

Design Inspired by Nature

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The goal of this paper is to understand how nature has been a constant inspiration to design better from prehistoric times to the present. The focus will be on understanding the creative elements and principles of nature, biomimicry, symbols, and patterns from nature.

Executive Summary

Nature is both physical and conceptual, there are many levels within it which can act as bio-inspiration - from the molecules to the biosphere, elements of nature to the flora and fauna and, there are many things that are happening in nature, evolution, creation, destruction, adaption, recycling and many more. This paper is a research result of curiosity to understand how nature has been inspiring in designing better and how it can be applied in the visual communication practice, this research follows the inductive approach. Chapter 1 discusses in detail how nature's attributes have been inspiring in the evolution of design history. Chapter 2 is an understanding of the design principles and elements i.e. colour, shape, patterns textures and etc. in the context of nature's universal principles and elements. Chapter 3 explores the symbols of nature and how they are perceived. Chapter 4 discusses the biomimicry and questions the process of biomimicry. Chapter 5 concludes the research and is intended to propose a theory.

Key words: Nature, Bio-inspiration, Design principles

Table of Contents

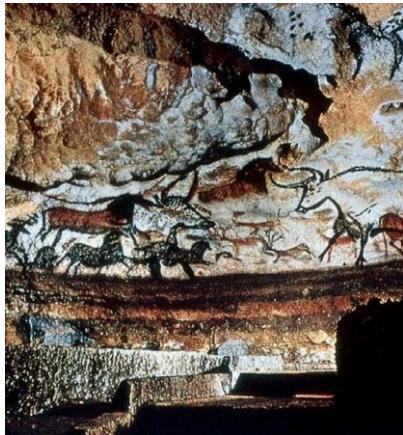
Chapter 1: Nature's Attributes in History of Design	5
Palaeolithic Age to Renaissance	5
Impressionism – Art Nouveau.....	7
Organic design style	8
Chapter 2: Principles and Elements of Nature.....	9
Universal principles.....	9
Shapes and forms	10
Circle.....	10
Triangle	11
Spiral	11
Patterns and textures.....	12
Colours	14
Brown.....	14
Green.....	14
Orange and yellow	15
Blue	15
Black	16
Chapter 3: Symbols of the Nature.....	17
Chapter 4: Bio-inspiration and Biomimicry	19
Chapter 5: Conclusion.....	20
Bibliography	21

Chapter 1: Nature's Attributes in History of Design

Palaeolithic Age to Renaissance

To understand the significance of nature on the design, it is necessary to look into history.

The upper Palaeolithic age of the man has emerged roughly 300,000 ago. Their primary objective was to survive, and mark-making was used to communicate visually and to record the events. It is evident that the man had painted the forms of animals to indicate the hunting scene if (Fig. 1-1) is explained closely. This can be considered as the starting point where the man had made the visual mark of the nature to express their idea. Moving into the Neolithic Era, the settlement era, masks and statues were dominant, (Fig 1-2) is a ceramic pot with a depiction of water waves on it and the form of the pot mimics a bird's nest. In the Bronze Age, civilization took a more prominent role and the monuments were made often symmetrical just like the composition of the leaves. Later, hieroglyphics (Fig 1-3) were used to keep the records and these symbols were mostly attributes from the nature. In the age of Idealism (900 BC – 450 AD) the architecture was made according to the golden ratio derived from the nature (Fig 1-4). A shift to depiction of religious figures and sculptures which were beautified with elements of nature. In the Renaissance, 1500 AD artist like Leonardo da Vinci illustrated the human form to understand our shells. Of all the pattern designers, in 1861, William Morris proved to be a brilliant two- dimensional pattern designer (Fig. 1-6). His work demonstrated close study of botany and drawing which were for wallpapers, textiles, carpets, tapestries (Meggs, 2006). Also, it is evident that the book publishers in past to present have been using a detailed art work bio-morphing the plants and leaves forms for an elegant look (Fig. 1-7).



