

## **Title:** Nature Inspired Inventions

**Objective:** Identify and describe how inventions are inspired by nature

**Time:** 20 -30 minutes

**Materials Needed:** Classroom set of natural objects and inventions pictures (found at [jeffersfoundation.org](http://jeffersfoundation.org))

### **Activity**

**Theme:** Biomimicry

Topic: Nature and Inventions

Suggested Grade Level: 2-5

Indoors or Outdoors: Outdoors

## **Directions:**

1. Take class outside and observe one animal or plant. Name one structure of this organism and discuss how the function of this structure helps it survive. (i.e. seed-crushing bird beak, claws for clinging or climbing, animal tail for stabilizing, thorny plant for protection, maple seed shape for dispersal, turtle shell for protection, etc.) What is the purpose of the structure?
2. Brainstorm how this particular purpose/function could be used to solve a human need. Tell students that many inventors look to natural organisms and imitate their structures to create designs that solve human problems. This is called biomimicry.
3. Hand out one card (blank side up) to each student. Their task, when you say begin, is to find their match- one student has the natural object and another has the invention that was inspired by nature.
4. Partners sit together in circle and discuss the following points:
  - What structure on the organism inspired the invention?
  - What is the function of this structure for the organism?
  - What problem was solved by creating the invention?
5. Go around circle and each pair shows their matching pictures and answers the above questions.

## **Discussion Questions:**

1. What nature inspired invention do you find most interesting or most useful and why?
2. Why do inventors look to nature to solve problems?

## **Science and Engineering Practices:**

1. Asking questions (science) and defining problems (engineering); 6. Constructing explanations (science) and designing solutions (engineering).

## **Crosscutting Concepts:**

2. Cause and effect: mechanism and explanation; 6. Structure and function.

## **Disciplinary Core Ideas:**

Life Sciences: LS 1: From molecules to organisms: Structures and processes; Engineering, Technology, and the Applications of Science: ETS 1: Engineering Design; ETS 2: Links among Engineering, Technology, Science and Society.

## **Background Information:**

- Biomimicry is the science of imitating nature to create inventions or innovations. Bio = life and mimic = to imitate.
- Inventors observe how natural organisms solved problems and adapt to their environment and then use these lessons to make things that are useful to humans.

## **Additional Resources:**

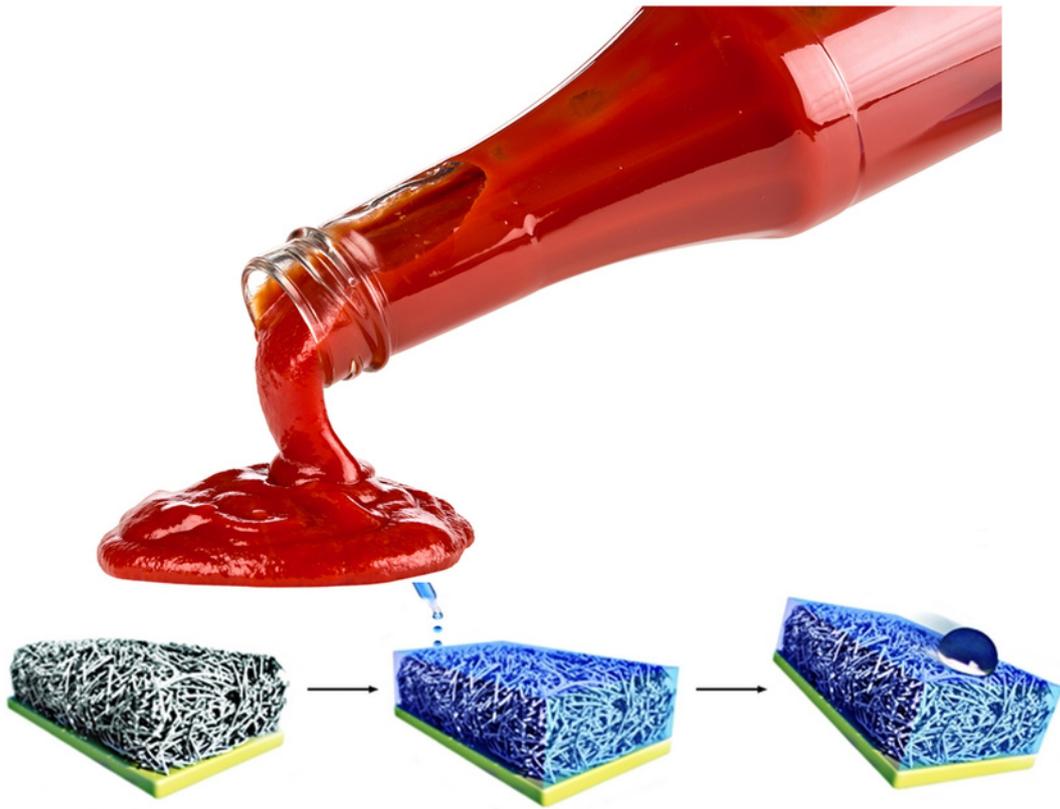
- *Nature Did It First* by Karen Ansberry
- *Biomimicry- Inventions Inspired by Nature* by Dora Lee
- *Nature's Energy* by Robin Koontz
- *Beastly Bionics* by Jennifer Swanson
- Biomimicry Institute <https://biomimicry.org>

## **Correlates with:**

Greeting - Fascinating Fasteners (p. 9)

Interdisciplinary Lesson - Make It from Nature (p. 103)

