

# Pranavi Gollamudi

## A Sea of Possibilities

They say the sky's the limit - but who knew that it was actually the undersea realm that researchers were expanding their horizons for? Not me - I was unfamiliar with undersea medicine before watching Dr. Sandra Chapman's interview. Only after watching her discussion (and reading several internet articles) did I realize what a revolutionary field undersea medicine is. It's a specialized field of medicine that deals with recognizing, treating, and preventing the many conditions that occur due to humans being undersea - a territory notorious for its incredibly high ambient pressure. Considering how - in Dr. Chapman's words - "humans were not built to be undersea," undersea medicine specialists deal with diseases caused by underwater conditions while coming up with viable ways to administer treatments in high-pressure environments and ways to keep deep-sea divers and scientists safe. Another facet of undersea medicine is exploring the effects that staying undersea has on the human body.

That being said, undersea medicine is a field of great inspiration to me. In terms of traditional medicine, humanity has come a long way in terms of recognizing and mitigating diseases. But with undersea medicine, it's a completely different ball game. New concerns are thrown into the mix - unbelievably high pressures that could crush a human, and new diseases that have never been encountered on land. Scientists have worked relentlessly to be able to not only keep humans safe at such depths and high pressures, but also to come up with ways to modify/apply traditional medical treatments - such as vaccines, first aid, and oxygen delivery - in these conditions. They've had to familiarize themselves with and develop treatments for all the new diseases that can result from prolonged exposure to high pressures. This is why I feel so inspired by the field of undersea medicine: it's a field that is teeming with new information to be explored and new problems to be solved, and the scientists in this field are ready to tackle challenges. That's exactly how I aspire to be in my future career - ready to take on every challenge - hence why undersea medicine motivates me.

For the Navy and Marine Corps, undersea medicine plays an enormous role in ensuring the safety of military divers and efficacy of treatments. Military divers are subjected to prolonged periods of being underwater. They deal with high external pressures for dozens of hours in an environment where oxygen is not readily available. They also need to be in top health so they can carry out their duties effectively. That's where undersea medicine comes in. To ensure that military divers are safe, healthy, and efficient, undersea medicine specialists work tirelessly to develop undersea treatment options for diseases, oxygen delivery methods so divers can breathe, and ways to treat newly-discovered undersea diseases. Without undersea medicine, there is no doubt that military divers would not be as secure, sound, and efficient as they are. We must appreciate the huge role that undersea medicine plays in developing and sustaining the effectiveness and security of our Naval and Marine Corps.

In particular, I found Dr. Sandra Chapman's work in undersea medicine fascinating. First off, when Dr. Chapman mentioned that she was working on "something related to Aquaman," I was immediately interested. The fact that Dr. Chapman is working on a way for humans to essentially become amphibians - able to seamlessly make the switch from land to water without the bulky technology that is currently used - is inspiring in and of itself. I'm sure an idea like that was initially seen as incredulous, but it's commendable that Dr. Chapman and her team are working to make it happen. The augmented reality that Dr. Chapman mentioned (in which divers are able to see their surroundings

in their helmets even with low visibility) is also of great interest to me, as is the technology that allows divers to see what's going on inside them physiologically. Dr. Chapman had to come up with the technology and modify it so that it could work underwater - a remarkable feat. But what I found the most unbelievable was Dr. Chapman's discovery of how ocean water could be electrolyzed to produce oxygen for divers. While other scientists were trying to develop ways to send oxygen down from above, Dr. Chapman realized that all the divers had to do was look around them for their source of oxygen. Her resourcefulness and novel thinking is another reason she really inspired me. Dr. Chapman mentioned in her talk that she was very interested in biomedical science when she was in college. As a STEM student who took biomedical engineering as an elective in 11th grade and wants to pursue BME in college, this point of commonality piqued my interest. I always thought that undersea medicine and biomedical engineering were not related. However, knowing that Dr. Chapman harnessed her interest in the biomedical sciences to develop all these revolutionary technologies in undersea medicine has given me more motivation to pursue my own career goals. I had no idea that the biomedical sciences had applications such as the ones Dr. Chapman described, but I now have a renewed motivation in my future endeavours.

By the year 2040, the novel technologies that Dr. Chapman discussed will have become commonplace. Humans will have basically become amphibious since they will be able to survive in land or water. New technologies that can support the needs of the human body at high pressures will have become omnipresent, as well. For instance, the augmented reality display that Dr. Chapman was talking about will make it so that divers can navigate underwater. The divers will use technology that alerts them to any surrounding threats. Underwater physiological monitors will make it so that divers can have access to massive amounts of data about their health - all underwater and at the touch of a button. Divers will be able to extract their oxygen directly from the water around them, completely eliminating their dependency on oxygen cylinders from land.

What exactly does this mean for our daily lives? An increased accessibility to the undersea realm will open up several possibilities - some beneficial, others more detrimental. In terms of positive developments, humans will be able to stay underwater for very long periods of time, which will make it easier to study the many species that live in the deep sea. This will allow for the advancement of the biological sciences, potentially giving us more insight about the human body, as well. In 2040, it will also be easier to harvest natural resources; humans will have easier access to the numerous oil reserves, hydrothermal vents, and minerals located under the sea's surface. Harnessing these valuable resources will allow humans to advance in other industries (such as the oil and mineral industries). This in turn will allow for the advancement of even more interdependent industries (such as the automobile and medical industries). But there is also a flip side to all this: the increased amount of humans inhabiting the sea could also lead to the collapse of underwater ecosystems and the extinctions of marine species if we are not careful. It is important to consider and mitigate the impact that humans will have on the undersea environment to prevent such things from happening.

This entails future advancements for the Navy and Marine Corps. Now, the Navy and Marine Corps require a lot of equipment and preparation so that military divers can maintain their health and fitness. With the aforementioned advances, the amount of equipment and preparation needed will be cut down significantly. This will save resources and improve the Navy's/Marines' efficacy. Military divers will require much less time to initiate and join missions since they won't have to worry about strapping on pounds and pounds of gear. They will have improved safety features at their disposal. In a dark, murky

environment? No problem - augmented reality vision allows for perfect visibility. Not sure if the symptom you are experiencing is a potential health issue? Simply use your underwater health sensor to gather instantaneous data about your body. When military divers are able to ensure their safety quicker and more accurately than ever before, they will become quicker and more effective in their duties. And if military divers don't need an external source of oxygen, they can spend less time worrying about how they're going to breathe and more time performing responsibilities.

Ultimately, underwater medicine is a field that is overflowing with potential. From underwater augmented reality to harvesting oxygen from seawater, the possibilities are limitless. Not to mention, undersea medicine has a number of implications for the Navy and Marine Corps. With undersea medicine specialists and military divers working hand-in-hand, there's absolutely no doubt that undersea medicine will prosper and completely revolutionize the way we see the sea. I cannot wait to see what undersea medicine has to offer, and where the sea of possibilities associated with the field will take us in the future!