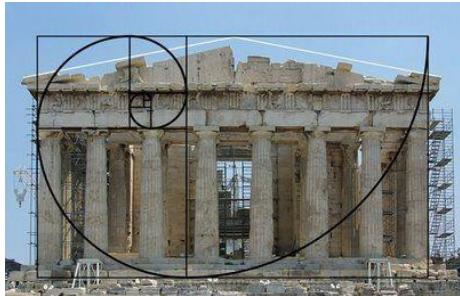
1-1 Cave painting from Lascaux –
Meggs' History of Graphic Design
design



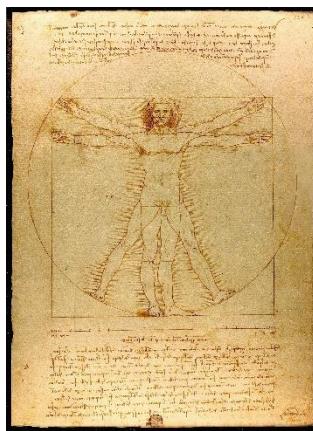
1-2 Pottery of Neolithic period -
Google arts & Culture



1-3 Egyptian hieroglyphs
- Meggs' History of Graphic
design



1-4 Parthenon Greece – Google.com



1-5 Leonardo da Vinci illustrated the human form



1-6 Morris, Rose fabric design
– Meggs' History of Graphic Design



1-7 Title page spread from Works of George
Charnock

Impressionism – Art Nouveau

Most of the paintings in the Impressionism movement were the impression taken from the nature to paint the landscapes and still life these, artworks from the nature were not much appreciated compared to the portraits and the religious art. Although, in that period it was the impressionist who have rendered the three dimensional nature to two dimensional (Fig. 1-8).

In the late 1800's the thought that art shouldn't be taught as studied as science or math has raised the Art Nouveau movement. The artist decorated the paintings with flowing organic lines of flowers and leaves. The colours and the form of the nature illustrations where picked from the biologist books, which were like a references. The art in this period was not just limited to paintings but to the architecture, sculptures and graphics. This movement with the organic structures has an impact in today's world too.



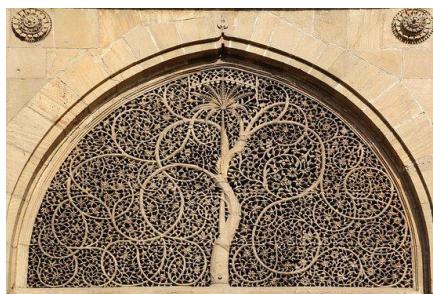
1-8 *Impression, Sunrise* – Wikipedia



1-9 Art Nouveau Armchair – Google Arts & Cultures



1-10 Art Nouveau Wallpaper – Google Images



1-11 Sidi Saiyyed Mosque's architecture



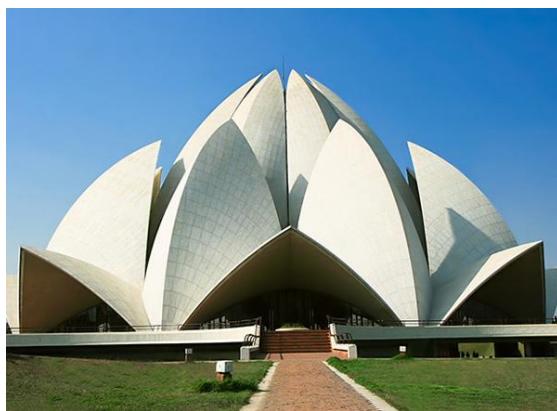
1-12 IIM Ahmedabad logo

Organic design style

The Organic design style began in the end of 20th century stands out from many other art movements because its purpose was to promote the harmony of man and his environment. It makes a real effort to integrate humanity with nature, so both can live side-by-side without disturbing the other. The organic design style started as organic architecture, by Frank Lloyd Wright and this style was not only applied to architecture but to other fields such as product design. The question to ponder here is - Is it relevant in today's time to maintain the harmony of humans and nature through design and, how can it be implemented in visual communication practice?



I-13 Ross Lovegrove Bone Chair
- Google Images



I-14 Lotus Temple Delhi

Chapter 2: Principles and Elements of Nature

“Principles that drive equilibrium in nature's design also power human design.”

