

# The definition of biomimicry



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Product design inspired by nature simply means that designers look to the nature for answer when they were in process of designing it. The action of copying from nature is called biomimicry. Biomimicry is not an entirely new idea to humans. The hook and loop fastener or known as Velcro was invented in 1948 based on the bur plants. Biomimicry is important in product design because nature has the best solution whenever we came to a design problem. For example, for the wind resistance problem faced by Japanese bullet train, the front nose was remodelled to look like a kingfisher's beak. Biomimicry design spiral is a kind of tool that takes us through the process of identify, translate, observe, abstract, apply and evaluate before a design is being developed. There are many inventions in this world that were inspired by the nature. Flying squirrel wingsuit, formula one car, sharkskin swimsuit and drag-reduced propeller are the best examples. The nature is and will always be our mentor in product design. Therefore, it is our responsibility to preserve and protect the nature we have today.

## **Definition of biomimicry**

Biomimicry is a discipline that studies our nature's ideas, models and processes to take inspirations from to solve the design problems faced by humans. In the words of biomimicry, ' bios' means life while ' mimesis' means to mimic. Therefore, biomimicry simply means to imitate from nature. Biomimicry is not a new idea. Humans have always been turning to the nature to look for any answer to solve both complex and simple problems. Humans take the nature as their mentor and model. This is because the animals and plants found on the Earth nowadays have survived for ages. They have gone through several stages of evolution and changes in order to

survive in this planet. Therefore, their body structure and functionality are worth copying for. For example, without birds the Wright brothers will not be inspired to build an airplane that turns out to be one of the greatest invention of all time. In addition, Eiji Nakatsu, a railway engineer remodelled the front nose design of the bullet train in Japan which will reduce air resistance and uses 15% less electricity. He took the idea from the shape of the beak of kingfishers.

## **The significance of biomimicry in product design**

There are thousands of products being designed in every single day. What really matter is, do the products have the ability to cope with the environment and perform well. Humans are not brilliant in every way, sometimes we do need some help from the nature. Some of the flora and fauna had been on Earth long before the existence of human race. They are full of experience in coping with the nature in order to survive. Therefore, designers always mimic the design of some animals and plants. The product designs nowadays have become more and more sophisticated. Designers are hoping to decrease any possibility of disaster and waste of energy. This is where biomimicry will come in handy. The existence of biomimicry provides a rough idea to the designers of what the nature would probably do to solve problems faced. Therefore, the designers can make amendments to their designs to avoid any unwanted errors. Hence, it cannot be denied that biomimicry is playing an important role in product design.

## **Biomimicry design spiral**

<http://juliangaviriasanchez.files.wordpress.com/2011/02/biomimicry-design-spiral.jpg>

<https://assignbuster.com/the-definition-of-biomimicry/>

Biomimicry design spiral is a tool that scientists created that uses our nature as our mentor and role model to solve any complex and simple problems faced while in the creation of any products.

Identify: Instead of asking ourselves what we want to design, we need to identify what we want our designs to do for us. If not, we probably ended up designing something which is only an updated version of current existing products.

Translate: Take the nature's perspective into consideration. We need to know how nature carries out a certain function to tackle problem it faced.

Observe: Consults biologist or natural experts. Take their advices into consideration before we begin to develop something new.

Abstract: Find out the relationship between the nature and the product. We need to know whether the product can adapt to the environment where it meant to be once developed.

Apply: Apply all the knowledge and studies that had been made into the development of product. Designs a product based on the research.

Evaluate: Find out how does the design performs in nature. Can the design adapt to the environment?

## **Biomimicry applications in products design**

### **Animals**

#### **Falcon birds**

Peregrine falcons are one of the species of falcons and a widespread bird of prey in the family Falconidae. The Peregrine falcon is renowned for its speed, reaching over 322km/h during its characteristic hunting stoop (high speed dive), making it the fastest member of the animal kingdom. According to a National Geographic program, the highest measured speed of a Peregrine Falcon is even up to 389 km/h. Hence, engineers have studied the body shape of the birds and implement it into the design of Formula 1 racing cars. A Formula 1 car is a single-seat, open cockpit, open-wheel racing car with substantial front and rear wings, and an engine positioned behind the driver. Aerodynamics of the car play a vital role in determining the speed, safety and drag produced. Therefore, the aerodynamic designer has two primary concerns which is the creation of downforce to push the car onto the track, improve cornering forces and minimising the drag that slow the car down. So, the front nose of a Formula 1 racing car is inspired by the shape of the head of Peregrine falcon. The head of the birds is in streamlined shape which will reduce the drag produced when flying at high speed. Therefore, designers design the front nose of the racing cars to mimic the head of the birds which used to channel air flow to the back of the car. Hence, drag is reduced and the downforce is increased. Racing cars can be driven to a higher speed.