## KETCHUP BOTTLE

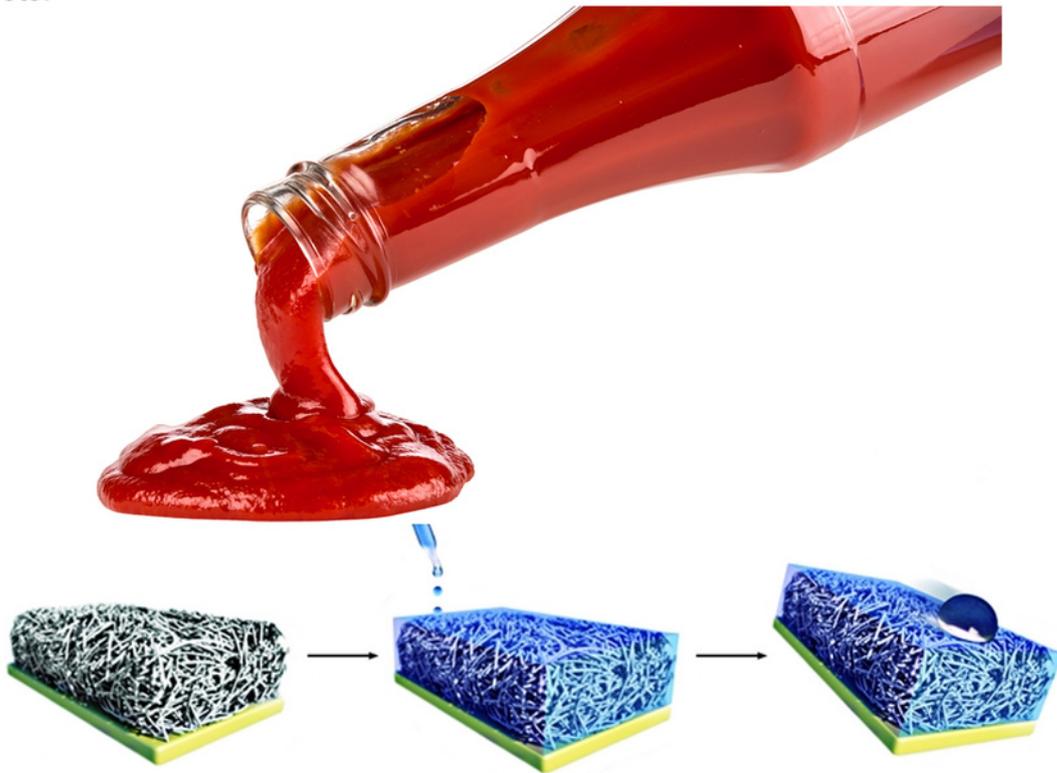


## PITCHER PLANT

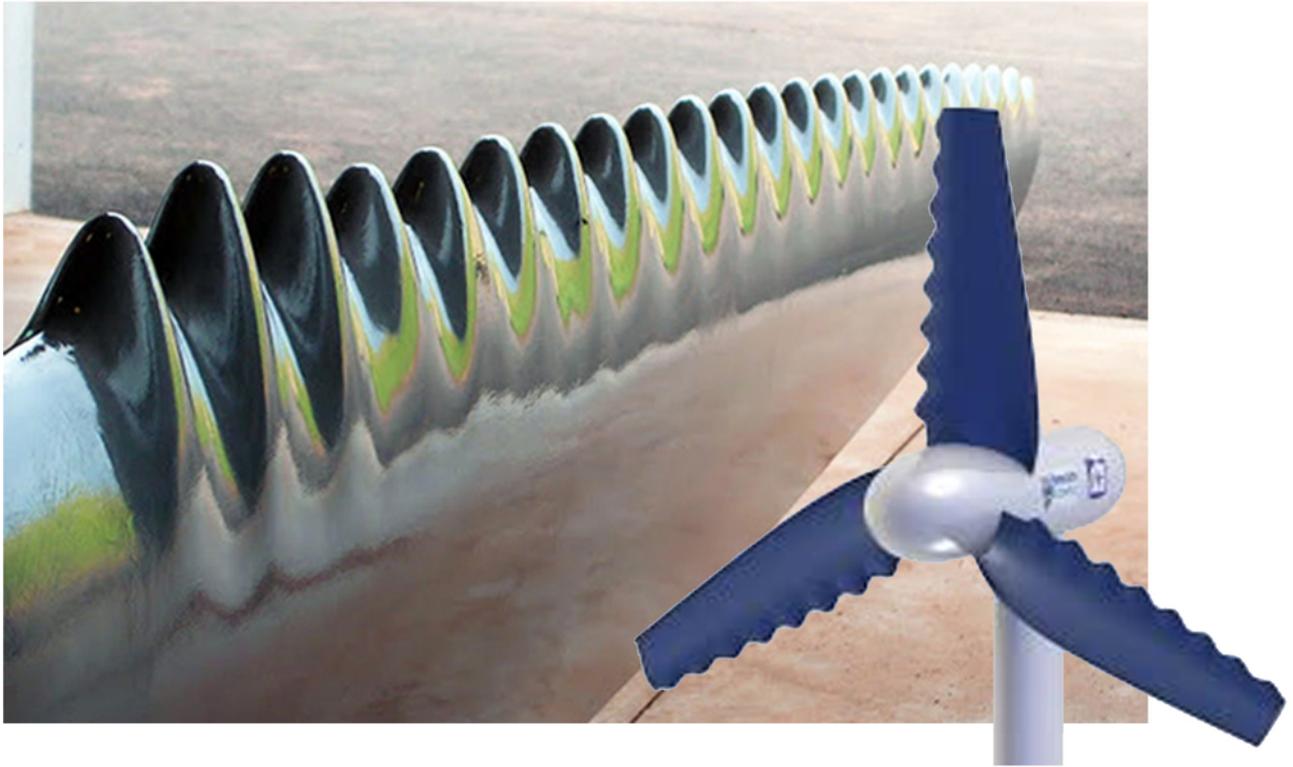


# 1. PITCHER PLANT - KETCHUP BOTTLE

Mimicking the slippery sides of the plant, the bottle helps ketchup slide right out. The inner surface of the leaf is very slippery so that insects cannot escape. The plant grows in areas with poor soil that does not have needed minerals, so a pitcher plant gets minerals from the bodies of the insects.



## WINDMILL BLADES



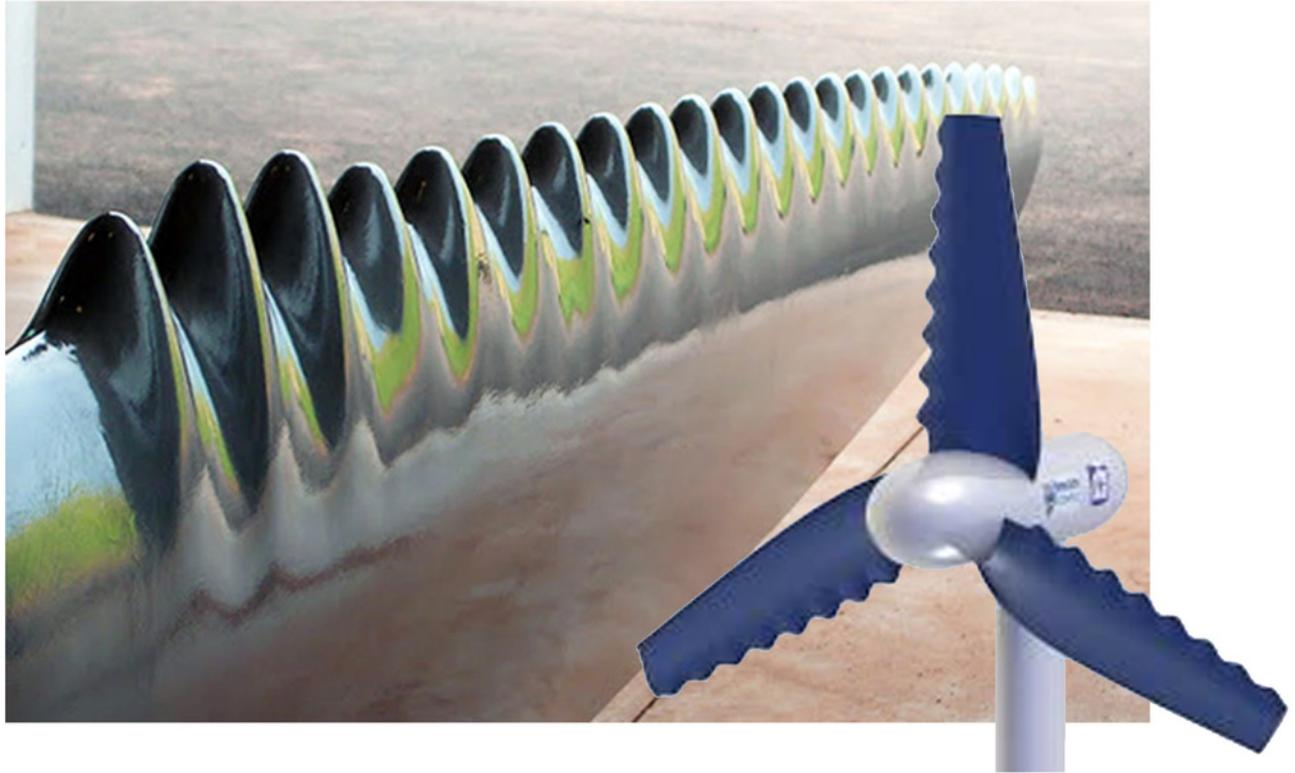
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## HUMPBACK WHALE



## 2. HUMPBACK WHALE - WINDMILL BLADES

Whale flippers push against water and windmill blades push against the air. The bumpy windmill blades that were invented copied the bumps found on the edges of the front flippers of a whale. The bumpy blades turn more smoothly in the wind.



## FIRE FIGHTING ROBOT



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## PILL BUGS



### 3. **PILL BUGS - FIRE FIGHTING ROBOT**

Pill bugs roll into balls for defense to protect their undersides from danger. The “pillbot” moves on six legs and carries water tanks and fire extinguishers. It can curl into a ball in a fire to protect the equipment inside.



