

Researchers look to nature for solving societal challenges

Nature has inspired many human innovations over the years. For example, Leonardo da Vinci was inspired by birds in flight when he sketched his idea for a “flying machine.” The Wright Brothers later brought this dream to life, guided by observations of pigeons.

The process of studying nature to engineer human solutions is called biomimicry, or biomimetics. In the 21st century, such biologically inspired solutions have become more and more appealing because they tend to be elegant, economical, efficient and environmentally friendly. Today, scientists and engineers are studying bat ears to improve sonar, gecko feet to make adhesives, and butterfly wings to create e-reader displays.

At Arizona State University, researchers have embarked on employing nature-inspired approaches for solving societal challenges. For example, scientists in the School of Life Sciences are learning how groups of people can make better decisions by studying social insects, namely ants (**Learn more**). They have also studied how groups of ants move large objects together successfully. To get a sense of the complexity of this task, imagine five or six people trying to move a large piece of furniture without being able to talk to each other! Understanding how ants manage this task can help engineers develop teams of robots that can work together in dangerous environments such as outer space, the deep ocean or the battlefield.

Researchers in ASU’s Center for Bioenergy and Photosynthesis are studying nature’s original clean-energy solution — photosynthesis. For millions of years, plants have combined sunlight, carbon dioxide and water to produce energy, leaving nothing more than oxygen as a byproduct. The ASU scientists are analyzing the biochemistry of photosynthesis in order to design new systems for harvesting solar energy and converting light into fuel.

The Biodesign Institute at ASU was specifically created to advance the



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vision of solving complex problems through bio-inspired innovations. Researchers working in this interdisciplinary institute are looking to nature to address challenges in human health, sustain-

ability and biosecurity.

Their approaches are creative and can sometimes seem counterintuitive. For example, a group of researchers is using a disease-causing microbe to improve human health. Salmonella is a bacterium that causes food poisoning when people eat contaminated eggs and poultry. It has evolved clever ways to survive in the digestive tract long enough to cause an infection. The ASU scientists have genetically engineered the microbe, neutralizing its ability to cause harm. Because Salmonella is so good at infiltrating the human body, they want to use it like a Trojan horse to deliver vaccines orally. This is useful in developing countries where storing and delivering injectable vaccines is difficult.

The future holds even more promising opportunities for us to learn from nature. In my own field, computer science and engineering, researchers are working to make computing devices and environments increasingly mimic human capabilities such as understanding subtle cues, learning and adapting to people and situations. Soon, we will see millions of nano-scale computing devices all around us and even in our bodies, working synergistically to accomplish complex tasks.

We still have a lot to learn from the natural world around and inside us.

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