— Maggie Macnab, Design by Nature

Nature has an evolutionary history for a billion years. Observing and interpreting nature can help us gain principles from it. Human creativity is influenced by a wide variety of factors, nature can act as one of the factors to understand and comprehend the design principles. The term ‘nature’ here refers to the phenomena of the physical world collectively, including plants, animals, the landscape, and other features and products of the earth, as opposed to humans or human creations¹.

Universal principles

A green leaf with veins flowing through it might seem to be beautiful, but it takes that form for its purpose. It is essential to understand the process of nature to understand the form. In this process of observing and appreciating nature, I have acquired the following principles which might have already existed. However, it has helped me to understand the significance of the principles and inspired to implement them in practice.

- Nature’s forms are related to their function – Any object in nature takes a particular structure for its purpose to follow the process. Similarly, our designed form should serve a purpose, and it is necessary to give attention to this irrespective of the aesthetics.
- Nature is calm – Nature blends seamlessly with our everyday tasks. Likewise, it's time that our design should communicate the needed information by taking the smallest attention.

¹ Google Dictionary, s.v. “Nature”, accessed October 20, 2019.

- Nature is universal – Nature is universal and is accessible to everyone irrespective of their ability and region, comparably it is required to design universal that is accepted and is useable by all.
- Nature uses only the energy it needs – The strength of the design is to use only the attributes that make the design sustain.
- Nature is recyclable – Nature teaches us to be sustainable. Our aim should be to design to reduce negative impacts on the environment and at the same time, improve lives.
- Nature is collaborative – In a design that requires the collaboration of different disciplinarians, nature is a piece of evidence that collaboration yields the best results.
- Nature taps the limits of innovation – Most of the complex problems can be solved by understanding nature and its process.

Shapes and forms

Shapes give depth and dimension to our thoughts and they are used to communicate the information in an easier way. Every design consists of different shapes that communicate different message. Similarly, each shape in nature inherit a quality in it, which takes that form for a particular purpose. The basic shapes from the nature – circle, triangle, and spiral are universally used in design. The following meanings are derived by observing the nature -

Circle

The circle shape of the sun represents the energy within (Fig 2-1), the circle shape of the earth represents the wholeness (Fig 2-1), and with the shape of the eyeball, it can be a symbol of imagination and vision (Fig 2-3).



2-1 Sun representing the power within 2-1 Earth representing the wholeness 2-3 Eye ball representing the vision
- Google Images

Triangle

Mountains are one of the first examples of nature obtaining triangle shape. These mountains give a vision of strength and togetherness as mentioned in the figures (Fig. 2-4 and Fig2.5).



2-4 Mountains representing the strength
-Google Images



2-5 Birds flying in triangle shape representing togetherness

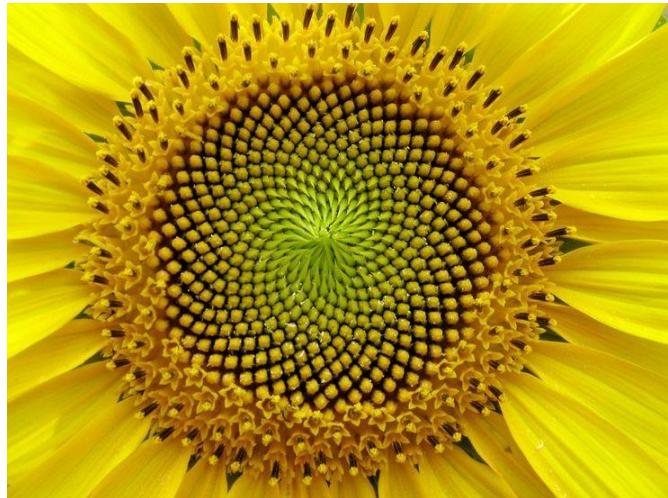
Spiral

The spiral shape is the nature represents continuity and recursive as shown in the (Fig. 2-6). Also, the golden ratio is derived from nature forming the perfect composition that any design from science to design can follow. The golden ratio is the sides of the rectangle which when a square is cut off, the rest of the rectangle has same proportion of the original rectangle. The value of this ratio is Phi calculated as 1.618 considered as nature's perfect number. In nature,

golden ratio proves that beauty lies in symmetric and balance of the design. Here the question is – How humans collectively have an emotional connection towards shapes of the nature?