## BULLET TRAIN



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## KINGFISHER BIRD

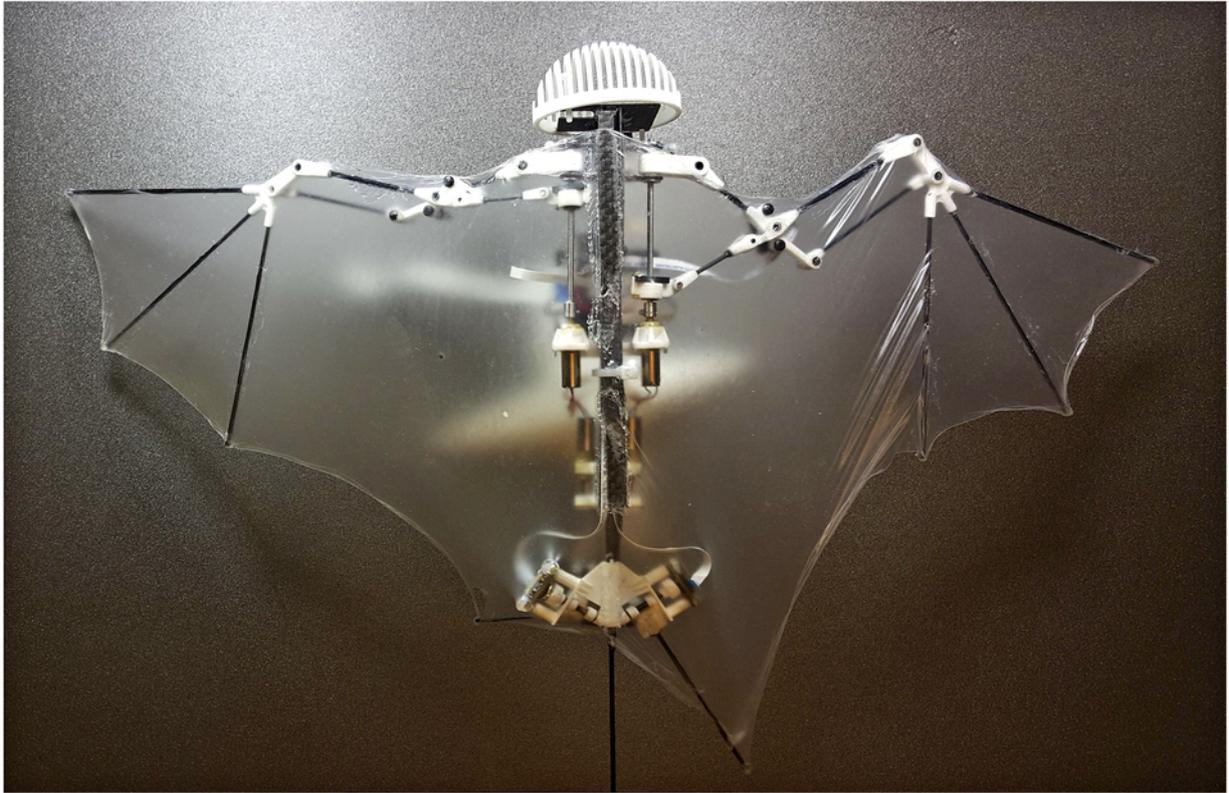


#### 4. **KINGFISHER BIRD - BULLET TRAIN**

A kingfisher's beak is streamlined so that when it dives into the water it barely makes a ripple. The first bullet trains had rounded noses which created loud booms when they sped out of a tunnel. The new pointed train nose, mimicked after kingfisher's beaks, slice through the air in tunnels without making the booms.



## ROBOT DELIVERER



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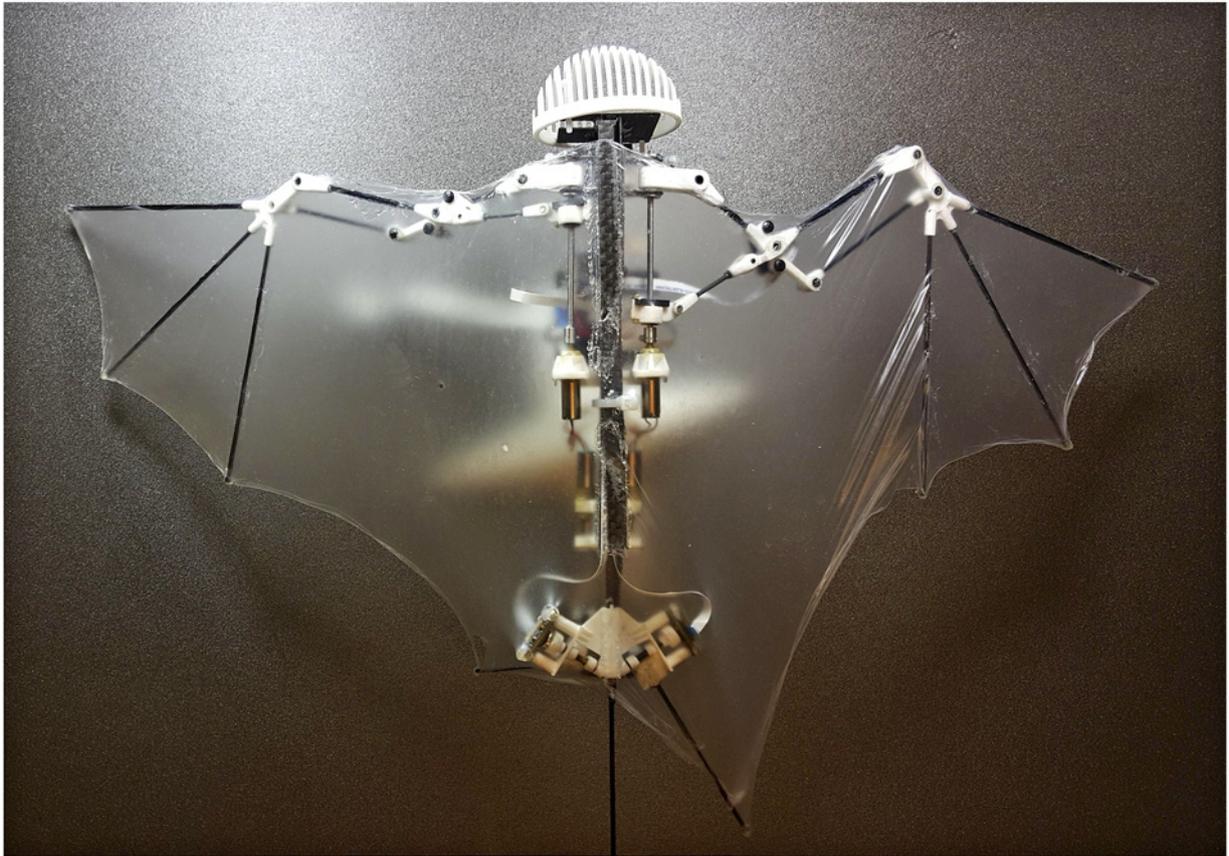
## BAT



