

Special project

An inspirational approach to retain natural aesthetics in our lives

Classification of Products based on Inspiration from Nature

Abhishek Prasad

PD 07613803

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Guide: Prof. R Sandesh

Industrial Design Centre,
Indian Institute of Technology Bombay,
Powai, Mumbai
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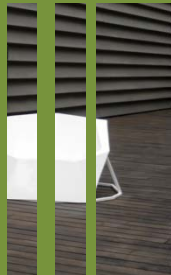
Acknowledgement

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Nature & Design

An inspirational approach to retain natural aesthetics in our lives



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Preface

Throughout the history, many leading thinkers in the area of Arts, Mathematics, Engineering and other have explored the parallels between nature and human design. Today, the huge increase in biological knowledge and developments in design engineering, along with the virtual revolution in computer science and electronics, have made comprehensive studies of nature possible.

Flying birds gave inspiration to the design of air planes, observation of a falling apple led to the Theory of Gravity etc. are some out of the endless list of the correlations between nature and human. Now and then nature is the origin for new theories and inventions. Biomimetics is the field that deals with design and development of products that are inspired by nature

In the field of industrial design, there are so many challenges in making things aesthetic

- a) Physically
- b) Functional
- c) Operational

Designers always have to achieve certain levels of aesthetics which are

- a) Function
- b) Form follows function and
- c) Less is more, clarity, minimalism, no ornaments, repetition, geometrical forms.

Nature is aesthetically designed in every aspect. One can find any level and any type of aesthetics in nature. It is the ultimate source of inspiration to make things of our surrounding aesthetic.

In the present project we are exploring the same correlation between nature and human design. Sometimes it's a need, sometimes lust for knowledge and sometimes to get something unique from nature to fulfil some unfulfilled human dreams.

Introduction

Human has always been taking inspiration & learning from Nature. This project is the study about an inspirational approach to understand Nature in our daily life.

It talks about various perspectives of taking inspiration from nature in industrial design to retain natural aesthetics in products. Some time biological methods become the solution of our daily life requirements, some time natural material help us to maintain sustainable environment. Best existing examples have been collected & studied to show some of areas & ways by which we can achieve natural aesthetics in designing the products.

Objective

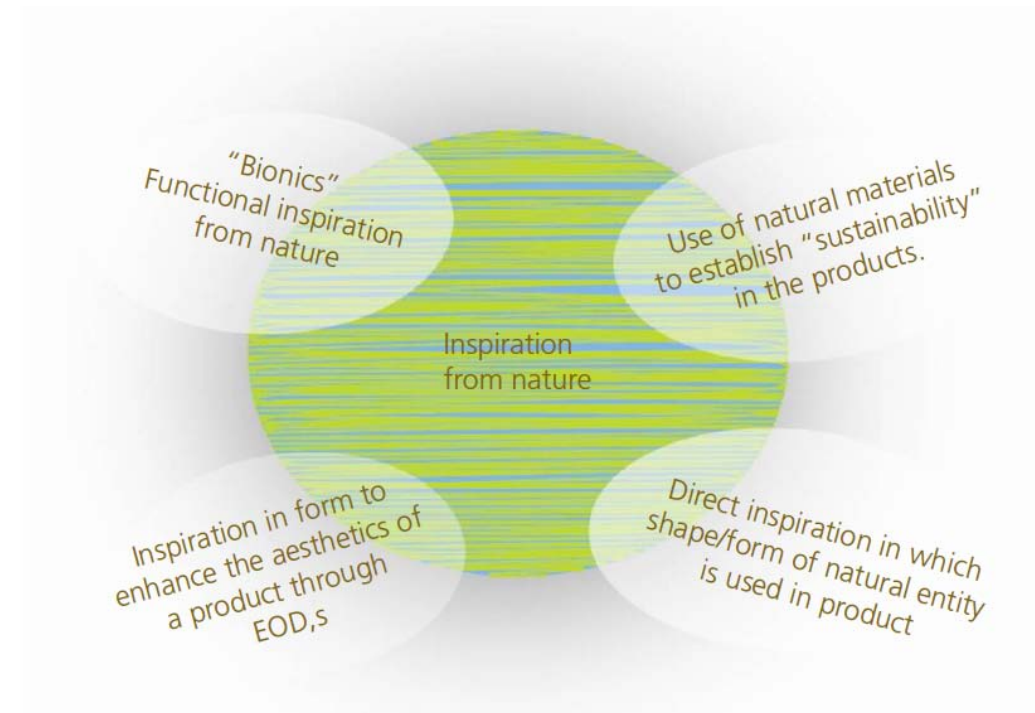
To study various products found worldwide, which are influenced by Nature in one or many ways. Further to categorize them based on finding.

