

# Biomimicry

WHAT IS THE ROLE OF NATURE IN DESIGN?

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## The importance of Nature in general

Nature has always been an important aspect in the worlds of art and design. The first forms of art were literally about copying the

things that people saw in the nature, we have found human paintings on cave walls as early as 40,000 years ago. Nowadays, art and design have been through many years of changes, and the role of nature in them might not be as apparent as it was



Figure 1. Ancient cave paintings

before, but it definitely is still there. Nowadays the most common depictions of Nature are still lives of breathtaking scenes that can be found in various locations, most of them located in remote areas outside of the crowded cities.

Not only can the nature be depicted in pieces of art, it has also served as a source of inspiration for new product designs. Back in a time when technology wasn't as advanced as it is now, the early humans had to hunt for their food. The perks that wild animals have that make them vicious predators, able to hunt whatever they want, are something that are no longer part of the human body. Think of sharp claws, feral teeth, pure power and instincts that carnivore animals all possess.

The thing that humans did have was intelligence. Even though the humans were not as fast, as strong or as dangerous as other animals, they did survive by using their intelligence to give them other advantages. The key thing



Figure 2. Prehistoric man-made tools

they did was mimic the best parts of other animals by making it into useful tools that can aid them in their daily activities. The most widely known first auxiliary tools have been found from the Stone Age, a period of roughly 3.4 million years that ended some time between 6000 and 2000 before the common time. Some of the tools that you can see in *figure 2* share a remarkable resemblance with the sharp teeth of animals.

The aforementioned tools are the first known execution of *biomimicry*. Biomimicry is the act of imitating the highlights of Nature to solve the problems that we face as humans. It is a conjunction of two Ancient Greek words, *βίος* and *μίμησις*, which can be loosely translated into '*the imitation of life*'. The main idea behind this is that Nature has had billions of years to solve problems with the help of evolution, and the idea that Nature as a whole is as efficient as possible, virtually everything in nature can be used for or by something to keep the system going.

Not only actual designed products have been effected by Nature, it has also had a strong influence on a smaller scale; microbiology. The most widely recognized microbiologist is Alexander Fleming, who found that a moldy substance, *Penicillium Notatum*, had strong antibiotic characteristics. It was studying nature on a very small scale that has helped him find this multifunctional cure for a lot of bacteria, and aided the human race in yet again increasing the quality of life by using the nature to solve problems that they encounter.



Figure 3. *Penicillium Notatum*

## The importance of Nature in Design

Nature has early on solidified its place in science with biomimicry, that's for sure. The place it has in Art and design though was not that clearly defined until the early 16<sup>th</sup> century, when the overall interest in Art and design increased to levels that were unknown before. It was *Leonardo da Vinci* who gained quite a bit of inspiration by

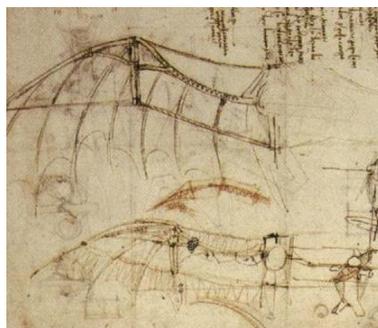


Figure 4. da Vinci's sketches

looking at the nature. Some of his most iconic works are his drawings of conceptual airplanes. The human race has always been fascinated by the idea of flying through the air, and it was da Vinci who made concrete models on how to accomplish this feat. The design that he made shows extreme similarities to the structure of the wings you can find on bats and birds. It should come as no surprise that most of da Vinci's inspiration was gained by taking a close look at how evolution has solved problems in the past.

As we're progressing as a society into the 21<sup>st</sup> century the needs of design change, currently one of the most important aspects of product design is the *sustainability*, the effect the new products have on the environment. Something that has grown huge over the past few years is finding ways to generate power without using up Earth's carbon reservoirs. Sun cells and wind turbines are the most notable examples of this. While these new technologies are already quite advanced, they are still being improved. The thing products like these need improvement on the most is efficiency, which is a nice coincidence, seeing as nature tries to solve everything as efficient as possible whilst producing as little waste as possible.

