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An Aquatic Inspiration

In the near future, seal whiskers could be the foundation for energy efficiency in all of human technology. These aquatic facial bristles may not seem very significant, but the structure of seal whiskers provides new insight into advances for energy efficiency that could save the planet. Thanks to the marine biologists at the bio-inspired research and development lab for the U.S navy at Newport, Rhode Island, and with the help of mechanical engineering, biology, mathematics, and bio-mimicry, the distinct composition of a seal's whiskers can be applied to many different types of technology.

A seal's array of whiskers are comprised of a unique structure that allows it to track moving objects in the ocean by the microscopic water vibrations left from the objects. Each whisker is covered in wavy, miniscule bumps- much like a wind sock used at air fields to display wind direction. This design reduces the amount of vibrational noise of each whisker, allowing a smoother signal of the water disturbances from whisker to seal.

In order to further study and experiment with the structure of the whiskers, researchers in Newport used CT scanning, 3D modeling, and then 3D printing to precisely capture their shape. Next, those 3D printed whiskers are placed in flow tanks in order to understand how they flow in water. When smooth whiskers (whiskers reminiscent of a dog or cat) flowed against water, they created rotating vortices that peel off both sides of the whisker in alternating directions, expending suction on both sides of the whisker. This created lots of vibrational noise, preventing a clean signal between the water disturbances and the seal. However, when bumpy whiskers flowed against water (the actual seal whisker structure), the bumps broke up the rotating vortices, causing less vibrational noise to the whiskers and overall providing a much smoother signal to the seal. Due to this, a seal's whisker could be used as rough prototypes for whisker inspired sensors on boats, autonomous underwater vehicles, and even windmills.

Throughout this entire process of seal whisker observation, bio-mimicry, and technological application, many aspects of STEM research were needed. In order for researchers to have studied the structure of seal whiskers in the first place, systems and entities for oceangoing platforms needed to be designed and built; requiring computer science and mechanical engineering alike. These complicated processes need to account for many of nature's unpredictable factors like ocean pressure and temperature, salt corrosion, forward travel, and more. With the proper technology, whiskers from seals were able to be safely extracted and studied in a lab environment. In addition, to test the vibrational noise and efficiency of the whiskers, researchers then needed to design and 3D print a scaled up version of the whisker, something that requires thorough knowledge of math, bio-mimicry, and engineering.

Christin Murphy and researchers at the bio-inspired research and development lab for the U.S navy at Newport, Rhode Island inspire me to explore the STEM field because it's clear how dedicated and resourceful they are when it comes to marine biology and its surrounding areas. Christin's story about how pursuing her passion for marine biology at a young age is something that I hope to experience someday in the future, as I know how incredibly rewarding and fulfilling a life like that can be. Furthermore, their methodologies and processes for creating new bio-inspired technology observed from the ocean are extremely clever and inventive, and it encourages me to pursue a career that pushes to me explore the boundaries of what's capable in the world.

Looking to the future, the structure of seal whiskers can be applied to a wide variety of human technology- primarily in higher energy efficient renewable resources. For instance, scientists are

speculating whether or not changing the shape of the wind turbines in wind farms to mimic the structure of an array of seal whiskers- as seal whiskers are able to use their entire set of whiskers due to its unique composition. This is just one application, understanding the structure of seal whiskers can also be used in technology involving vibrational noise, wind reduction, and drag. While these changes might not seem significant, combined together they could revolutionize how much energy we can get out of certain resources- something that's incredibly valuable in a world that's rapidly changing due to pollution and climate change. Often, humans tend to forget about the world that we live in, forget about how amazing nature has come to benefit us and our existence. The more effort we put into energy conservation, marine biology, and the rest of the STEM field, the more likely we will be able to preserve the world that we take for granted too often.