2-6 Spiral shape represents continuity
– Google Images



2-7 Golden ratio in nature

Patterns and textures

Every design is self-contained of a pattern that adds additional purpose to the design. Nature has countless patterns that one can get inspired from. These patterns can be explained differently in mathematics, physics and chemistry. There have been many theories derived from nature, the golden ratio is one such theory which is discussed in the following chapter. The patterns in the nature are majorly classified into symmetry, trees, fractals, spiral, flow, waves, bubbles, foam, cracks spots and stripes and these patterns are well composed and striking (Fig. 2-8). The following is an example of Starbucks logo (Fig. 2-9) to examine the pattern - the flow pattern of the waterfall and the composition of the fish tail as hands makes the logo perfect with equilibrium. Taking it further, it is necessary to examine the patterns in the nature and application of it, to create equilibrium in the design. Similar to the patterns in nature, the textures adds depth to the design, the human creative brain has the ability to preserve and feel the two dimensional object and textures similar to the three dimensional

surface. For example – considering the Minute maid pulpy juice, the bottle is mimicked with the texture of real orange fruit, which makes the consumer to trust that the pulp used is indigenous. In the (Fig.2-10) the signifier is the texture of the orange fruit and it is signified that the notion the pulp is original. There are many examples in our everyday life that are biomimicked from the natural textures that will have an impact on the users – From plastic flower pots to mobile back case covers (Fig. 2-11). It is interesting to know the experience and impact on the consumer with these textures used on the products.



2-8 Patterns from the nature



2-9 Examining the Starbucks logo



2-10 Signifier and signified of Minute maid



2-11 Mobile cases with natural textures – Google Images

Colours

Why are colours differentiated as warm and cool colours? To answer this question it is important to understand the nature and its colours. Colour gives meaning to the design, they change the mood of the person. To understand the often used term – warm and cool colour the following experiment is conducted with the hypotheses – The light and temperature decide the categories of the colour. Here the light is the natural agent that helps to see and the temperature is the degree of the heat.

Brown

From the following (Fig 2-14) the colour brown is considered as warm and dry colour because of the high temperature.



2-12 warm colour of the mountains

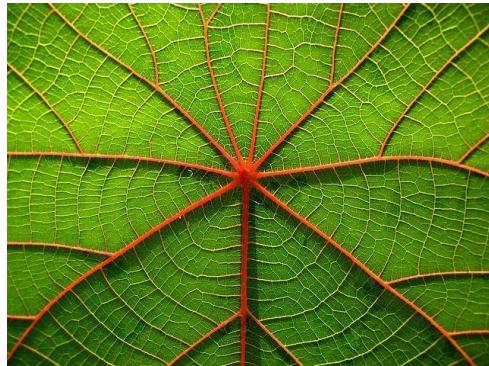
2-13 Sand in the desert



2-14 Dried plants

Green

The colour green in the nature can be considered as warm and refreshing colour, this notion of considering green as refreshing might be the effect of the green pigment in leaves and their very nature of fresh feeling (Fig 2-15, 2-16)



2-15 Green leaf with organ vein
– Google Images

2-16 A green bug as example of warm colour

Orange and yellow

The colours orange and yellow are bright and this can be seen as sun light and sunset they create a warm and pleasant feeling (Fig 2-17).



2-17 Sunset as an example of warm colour – Google Images

Blue

The colour of the water and the colour of coldness is considered to be warm because of its cold temperature.



2-18 Blue colour of the ocean is considered as cool – Google Images

Black

The temperature gradually drops down in the night and also the colour of the sky black is considered to be a cool colour.



