

## Aidan Kenney

Every single animal in this world has uniquely evolved to face the challenge that is survival, and just because they aren't as evolved as humans in some areas doesn't mean we cannot learn from them. Such is the case with Dr. Christin Murphy and her research team, and everything they have learned about seal whiskers in the video titled Seal Whiskers. Through the fields of Biomimicry and Bio-inspired, Dr. Murphy and her research colleagues has found unique traits in seal whiskers and have applied the principles of these learning to increase the power output of windmills as well as increase the longevity of the windmills and anchoring systems for offshore farms. Dr. Murphy's work allows engineers and scientists to draw parallels to active engineering research and projects across many different fields.

Inspired by Dr. Murphy's work, I wondered what other pieces of modern technology took their inspiration from the struggles that mother nature overcame. The first thing I came across was how designs for fins (Strakes) on submarines and aircraft, as well as the blades on fans and windmills came from the tubercles on humpback whales. It was shocking to learn about the wide range of application that came from one single idea. The fins or strakes reduce the vibrations thereby reducing the fatigue on mechanical items. Bio-inspired technology can be traced back to the 1940's with the invention of the first swimming flippers, used for humans to swim faster while under water. These former technological advances came when humans studied fish, creating one of the first Bio-inspired, Biomimicry pieces of technology.

Upon further reflection, I recall the first time I visited a cold-weather climate, and being instructed to wear several layers of clothing to stay warm in the snow. At the time I didn't understand the benefit of layering-up, but I don't remember feeling too cold and enjoyed our hike. Nature naturally protects animals when the weather changes. Dogs, horses, bears, wolves and other animals naturally grow additional layers of fur in the fall season. These extra layers keep them warm and sustain them through the winter. Once spring approaches, the animals lose their winter coats so they don't overheat once the weather warms up and summer approaches. Dr Murphy explanation of animal science and nature caused me to think about applications for naval ships that have to traverse very cold waters of the far north and then redirect to the warm waters near the equator. Just like nature protected animals during changing season, I wondered how Naval Ships adjust to large temperature swings and stay mission ready? The follow-on research I did on this topic opened my aperture to the seriousness of this question. Ships routinely have to have scheduled maintenance, kind of like the cars we drive, but engineers and naval architects are very focused on metal fatigue; they have to ensure the ships are in top working condition.

I was very surprised to that Dr Murphy discussed energy efficiency as an area of her research related to marine biology and how that related to wind power. I attend school near a wind farm and an international airport. Dr Murphy's video about increasing sustainable power in the most effective manor really caught my attention. After seeing the windmills in the water tank, and learning how simple math equations can predict the amount of power generated by each windmill allows engineers to optimally space the windmills to generate the highest power, I became curious how windmills could be located close to airports. After more research, I learned that the windmills located near my school / airport

initially effected the international airport as the windmills changed the wind patterns and strength resulting in concerns for aircraft operations. To address these safety concerns, some of the windmills near the airport were relocated. Dr Murphy and her team developed the mathematical equations to predict the optimal location and spacing of windmills to maximize utilization.

I have always wondered why the united states doesn't utilize more wind power and this video helped me understand that wind energy, whether on land or at sea, is very complicated and could have adverse effects. I was also excited to see the different technical disciplines working with Dr Murphy. The teamwork and collaboration all of the scientists working together was very impressive. I can definitely see the benefit of cross-functional teams; why creatively is so important, and why working together is the only way to ensure a good idea doesn't have unintended consequences.

At the start of the video, I really could not understand why the Naval Research Center would have a video title Seal Whiskers, but now I appreciate the benefits to both the Navy as well as industry that these breakthrough technologies bring. I now realize how crucial these fields are to not just the Navy, but the whole world. If a submarine were to be just 10% more efficient, the applications for its crew are stunning e.g. the submarine could stay under water longer, move faster and use less fuel. I cant wait to study engineering in college, and as I narrow my list of college to apply to, I will be asking each school how they integrate with other engineering departments as well as other areas of study just like this video. In the next 20 years, I can only imagine the technological breakthroughs we will encounter. Rather than guess the secrets we might unlock, I prefer for them to be a part my scientific journey.