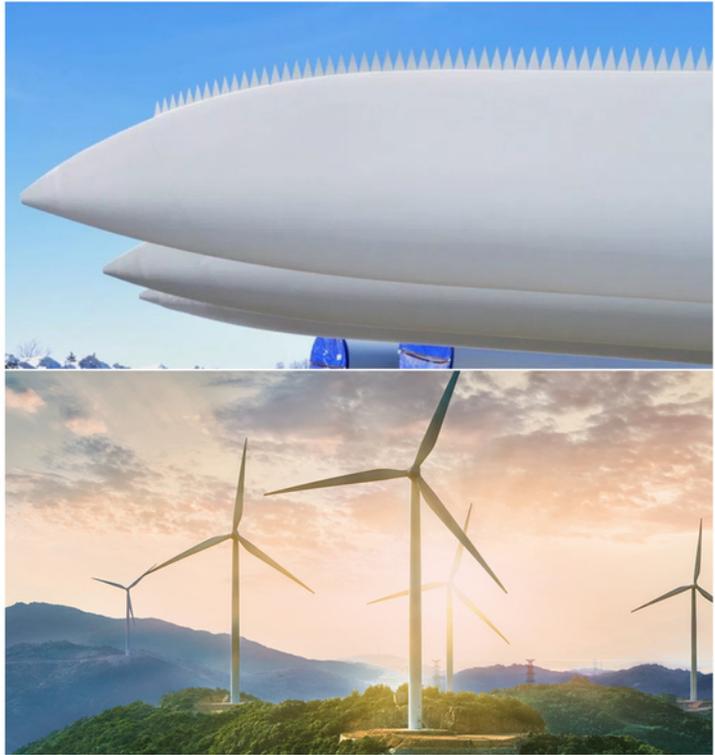
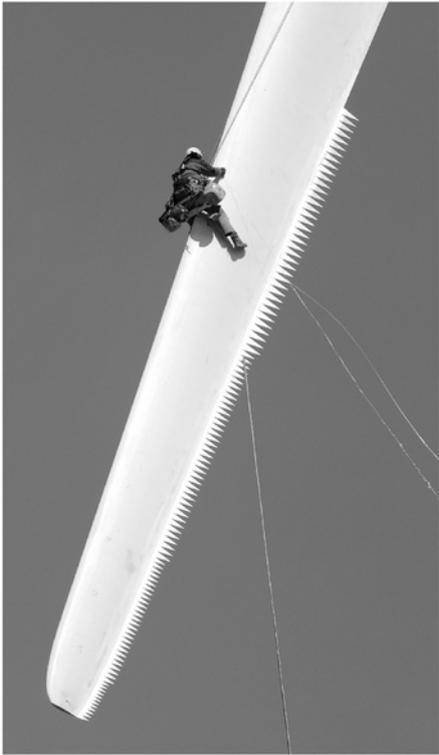
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## BAT - ROBOT DELIVERER

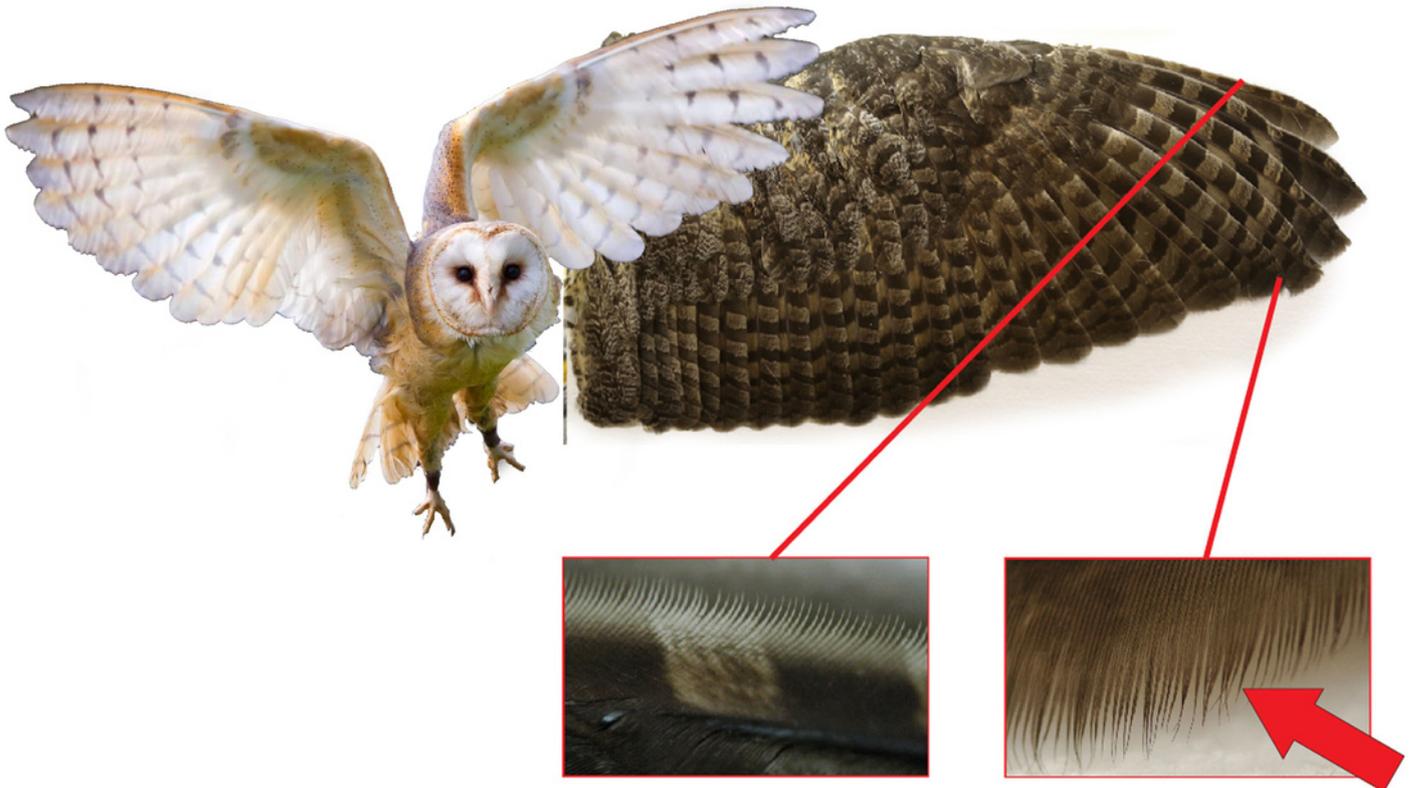
Bats fly noiselessly and the robotic bat (Bat Bot) was designed to fly quietly and quickly in hospital settings to carry supplies.



