

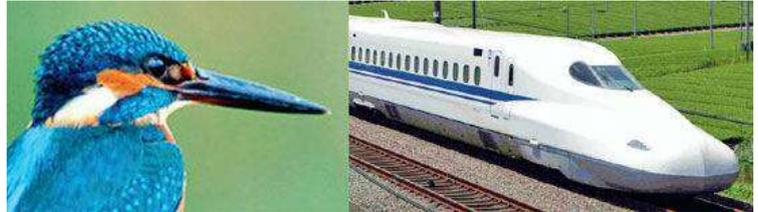
# 14 smart inventions inspired by nature

Bloomberg Aug 22, 2013

*Companies seeking breakthrough products tend to ignore the greatest invention machine in the universe: life's more than three-billion-year history of evolution by natural selection. By watching birds, dogs, sharks and other creatures of the wild, researchers and engineers have invented several new products that are inspired from these animals and their physical attributes.*

## Shinkansen Bullet Train

Eiji Nakatsu, an engineer at the Japanese rail company JR-West, took inspiration from the kingfisher, that creates barely a ripple when it darts into water in search of a meal. The train's redesigned nose — a 50-foot-long steel kingfisher beak — reduced power use and enabled faster speeds.



## Experimental Fish Car

Mercedes-Benz instead found inspiration for a car body (less its wheels) in the boxfish, a tropical species shaped sort of like a two-door compact. The fish's body turned out to be aerodynamically superb, and the resulting concept car has one of the most efficient shapes for a car of its size.



## A very fishy wind farm

Wind turbines take up a lot of land, their blades sweeping circles more than a football field in diameter. John Dabiri of Caltech built a wind farm where the location of turbines relative to each other take advantage of the air flow among them. Their placement was determined by studying the wake vortices produced by schools of swimming fish.



## Fin to the wind

A Humpback whale has a row of warty ridges, called tubercles, on the front edge of its fins. Frank Fish, a biology professor in Pennsylvania, discovered that by adding rows of similar bumps to turbine blades he could reduce drag and noise, increase speed to changing wind direction and boost the power harnessed by 20%.



## Firefly Lightbulbs

When insects of the genus *Photuris* light fires in their bellies, the radiance is amplified by their anatomy — sharp, jagged scales, according to research by scientists from Belgium, France and Canada. The scientists then built and laid a similar structure on a light-emitting diode (LED), which increased its brightness by 55%.



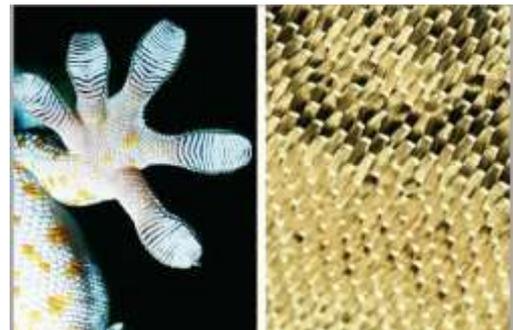
## 'Candy-coated Vaccines'

A process called anhydrobiosis protects a tardigrade's DNA, RNA and proteins. Laboratories have developed "a glassy film made of sugars," or "candy-coated vaccines." It keeps the virus effective for six months at temperatures up to 45 degrees celsius — helpful for vaccinating vulnerable populations in tropical countries.



## Gecko feet adhesives

The source of the gecko's grip is the microscopic hairs on the bottom of their toes. Scientists estimate that the bristled hair from a single gecko could carry about 113 kg. Researchers have developed Geckskin, an adhesive so strong that an index-card-size strip can hold up to 700 pounds. A form of gecko tape could replace sutures and staples in hospitals.



## Hive Mind Manages Grid

Individual bees can sense what job the colony needs done and sets at it instinctively. A problem with complex human infrastructure, such as the electrical grid, is that its components don't monitor the whole grid. Regen Energy creates a network and provides controllers for grids that communicate wirelessly with each other to maximise efficiency.



## Watercube

The swimming centre at the Beijing Olympics in 2008 was dubbed the Watercube. Its design is based on the structure of soap bubbles — both in form and function. Each bubble in the walls is made of rugged plastic. It traps hot air from the sun that is circulated to heat the pools. The plastic is resistant to damage from sunlight, weather and even dust.



## Spider web glass

Certain spiders protect their delicately crafted insect nets with a special silk rope that reflects ultraviolet rays. Birds can see the ultraviolet rays and recognise the webs as obstacles they should avoid. German engineers at Arnold Glas glazed their Ornilux-brand glass with a web-like pattern of ultraviolet-reflecting coating to save birds from high-speed accidents.



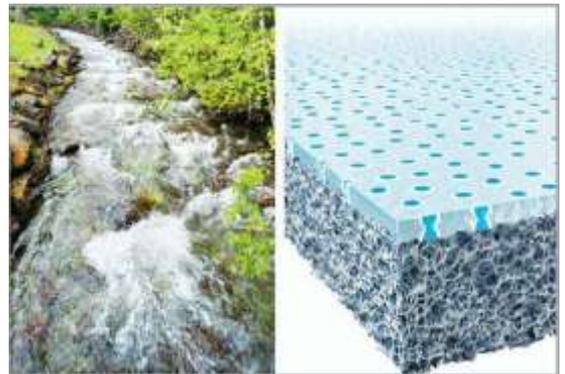
## Velcro

After a hunting trip in the Alps in 1941, Swiss engineer George de Mestral's dog was covered in burdock burrs. Mestral put one under his microscope and discovered a simple design of hooks that nimbly attached to fur and socks. After years of experimentation, he invented Velcro — and earned US Patent 2,717,437 in October 1952.



## Nature's water filter

The 2003 Nobel Prize was awarded in part to Peter Agre for his discovery of a membrane protein that allows water to pass through cell walls. Danish company Aquaporin has developed a new approach to seawater desalination that eschews the polymer layering of traditional industrial films for the energy efficiency of biological membranes.



## Vehicles don sharkskin

Sharks stay clear of algae thanks to their skin, which is covered with microscopic patterns called denticles. These patterns help reduce drag and keep micro-organisms from hitching free rides. NASA scientists copied the patterns to create drag-reducing patterns they call riblets. It helps planes, boats and windmills reduce drag and conserve energy.



## Harvesting Desert Fog

The Namibian Beetle raises its back into the air as fog rolls into its desert habitat. Bumps on its shell catch water droplets, which then run down chutes toward its mouth. A "Dew Bank Bottle," designed by Pak Kitae in Seoul, imitates the beetle's water collection system. Morning dew condenses on it and conveys it to a bottle, which has a drinking spout.