A company named WhalePower Corporation has also been experimenting with using nature's millions of years of field testing to their advantage. WhalePower Corp. are a company that create unique wind turbines with



Figure 5. WhalePower rotors

blades that were designed after the fins of a humpback whale. While doing research for a new, more efficient model of a wind turbine, WhalePower's president, Frank E. Fish, was studying the hydrodynamic properties of some of nature's largest animals, and found that the humpback whale's fins had some curious features; they had bumps at the front end. These special fins allow the whales to get more thrust out of their movement, which causes them to conserve energy.

WhalePower has mimicked these fins, and used them for their own wind turbines. The results? A 32 percent decrease in drag and an 8 percent increase in lift compared to the original shape. All of these factors allow the turbine to produce 20% more energy. All in all the entire project was a huge success, and yet again a brilliant example of how nature can provide us with the tools to make design better.

As you all know, nature is very complex. Over the course of millions of years solutions were found for countless problems. A lot of these problems were solved at a much smaller scale. Let's take a look at some examples of this. In the second half of the past millennium the industrial world was booming. New products were designed every day and the fashion scene changed drastically as well, all caused by the rise of machinery. Something some people have been struggling with for ages were shoelaces. It was no surprise that researchers have been trying to improve this concept for decades.

It was the 1940's when *George de Mestral* found a solution for this. He owned a dog, and whenever he took his dog out for a walk it would return with its fur covered in burr seeds. When he examined

this occurrence closer he found that the exterior of the seeds had something extraordinary; the outside of the seed was covered in long hooks that latched onto every animal that brushed past it. From an evolutionary perspective this makes a lot of sense, as the seed generally needs to be carried away from the original tree to provide more opportunities for survival.

George de Mestral began experimenting with this phenomenon, which led to the discovery of *Velcro*, a system that allows people to quickly stick multiple objects together and pull them apart again. Velcro is an easy to use, safe and maintenance free product that has shown its value over the years.



Figure 6. Burr seeds

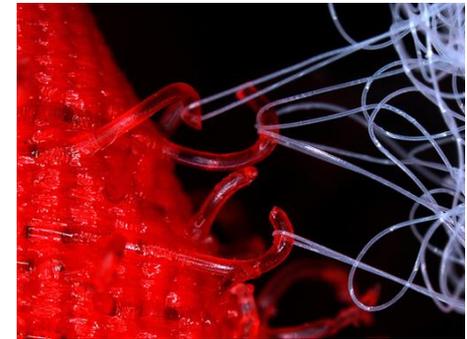


Figure 7. Velcro

## How Nature will affect Design in the future

The world as we know it started with nature. When mankind had evolved into a highly intelligent species, not only did we start to live in the nature, we started to think of ways to make it better, all to improve our living situation. Ever since mankind has been alive we have had the drive to describe the things we see in an artistic way.



Figure 8. Patterns in Nature

The earliest examples of this are wall paintings in prehistoric caves. By looking at nature you are able to see the solutions that it has found for problems because of the many years of evolution. If you look at a broader scale you could see evolution as a kind of user-testing, with many iterations, all done to improve the concept.

As evolution is an ongoing process we can still expect to see more highly advanced solutions to problems in the future. Another thing to consider is that we have not seen everything on the earth yet. Even though most of the world is considered to be known, there still are areas on this planet that have not been visited. Most of these places have extreme conditions, such as oceanic trenches, which might offer things we have never seen before that we can use in new technologies.

All in all I think it's fair to say that Nature has played a huge role in the world of art and design, and will continue to do so in the future. It has been a foundation for us to build on, and has shown us many things we can do to improve our lives. If you take a look at some of the most innovative ideas of the past hundreds of years you can see a very distinctive theme of nature, not only in art and design, but in technology as well. Technologies that could be used to provide even better product designs.

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