## WIND TURBINES

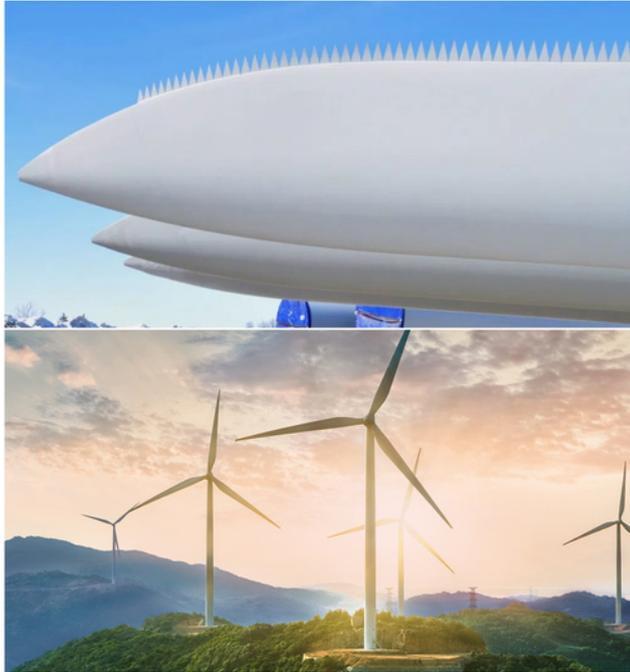


## OWL

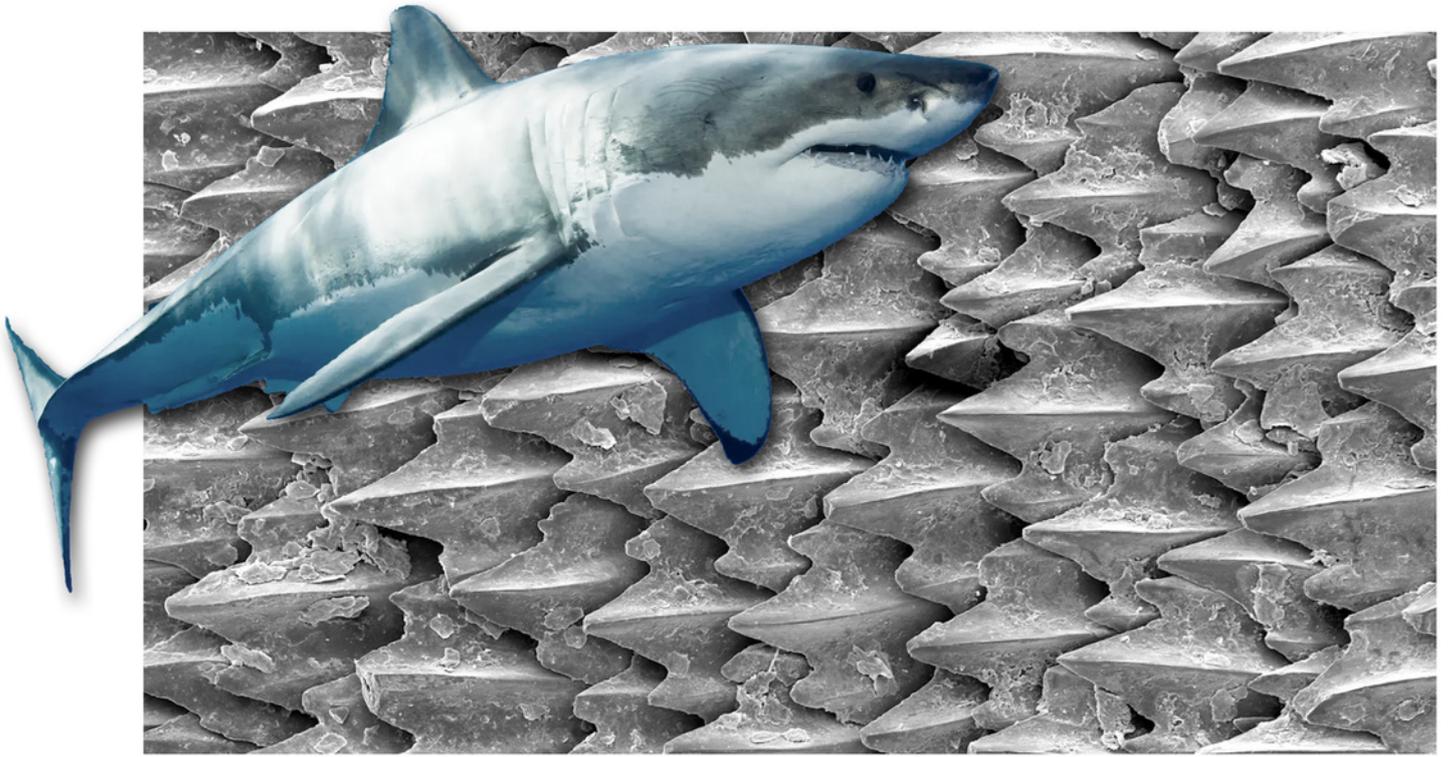


## 6. OWL - WIND TURBINES

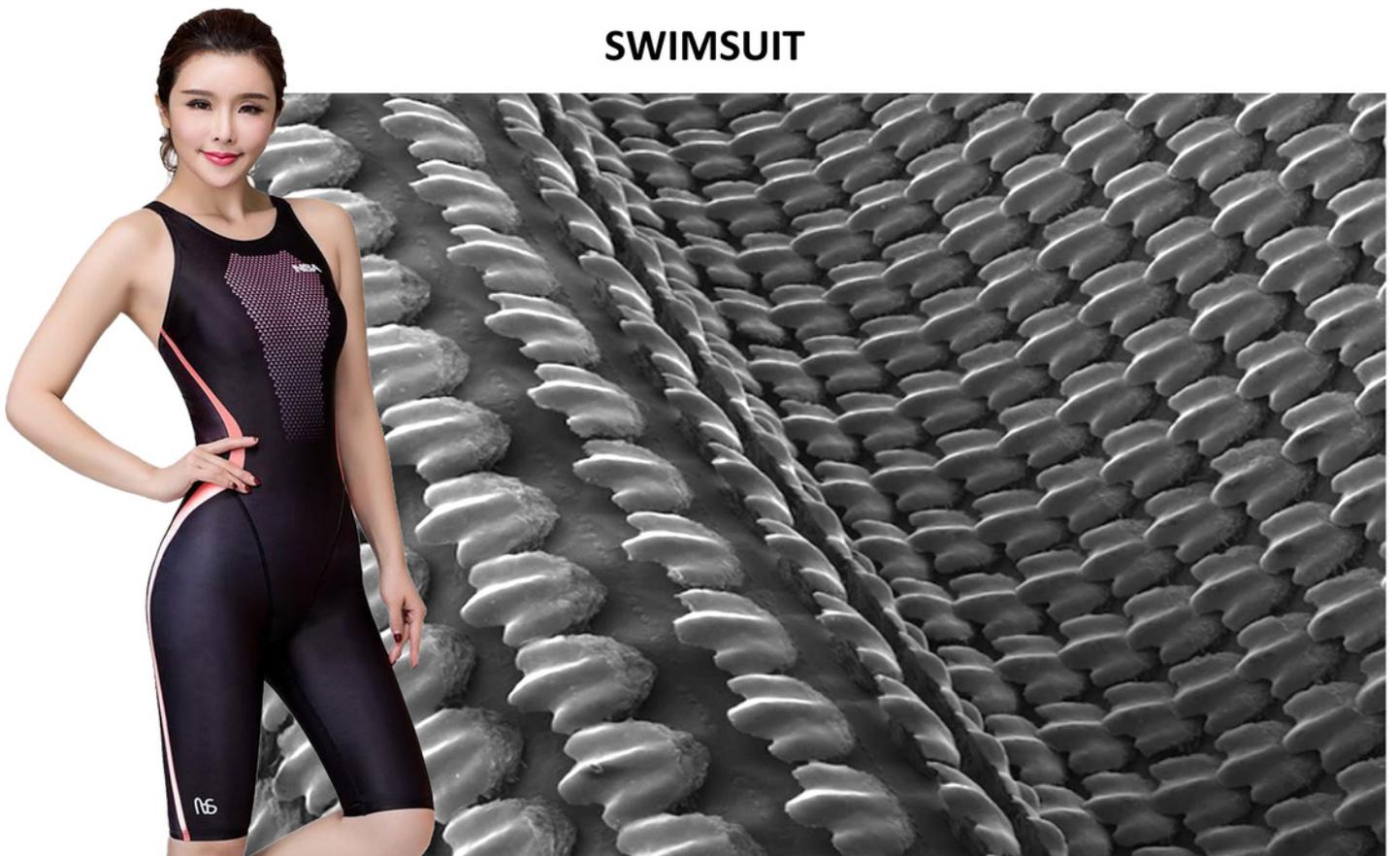
Owls fly silently through the night due to rough feathers on the edges of their wings which break up sound waves. Scientists copied this idea by putting fins on the turbine's huge fan blades so the blades could run more quickly and more quietly.