How we are inspired from Nature? - A Classification

There are numerous ways of getting inspired from nature but broadly we can classify it into four ways.

- i) Bionics – This is the branch of science that deals with the natural processes and science being used in the man made systems and design.
- ii) Sustainability – A particularly new field to venture, came to light within few years due to the adverse effect of the modern day lifestyle.
- iii) Direct – In this there is direct inspiration in which shape/form of the natural identity is used directly into man made products.
- iv) Indirect – Inspirations are taken indirectly to enhance the aesthetic of the product.

Beside these there are several other ways and field to classify this depending upon the context being addressed.



Functional inspiration from nature

Bionics

(also known as Biomimetics, Biognosis, Biomimicry, or Bionical creativity engineering)

“Bionics is the application of biological methods and systems found in nature to the study and design of engineering systems and modern technology.”

Let's have some examples of bionics.

Hulls of boats imitating the thick skin of dolphins.

Sonar, radar, and medical ultrasound imaging imitating the echolocation of bats.

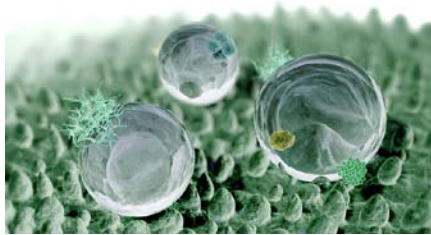
And so many things are around us which are the good examples of this revolutionary term.

Let us consider a few examples.

Functional inspiration from nature

1. Dirt & Water Repellant Paint

Inspired by: Surface of the lotus flower plant



Lotus leaf, due to the presence of wax, does not retain any water or wax on its upper layer. This is called Lotus effect. Based on lotus effect a paint named Lotusan is developed by a German Professor Wilhem Barthlott, from the University of Bonn, which is dirt and water repellent. It has self cleaning properties and excellent resistance to weather, chalk and UV rays. It remains clean even for decades.



2. Bullet Train

Inspired by: Kingfisher's beak

The 500-series Shinkansen Japanese bullet train running between Tokyo and Hakata is one of the fastest trains in the world. It drew its inspiration of air piercing nose cone design from the Kingfisher's beak. The shape of Kingfisher's beak is aerodynamic. Scientists observed the aerodynamics in it and designed the front part of that train.

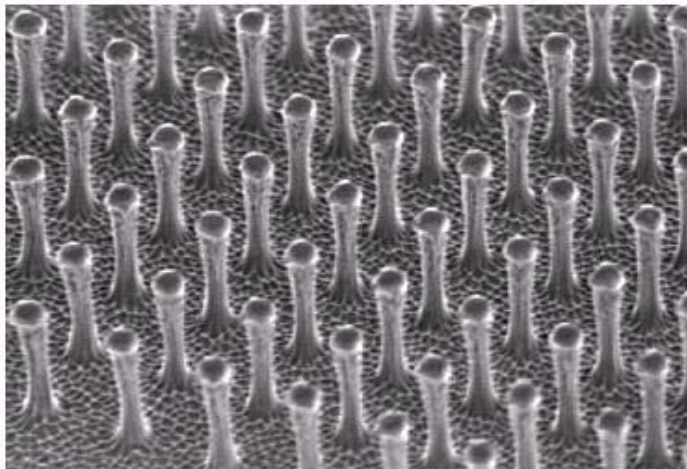
Functional inspiration from nature

3. Shark Suit (Speedo Fast Skin)

Inspired by: Scales of Shark



It has been observed that the reason for the ability of shark to swim fast is nothing but the design of its scales. The shark suit is designed this way to help the swimmers. It helps them to swim fast by reducing water friction.



4. Gecko Tape

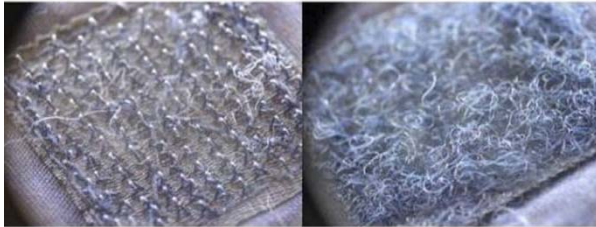
Inspired by: Gecko lizard's ability to climb up walls and walk along ceilings

Gecko tape is a gum less tape designed by the Manchester University Scientists. This is designed by the inspiration of the Gecko lizard's ability to climb up walls and walk along ceilings. The Gecko foot has tiny hair-like structures called setae that exhibit van der Waals forces.