## **Flying squirrel**

**Flying squirrels are one of the 44 species of squirrels in the family of Sciuridae. Flying squirrels do not have wings and are not capable of powered flight like birds or bats. The loose folds of skin between the front and hind legs of these squirrels enable them to “fly” from trees to trees but what they actually do is glide through the air on the stretched surface of this loose skin. The direction and speed of the animal in midair is varied by changing the positions of its two arms and legs, largely controlled by small cartilaginous wrist bones. Therefore, man has used the body structure of the flying squirrel and created the flying squirrel suit.**

**Modern wingsuit are equipped with fabric attached between the legs and under the arms which will add surface area to the human body to enable a significant increase in lift. A wingsuit flight normally ends with a parachute opening. So a wingsuit can safely be flown from any point that provides sufficient altitude for flight and parachute deployment.**

## **Sharks**

**Sharks, also known as the nature's great predator are a group of carnivorous ocean going fish with 368 different species in a total of 30 families. Some species of shark, such as the great white, are infamous among humans because they have been involved in attacks resulting in severe injury and sometimes death. Most sharks have streamlined bodies designed for moving efficiently through the water. Many species have a projecting dorsal fin, and all have split caudal or rear fins. The shark can move very rapidly in search of prey. The shortfin mako shark, the fastest shark and one of the fastest fish, can burst at speeds up to 50 km/h. The reasons why sharks can swim fast in water are closely related to its skin. Seen under an electron microscope, sharkskin is made up of countless overlapping scales called dermal denticles. The denticles have grooves running down their length in alignment with water flow. These grooves disrupt the formation of eddies, or turbulent swirls of slower water and make the water to pass by faster. Therefore, the scientists replicate the dermal denticles and apply it on the racing swimsuit. Speedo's Fastskin line of high-tech, high-performance swimsuits were inspired by the shark skin's sandpaper-like texture is thought to reduce drag, hence its usefulness in swimming gear.**

**Plants**

**Bur**

**A bur is a seed or dry fruit in which the seeds bear hooks or teeth which attach themselves to the fur of passing animals or the clothing of people. The hooks or teeth are irritants and quite hard to remove from clothing, such as wool or cotton. The bur of burdock was the inspiration for hook and loop fastener (Velcro). Velcro was invented in 1948 by the Swiss electrical engineer George de Mestral. Hook-and-loop fasteners consist of two components which are two lineal fabric strips which are attached to the opposing surfaces to be fastened. The first component features tiny hooks while the second features even smaller and hair-like loops. When the two components are pressed together, the hooks catch in the loops and the two pieces fasten or bind temporarily. Velcro strips make a distinctive “ripping” sound when they are being separated. Because it is extremely easy to use, low chances of being spoilt and safe, the hook-and-loop fasteners have been used for just about every conceivable application where a temporary bond is required. It is especially popular as a shoe fastener for children who have not yet learned to tie shoelaces and for those who choose Velcro over laces.**

**Kelp**



**Kelps are large seaweeds belong to the brown algae in the order Laminariales. Kelp grows in underwater “ forests” known as the kelp forests in shallow oceans. There are several Pacific species of kelp which is a very important ingredient in Chinese, Japanese and Korean cuisines. Because of its high concentration of iodine, brown kelp has been used to treat the enlargement of the thyroid gland caused by a lack of iodine, known as goitre. Kelps have the very unique spiral shape which moves with the current rather than fighting against it. Therefore, they will not get swept away easily by rough current. This phenomenon inspired the design of drag-reduced propeller. A propeller is a type of fan that transmits power by converting rotational motion into thrust and normal seen installed at the back of vessel or boat. Propeller designed in spiral shape will has lesser drag when it spins in water. Hence, less energy is required to accelerate the water to the back of blade which in turns provides more forward thrust to the ship.**

**Tumbleweed**

**Tumbleweed is the above-ground part of any plants that once mature and dry or wilt. It will disengage from the root and tumble away in the wind. The tumbleweed is a norm in steppe and desert climates. The tumbleweed is a diaspore, which aids in the dispersal of seeds or spores. The tumbleweed is very light and round in shape. Therefore, it moves around and tumbles along to disperse seeds when the wind blows. Eventually, the tumbleweed comes to rest in a wet location, it opens as it absorbs water and then it dies. The characteristics of tumbleweed for being light and round in shape have inspired the NASA engineers to design a rover of the same concept. The rover is designed for any exploring missions in planet Mars. The rough terrain of Mars can be tackled using a wind-driven planetary rover. A wind-driven planetary rover design maximises drag and therefore it will be easy to manoeuvre around the planet.**

## **Conclusion**

**Every single thing created by God in this world existed for a reason. It just that some of things are still yet to be discovered by humans. As mentioned earlier, most of the designs in this world are inspired by the nature. Humans copy the design of some animals and plants to achieve success in their design. The nature is our teacher, our mentor and our role model. We always look to nature for answer whenever we faced obstacles. Hence, through biomimicry, the relationships between humans and nature grow closer than ever before. The continued existence of the nature depends on humans and vice versa. Therefore, we must appreciate and preserve what we have right now for the sake of our latter generations.**