## SHARK



## SWIMSUIT

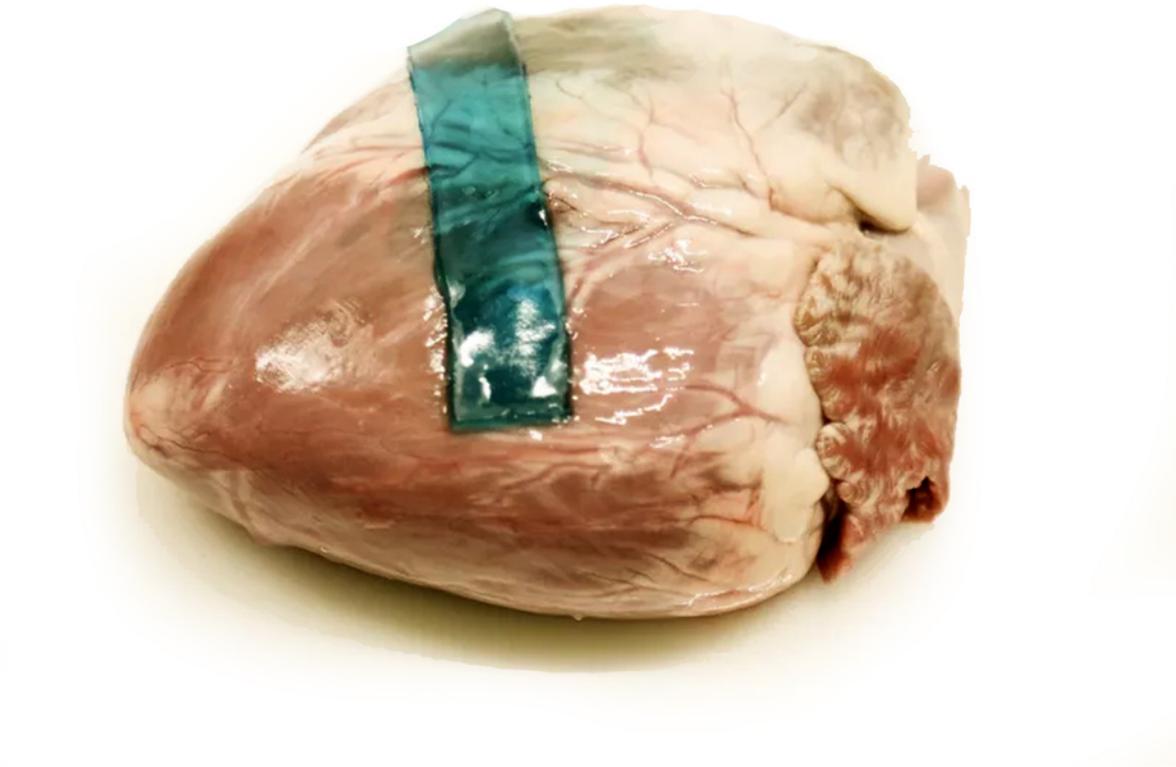


## 7. SHARK - SWIMSUIT

Sharkskin is made up of tiny overlapping scales (denticles) which break up the water as it flows over the skin, thus reducing drag in the water. Competitive swimsuits, in which tiny denticles were added, were inspired by shark skin.



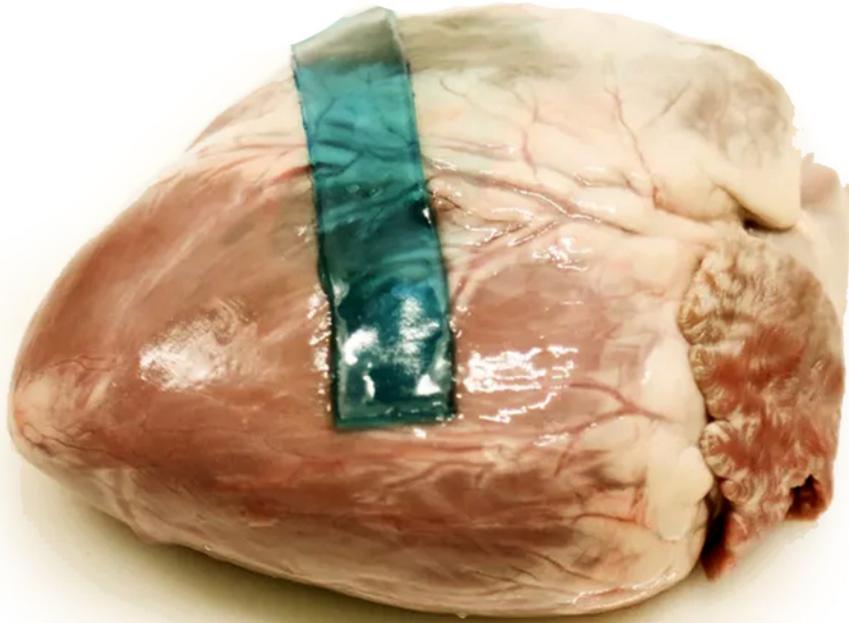
## SURGICAL GLUE



## SLUG



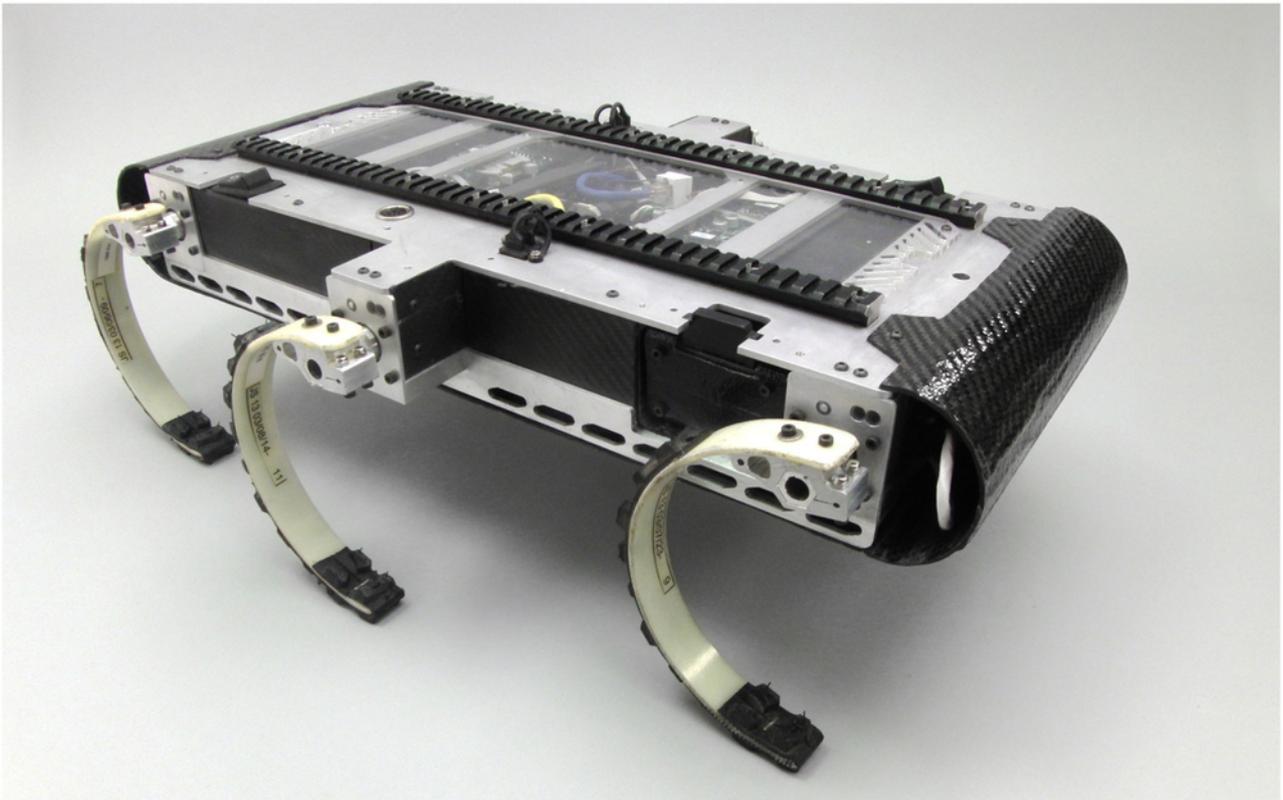
- 8. SLUG - SURGICAL GLUE**  
Slug slime grips tightly (allowing slugs to climb and to hold themselves down when a predator tries to pull it away), and the slime is flexible. Mimicking this, scientists made a bandage that was flexible and strong enough to stick to a pig's beating heart.