Functional inspiration from nature

5. Velcro

Inspired by: How the hooks of the plant burrs stuck in the fur of his dog and his pants



Velcro is the famous brand of the hook-and-loop fasteners that was designed by Swiss Engineer George de Mestral in 1940. He designed it after the observation of how the hooks of the plant burrs stuck in the fur of his dog and his pants. Observation of this under microscope showed him numerous tiny “hooks” that belonged to the plant.

6. Cat's Eye Reflectors

Inspired by: The Tapetum Lucidum, the reflector cells in cat's eyes that reflect even small amounts of light



After studying the tapetum lucidum, the reflector cells in cat's eyes that reflect even small amounts of light, Percy Shaw in 1935 designed reflectors that are now being used on roads to mark road margins and lane dividers. The reflectors usually consist two reflector glasses fit into a white rubber dome. This dome is fortified by mounting onto a cast iron holding.

Functional inspiration from nature

7. The Eastgate Complex, Zimbabwe

Inspired by: Termite Mounds



The Eastgate Complex located in Harare, Zimbabwe was designed by the Engineers of Arup led by Mick Pearce. This complex is designed with the inspiration from the ventilation design from termite mounds. Termites require their home to remain at an exact temperature of 30.5°C throughout the day even when the temperature ranges from 1°C (during the night) to 40°C (during the day). This complex has natural cooling ventilation process with specially designed hooded windows, variable thickness wall and light colour paints to reduce heat absorption.



8. Smart Fabric

Inspired by: The mechanism used by the pine cones to shed their seeds.

Smart fabric is developed by Britain Researches at the University of Bath's Centre. This new fabric is developed based on the mechanism used by the pine cones to shed their seeds. The smart fabric does the same thing, opening up when it is warm, and shutting tight when cold.

Functional inspiration from nature

9. Mercedes Bionic Concept Car

Inspired by: Aerodynamic shape of box fish



Mercedes bionic concept car is designed based on the body shape of a box fish. Box fish is found in tropical marine habitats. The car has hexagonal shaped body which has less weight and all its parts are also lighter in weight. This car can travel 60 km within eight seconds only. It emits 80% lesser nitrogen oxide and consumes 20% less fuel.



Functional inspiration from nature

10. Pax Scientific's Ultraefficient Impellers

Inspired by: Calla Lily, Shells and other Spiral Forms



Pax Scientific's Ultraefficient Impellers took inspiration from the calla lily. Harman's observations of shells and other spiral forms led to his discovering the Streamlining Principle.



Use of natural materials to establish Sustainability

Various Products made up of natural material helps us in maintaining sustainable environment. Every aspect of the world of tomorrow depends on our present decision and sustainability is the word in focus. Various types of Lifestyle Products, daily and even electronics are made sustainable to make the things economical, social and ecological. Let's have some good examples of it.

Use of natural materials to establish Sustainability

1. Ceiling fan

Material Used: Cane, Bamboo



2. OOOMS's USB Memory Sticks

Material Used: Wood

These sticks from studio OOOMS are made to stand out from their natural environment of computers and offices. The sticks are picked from the woods and are individually selected for their natural beauty, and then professionally handmade into unique and personal USB memory sticks.



Use of natural materials to establish Sustainability

3. The Honeycomb Vase “Made by Bees”

Material Used: This vase was build in one week and by approximately forty thousand bees



Prototype 2006, Directed by Studio Libertiny (The Netherlands)

The work takes from two to ten days, depending on the weather, the season, the size of the colony, and the colony's need to expand. The process, which the designer calls “slow prototyping” in an ironic counterpoint to today's rapid manufacturing technologies, poetically brings a natural phenomenon full circle, starting with flowers, which nourish bees and enabled them to produce the vase, and ending with a vessel that is meant to contain flowers.



4. Plyboo Pendant Lamp

Material Used: Plywood

Propeller's gorgeous new pendant lamps demonstrate the potential of combining CNC milling with sustainable materials like Plyboo. What particularly attracts us to the Furrow Parkade pendant light is the simple linear design, with cuts that reveal the inner core of the material, making it equally beautiful when showcased in natural light or when used to light-up a dark night.

Direct inspiration from Shape/Form of Natural Entity

Shape/Form are directly taken from nature and product directly resembles the entity from which the inspiration has been taken.