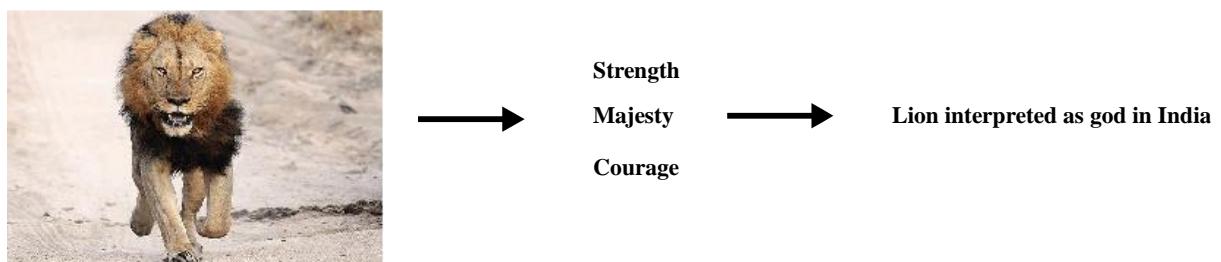
2-19 colour of night sky - Pintrest

The question to ponder here is – Does the persuasion of the colour change with the change of the season.

Chapter 3: Symbols of the Nature

In the pre-historic time, the human communicated visually by drawing the natures elements such as bulls and other animals to explain the hunting and sun and fire to explain its nature.

Moving on these symbols of nature were the only means of communication and the alphabets are derived from these symbols. Later, each of these symbols from the nature had a meaning and this meaning differed with the socio-culture influence. For example the Lion is the signifier and the signified message is the strength and is interpreted by different cultures as symbol of power and god (Fig. 3-1). There are plenty of nature's symbols used in the design community which have a particular meaning associated with them.



3-1 Lion as signifier - Google Images

In many advertisements the consumers are attracted with the help of nature's attributes used in it. For example, consider the advertisement of Halls – to convey the message that the new halls is all cool and mint flavour, a polar bear in snow is used. It instinctively makes the person watching it understand and feel the coolness of it (Fig. 3-2)



3-2 Halls Ad - google Images

The new means of communication is the instant message technology, the emoji - ideograms have become the new alphabets of this age. In (Fig. 3-3) the signifier is the volcano and it signifies that it's busted or erupting or breaking out. Thus, this emoji is interpreted as mind blowing or stunned or explode mind.



3-3Exploded mind emoji

The question raises - How the symbols in today's world resonate at the spontaneous level, is it because of nature's symbol and their meanings?

Chapter 4: Bio-inspiration and Biomimicry

Nature has been a constant inspiration, there have been many terms used to describe the process and products made with the help of nature as an inspiration. The term bio here refers to biological structures or processes, the design that inspired only from the form of is it called as biomorphic where the mimicking of the nature is called as biomimicry. This inspiration is not only limited to the design but nature has been helping the humans by giving inputs in different fields like politics and social behaviour. To elaborate this, let's take the example of the ants, if closely observed the way the ants communicate and the way they are leading to achieve their goal can inspire one to understand and learn from this. There are various examples of biomimicry such as the aeroplanes inspired from the bird wings, and the bullet trains in Japan mimicking the shape of it to control the sound and speed and etc. The materials, devices and structures developed with nature as inspiration, are considered to be sustainable and self-sufficient. The future is going to be of bio inspiration for example in the series Abstract: The art of design playing on Netflix, the artist Olafur Eliasson has made an attempt to make a rainbow and his understanding of the waterfall and inspiration from it has made him create the waterfall and install it. Similarly, the bio-architect Neri Oxman from the same series has used nature as an inspiration and created new materials that emulate nature. Here one should question the practices by biomimicry and their impact on the environment.

Chapter 5: Conclusion

Inspiration from nature helps in understanding the design better and simultaneously solves today's technological in a sustainable way. After understanding the nature and its principles and attributes, it is concluded that nature's secrets can be used for commercial and industrial purpose and can improve to design better. However, as discussed in each chapter, the questions formed in this inductive research should be addressed and analysed. Summing it up, this research out of curiosity doesn't end here but has a long way to go further.

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