## GECKO

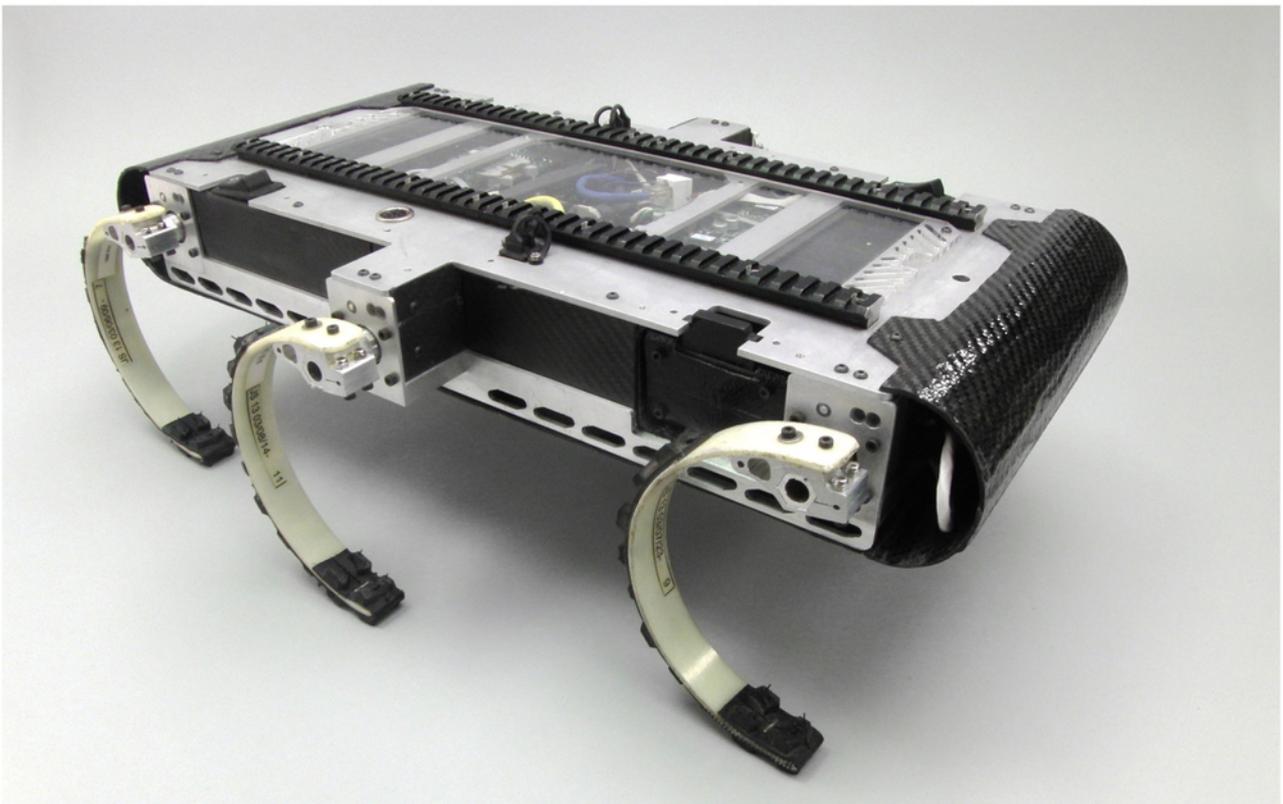
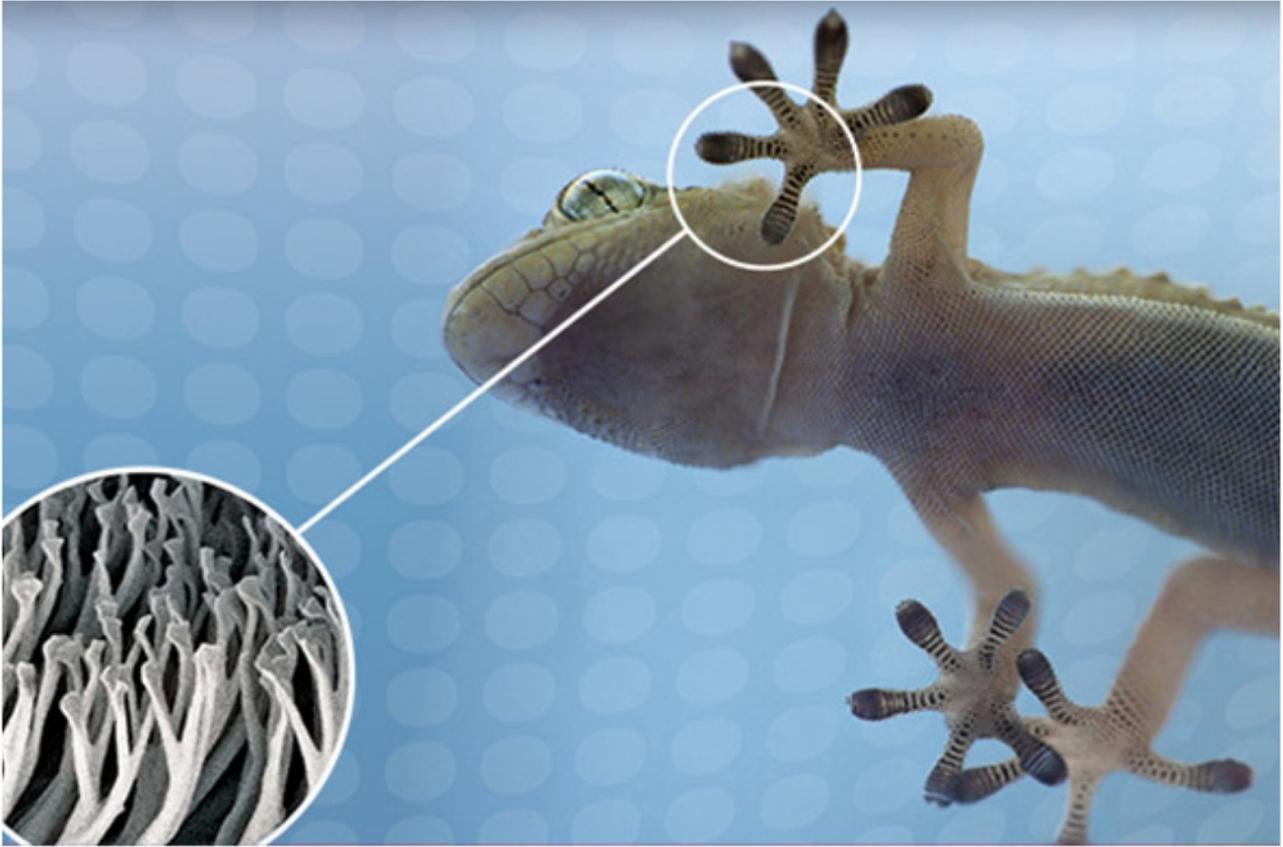