Direct inspiration from Shape/Form of Natural Entity

1. Swing

Inspired by: The falling of the leaves in autumn



Swing Dsigners: Verónica Martínez y Alberto Sánchez

Swing is a suspended seat for adults. Inspired by the falling of the leaves in autumn, Swing should be placed in outdoor spaces where the sunset glints through its leaf holes, creating sweet shadows. This slow rocking movement will remind you of the peace and tranquillity of a child hearing a lullaby. A time to relax at the end of the day...



Direct inspiration from Shape/Form of Natural Entity

2. Moth Design Lamps

Inspired by: Trunks of plants



Shannon Shapiro is a designer from Los Angeles who creates lighting, furniture and interiors that are inspired from nature. As the founder and principal designer for Moth

Design, Shannon has been able to further spread her creative wings into new areas and products, focusing initially on lighting and expanding into furniture and furnishings. Famous for her coral lighting Shannon admits she is an avid athlete who loves the outdoors and strives to find ways to bring the “outside” in, “...wind is inspiring to me...particularly its effect on water, trees, coral, grass...all elements of nature.

3. HUSKY Tent

Inspired by: Dry twig of tree which create space under the bent branches



Direct inspiration from Shape/Form of Natural Entity

4. Waterflux

Inspired by: Nature and the way nature and its processes function like "ice cavity"



The new art museum scheduled to be finished in 2009.

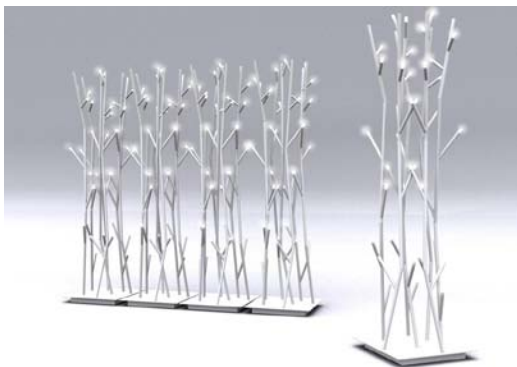
On the first look, seems like an ice cavity but in fact it is carved out of wood and other eco friendly materials.

Even the construction of this museum has been carefully planned so that the end result gives out an amorphous mix of structure which though looks disorderly but does have an identity of its own.



5. SNOWWHITE

Inspired by: Trees



Designer: Alberto Sanchez and Verónica Martínez

Snowwhite is a lighting design for outdoors and indoors that can be used alone or in a group. It's light creates a subtle atmosphere giving different sensations used separating areas or creating a wall of light-trees.

Direct inspiration from Shape/Form of Natural Entity

6. Lounge Chair by OOOMS

Inspired by: Sea Urchin



It looks exactly like a sea-urchin! No, it isn't the small, globular, spiny sea creatures found in oceans all over the world, it is a lounge chair with RVS-frame which is cover by 8000 cable-ties.

A collection of handmade products by Studio OOOMS. "With a lot of patience we'll be rewarded with beautiful new structures, which can only emerge by fervent monkish work."



5. Leaf Lamp

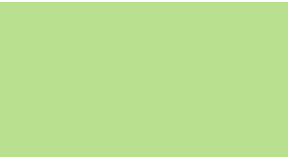
Inspired by: Leaves



Floor lamp designed in the shape of a plant with its leaves spreading all around. Inspired by Mother Nature, designer Sofian Tallal of France has created a beautiful lamp that could be used as a table lamp, floor lamp or study lamp.

Each of its leaves spread white light with a medium frequency so as to provide a soothing effect to your eyes. Hanging switch interprets the dew drops that are just falling through these green leaves. Altogether you will feel yourself nearer to the lap of nature with this beautiful LeafLamp around you.





Inspiration in form to enhance the aesthetics

Elements of Design are extracted from natural entity and are used to enhance the aesthetic of the product.

Inspiration in form to enhance the aesthetics

1. Insecta Concept

Inspired by: Grasshopper



Personal vehicle for the future, with unique construction and design language. The exterior expresses the characteristics of friendly insects, such as Grasshoppers- Agile, Lightweight & Green.



2. Whale-Shaped Aircraft

Inspired by: Whale



“Manned Cloud” a flying Hotel by the French designer Jean-Marie Massaud.

A beautiful piece of art & technology developed with French national aerospace research body ONERA can host 40 guests & has a range of 5000 km.



