

## Kevin Linne von Berg

When one really thinks of what the Navy does, where it operates, and the impact it needs to make around the world, it becomes obvious that the Navy has to be everywhere. The Navy is on water, underwater, on land, in the air, in space, and even in cyberspace. It needs to be able to adapt and overcome any obstacle in its way in any environment. The Navy specializes in everything from ships, planes, and submarines, to cybersecurity, nanomaterials, and so much more. Of all the various technical areas described in the Navy STEM videos, the one topic that interested me the most is autonomy and artificial intelligence (AI). When I think of autonomy and AI, I think of the future. AI programs have advanced significantly over the past 10 years and will only continue to improve as time goes on. Ever since I watched science fiction movies as a child, I have been interested in robots. This interest then evolved into the science behind how they work, which led me to how they think and interact independently, which then led me to my current interest in autonomy and AI. I believe that autonomy is important to the Navy and Marine Corps of today because of its great possibilities of doing things better, faster, and safer. AI programs can make decisions and act on them instantaneously while keeping human lives safe. AI and autonomous systems can assist the crew of a ship in figuring out which targets are the biggest threats or help a Marine Corps squad gather intelligence on a target without being seen or putting the team in harm's way. This field has become an inspiration to me and in my opinion will be a key technology for the future Navy and Marine Corps.

In addition to being interested in autonomy and AI, over the years I have seen so many news reports about the effects of global warming and how the use of fossil fuels is a major factor in contributing to this issue. As of 2019, fossil fuels made up around 80% of all domestic energy production. While we definitely need energy to function, burning fossil fuels is a harmful and nonrenewable form of energy. This situation has always made me feel horrible and has inspired me to do something about it when I get older. Because of this, I have a passion to try to combat the upcoming energy crisis and this passion made me consider many ways of producing and transporting energy efficiently. This is why Dr. Paul Jaffe's STEM video on moving energy really piqued my interest. Dr. Jaffe is an electrical engineer that focuses on energy transportation and redirection. I have always had an interest in becoming an electrical engineer just like him because there seems to be a vast amount of fascinating topics and fields that one can go into if you have a background in electrical engineering. In his video, he described a project that he is working on called space solar, in which solar panels are to be positioned in space instead of on the planet, which is actually something I had thought of as a futuristic idea; and he is actually doing it! Since these solar panels are in space, they receive unfiltered sunlight, not affected by the atmosphere, and can remain active all the time since there can be no "night" in space if the panels are positioned correctly. Another project of his that immediately interested me is called power beaming. Power beaming is a way of charging devices or machines anywhere on the planet from a concentrated beam of energy. This would act as a means of wireless charging on a grand scale. When this technology advances in the future, electric vehicles would not have to be concerned about power since they could be constantly receiving a charge. The projects Dr. Jaffe described have definitely inspired me to continue to pursue electrical engineering or similar STEM fields because it demonstrates how I could also improve the planet by developing clean energy sources and combating the fossil fuel energy crisis. Not only does this technology help our country, but it could also have a huge impact on how the future Navy and Marine Corps could operate and maintain an advantage over other countries that are still reliant on

nonrenewable energy sources. I really like the idea of having a career where I can work on new technology that not only helps our Navy but also can have applications to our country as a whole.

Looking at the future, the science and technology of autonomy will advance significantly over the next 15 to 20 years. In the year 2040, life as we know it will be drastically different. Fully electric self-driving cars, that can calculate and perform actions in a split second, will dominate roads and highways, and maybe even the airways. These vehicles will be effective, efficient, and ensure the safety of their passengers. Autonomous AI robots will be implemented in many job environments and will be more efficient than humans. These worker robots can perform many more dangerous tasks that wouldn't usually be possible by humans. Delivery drones will send packages to your doorstep and autonomous planes and boats will take you anywhere without needing a crew. This idea of autonomous vehicles will dramatically impact the future of the Navy and Marine Corps and will be a valuable asset for protecting lives. Humans are very valuable and shouldn't be taken for granted. Lives have always been in the balance when it comes to wars, but what if they weren't? The Navy of today mainly has aircraft, ships, and submarines that are piloted, manned, and sustained by people in them which can lead to many casualties of those on duty if they were to be attacked. However, in the future, this risk could be minimized by autonomous vehicles. These vehicles could be piloted from across the world or run totally autonomously without a remote human pilot, thus keeping those lives safe. AI and computers will have advanced exponentially by the year 2040 and will be able to react faster and smarter than any human in the world. Because of this, future AI controlled military vehicles could perform functions much greater than any human could and calculate the safest and most efficient outcome of a situation while also performing the action autonomously. In addition, these autonomous processes could be done in a fraction of a second, much faster than a captain determining the best course of action, informing the crew, and the crew performing the action. These future autonomous ships will be taken on long and dangerous missions without a concern for crew safety or morale because no crew is necessary. Since the future military vehicles will not need any people directly in or on them, the design of military vehicles can also be reimagined. For example, most modern ships contain a lot of empty space like rooms, corridors, and passageways. They need sleeping quarters, bathrooms, kitchens, and many facilities that are all required for humans to live and work in. Since people will not be necessary for future autonomous military vehicles, they can be much smaller, more compact, and more power efficient. More focus will be put on the means of transportation, hardware, and weaponry. Because of the decrease in size, the ships will be cheaper to make and will move faster on the water; hydrofoils could also be installed, because of the smaller hull of the ship, which can reduce drag when moving fast. Reconnaissance and research vessels are also an important aspect of the Navy. For these future vehicles, whether in the air, on land, on the water, or under the water, they will also be controlled by AI algorithms. However, instead of a standard aircraft, humvee, ship, or submarine design, these new vehicles could be optimized for their environment, which could be a totally different design such as being animal shaped. An example of this is a fish or dolphin shaped vessel, in which it can easily maneuver around or through obstacles that were previously impossible to navigate through with current designs. Instead of a rigid hull, these vessels could be flexible, durable, and can survive in extreme conditions. They could easily gather valuable scientific data or information on a target without drawing too much attention to itself and escape unscathed.

In summary, autonomy is the future of the Navy and Marine Corps by reimagining vehicle design, increasing efficiency and effectiveness, and by keeping lives safe. The numerous Navy research areas, including autonomy and AI, inspire me to continue to pursue a STEM career because of their impact and significance to the future. The scientists and engineers, like Dr. Paul Jaffe and the other Navy researchers that made the various STEM videos, demonstrate that we can follow our passions into a career environment and shape the world. The only things holding us back now are our persistence and imagination.