not have to go to port. 3-D printing has the potential to completely alter the military’s supply chain. Large and small-scale printers alike could make it so the military doesn't even have to order parts, just the necessary metals used to feed these 3-D printers. By offsetting the Marine corps and Navy supply chains, they can save a very large sum of money which can further research in very limited areas.

Additive manufacturing can very well change our daily lives. In the medical industry, 3-D printing is predicted to be able to create skin grafts, organs, and prosthetics that are all personalized for that one individual. 3-D printing is also going to further space exploration because it can create much-needed parts for astronauts. 3-D printers can currently make a few types of food, but we could very well feed the homeless all over our nation in the future.

The fields of chemical engineering, undersea medicine, and additive manufacturing all make it possible for the military to advance in today's warfare. Chemical engineering makes it possible for our nation's defense to fight back, and stay safe. They create ways to safely traverse underwater for submarines, or stay safe from biochemical warfare. Undersea medicine is making it possible for our soldiers to transition from seat to land and vice versa through revolutionary research. Additive manufacturing gives the military the ability to make important but hard-to-get parts so they don't have to wait for them to be sent in.