Inspiration in form to enhance the aesthetics

3. Grower De Jorge Valls En Nude'08

Inspired by: Shape of the legs resemble roots, and the upper part adopts the form of a flower in blossom



The exclusive design is brought to light from a growing concept; the shape of the legs resemble roots, and the upper part adopts the form of a flower in blossom. A clearly organic geometry made out of aluminium, that develops itself from a single module allowing to create Grower.



4. Whale-Shaped Aircraft

Inspired by: Whale



Public chair modules called Fungus.

Designed by the Chinese artist Ma Yansong of MAD for the Zhangjiang business park in Pudong, Shanghai.

It represents the basic organic form that could create infinite combinations. They scatter in the urban public space as mushroom made of modern materials.



Inspiration in form to enhance the aesthetics

5. Frog-Inspired Bike

Inspired by: Frog's motion and structure



Alex Suvajec's concept bike. It's unconventional frame expresses the characteristics of frog. Dynamism of the bike resembles the movement of frog body.



6. Volkswagen Beetle

Inspired by: Beetle



Inspiration in form to enhance the aesthetics

7. Capca Car Concept

*Inspired by: Petals,
Shells,
Flowers,
Animals,
Insects &
Armor*



Deviation - A Cross-Classification Category

We have seen many examples of products which are influenced by nature based on the classification.

However, there are many products which are influenced from two or more factors, They represent themselves in two or more classification category of Nature.

1. Bird's Nest National Stadium, China

Functional Inspiration: Strong Architectural Structure based on the construction of Bird's Nest

Aesthetic Inspiration: Unique Design inspired from the Bird's Nest



The bird nest from the swiss architects duo Herzog and DeMeuron for the 2008 Beijing Olympics. The structure is composed of a grid-like formation that serves as both structure and facade, integrating the stairs, walls, and roof into one cohesive system. Instead of form being dictated by function, Herzog and DeMeuron's design effectively removes the distinction, making function and form one in the same.



Deviation - A Cross-Classification Category

2. NUVU CAR

Functional Inspiration: Energy Tree inspired from the Real Tree to provide protection from Bright Sunlight

Aesthetic Inspiration: Flowing lines with gentle curves inspired by Nature. Tropical fish inspired the profile of the side window graphics



The most unusual feature of the interior is the 'energy tree' which rises from the luggage compartment floor to the roof behind the driver's seat.

The energy tree is shaped like a thin trunk. As it reaches daylight it branches out under the glass roof providing occupants with protection from bright sunlight, just like a real tree. Covering the branches are dozens of small solar panels shaped like leaves. The panels absorb energy from the sun which is then fed back down the energy tree and used to help recharge the battery and provide an extra power boost for the electric motor. It is estimated that the power generated via the solar panels will save the equivalent of one full overnight charge each month.



Flowing lines with gentle curves inspired by nature. The distinctive shape of the door glass on either side gives the impression of a hot air balloon that's being gently inflated by pressure from within. Tropical fish inspired the profile of the side window graphics as a whole. Contrast between the natural, fluid shape of the greenhouse and the strength implied by the solidity of the lower body gives Nuvu a feeling of quality rarely found in a compact car.



Conclusion

The creator of this world has made it very beautiful place. We always follow the laws of Nature because we also are the part of it. Complex processes in the Nature are designed very well to be happened nicely & without fail. Mystery of nature is beyond Human understanding. Nature is ornamented by organic forms & mysterious functionalities. For common man it's very difficult to understand & use the intricate nature of organic curves of Nature (in comparison to geometric forms). So, it comes out as very helpful in design process when organic forms are incorporated to retain a sense of aesthetic to impart uniqueness to a product.

Study reveals correlation between nature & design in many ways. It is concluded that, there are infinite areas in which Nature has played a vital role in shaping the overall design of a product whether it's Functionality or Aesthetic or Direct Resemblance or Use of Natural Material. Product influence our approach but Natural Entity's own specific properties always makes the path of exploration & outcome unique.

References

Web Links

<http://sciencera.com/technology/information/10-product-designs-that-are-inspired-by-nature/>

<http://www.acceleratingfuture.com/michael/blog>

<http://www.dezeen.com/2008/01/10/manned-cloud-by-jean-marie-massaud/>

<http://www.carbodydesign.com/archive/2007/02/05-mazda-nagare-concept/>

<http://picocool.com/story/title/frog-inspired-bike-design>

<http://www.tuvie.com/waterflux-by-rsien>

Books

Design with Nature

by Ian L MacHarg

Design Lesson from Nature

by Taylor b.D.B. (Pittman, London, 1974)