## MICRO ROBOTS

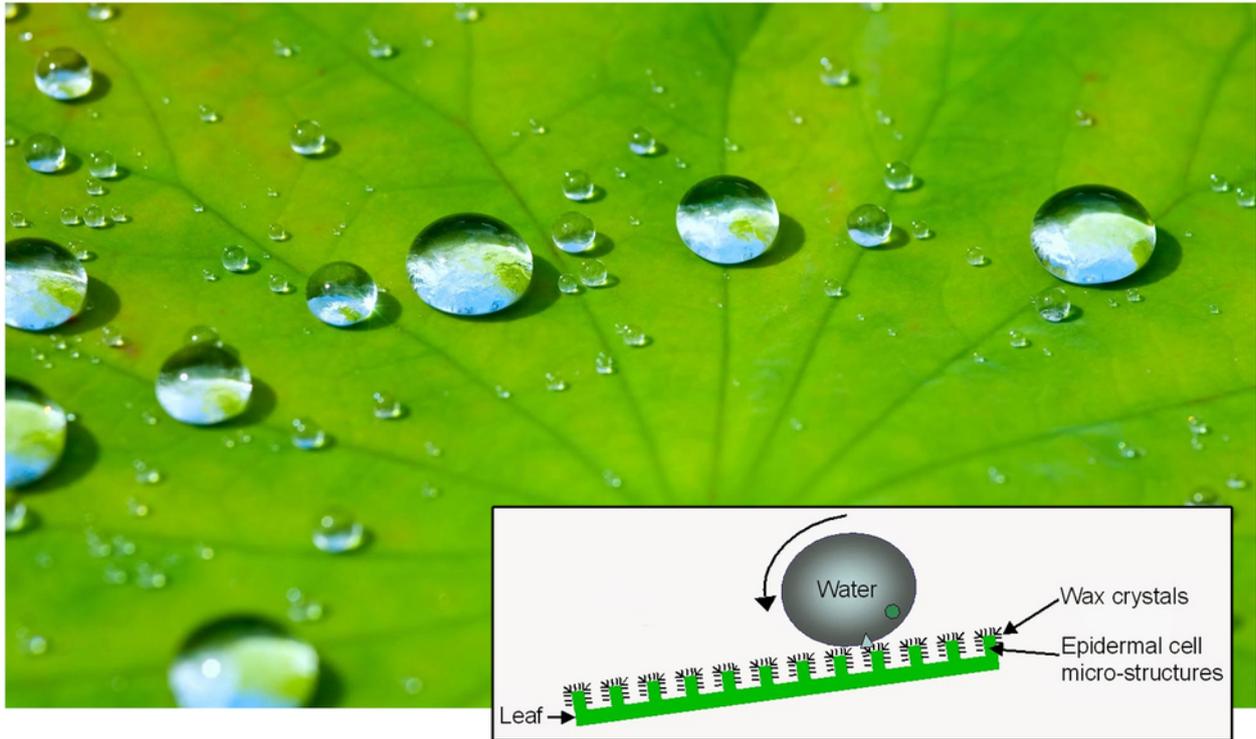


## 9. **GECKO - MICRO ROBOTS**

Tiny hairs on a gecko's feet allow it to stick anywhere. The gecko's sticky feet have inspired several inventions. NASA has sent gecko grippers to the international space station to see if they can hold things in environments with little gravity.



## LOTUS LEAF



## SELF-CLEANING PAINT



## 10. LOTUS LEAVES - SELF CLEANING PAINT

Lotus leaves are able to stay dry and clean because of microscopic bumps on its surface. Scientists mimicked the surface of this plant and developed a paint that repels water and dirt.



## FIREFLY/LIGHTNING BUG



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## GLOW STICKS



**11.**

## **FIREFLY/LIGHTNING BUG - GLOW STICKS**

These insects are bioluminescent which means they give off light through a chemical reaction on its body. Scientists were fascinated by this natural ability to produce light without heat and figured out the chemical substance that was needed to recreate it in glow sticks.



## BURRS



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## VELCRO



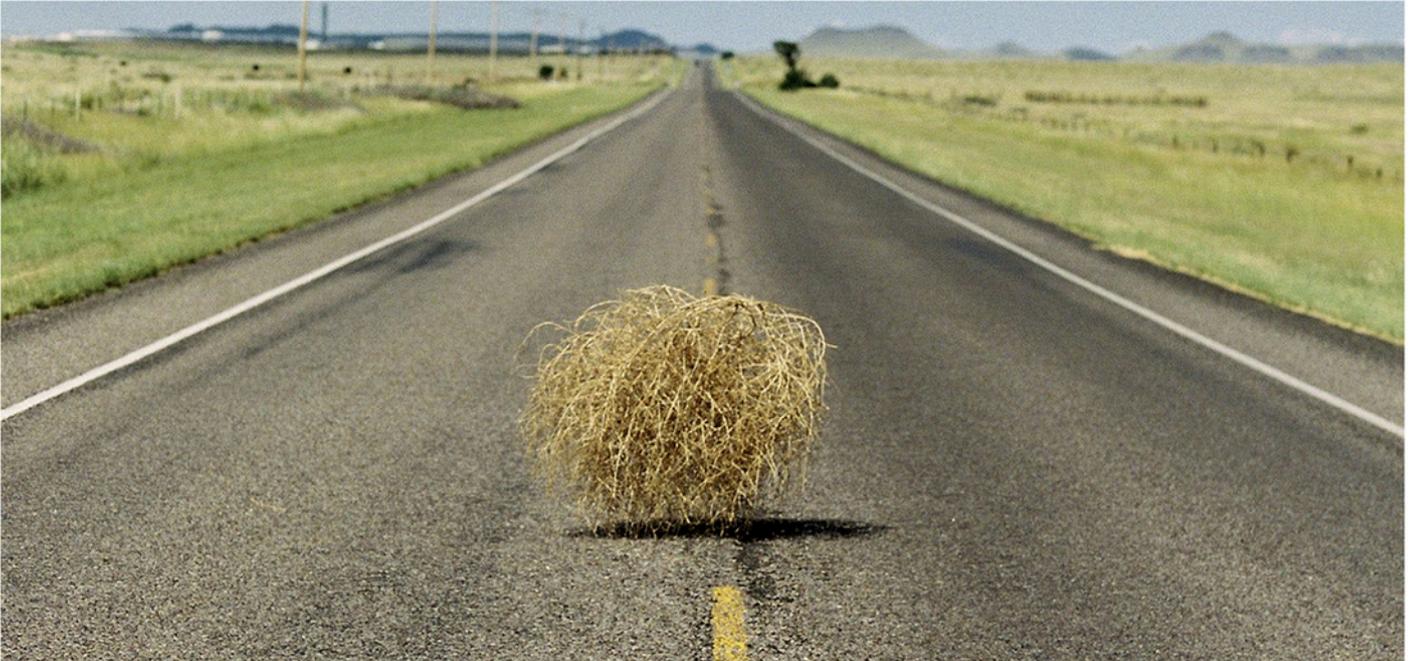
**12.**

## **BURRS - VELCRO**

Burrs have tiny, curved hooks on their ends which help them connect to fur and fabric. An engineer created a new way to fasten things, Velcro, based on this model in nature.



## TUMBLEWEED



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## PLANETARY ROVER



### 13. **TUMBLEWEED - PLANETARY ROVER**

A wind-driven planetary rover that maximizes drag was created from watching the movement of tumbleweeds.



## NAUTILUS SEA SHELL



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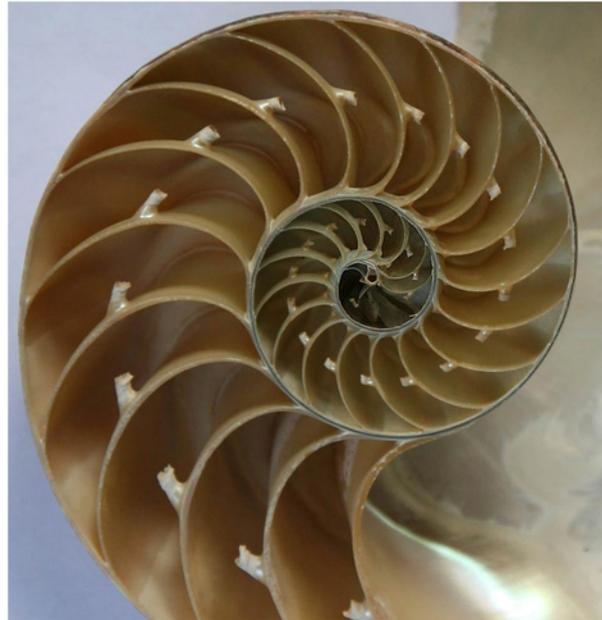
## BLOWER FAN



14.

### NAUTILUS SEA SHELL - BLOWER FAN

The shell's spiral structure (which moves water easily) led to a design of an efficient fan that moves air with the least amount of effort.



## ICE AXE



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## WOODPECKER



## 15. WOODPECKER - ICE AXE

Modeling the shape and angle of this ice ax after the woodpecker's beak, resulted in a more balanced swing and more efficient hammering effect.

