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Exploring the Possibilities of Applying Biomimicry in Interiors

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ABSTRACT
Several issues have been raised regarding the interaction between architecture and nature. By using the principles behind natures living thing biomimicry aims to advance human kind. The goal of this study is to contribute to the creation of high quality and long-term solutions for the daily problems facing by the society with environment. A design for an interior space that is produced utilizing the techniques from biomimicry and any materials and goods that made it sustainable, effective, durable and productive. The samples presented in this paper are sustainable and offer good options for addressing environmental challenges. This paper calls for more research to be done with a view to finding other sustainable biomimetic innovations which can be applied to our interior spaces.

Keywords: Biomimicry, Sustainable, Organisms, Ecosystem, Form, Structure, Nature

I. INTRODUCTION

Biomimicry originates from the Greek word bio mimesis bio means life and mimesis means to imitate. Biomimicry is a technique that draws inspiration from and imitates natural process to address problems and human design. Stimulation, interpretation, integration, reproduction and emulation are the steps of biomimicry. It is a process that we learn from nature to create human centred technologies that are more sustainable. In ancient Greeks and Romans natural shapes are incorporated into the design as tree inspired columns. Biomimicry is used as sustainable design solutions.

The application of biomimicry in interiors is particularly challenging since the interior is already assembled architectural entity with the walls, doors, windows and other features that may not have been created using biomimicry. Consequently may be used on a modest scale in interior design , such as design of items, materials, the integration of plants into a room etc, concentrating on the origin of the product and material . Architecture and interior design are inseparable, neither can exist without each other. The structure must first be constructed using biological principles and then only biomimicry will be used to design the interiors of the space.

For instance, biomimicry inspired patterns such as fractals and spiral can create visual stunning designs that are both functional and pleasing to eye.additionally, biomimicry can create an sense of connection with nature and promoting biophilia, which is inherent human tendency to seek connection with nature and other forms of life. In order to achieve goals designer can analyse natures system and processes that can be able to identify patterns that can be translated intodesign elements such as lighting, ventilation and materials selection. For example, the study of lotus leaf, self-cleaning properties can inspire designers to create easy-to-clean surfaces that reduces the need of toxic for cleaning chemicals.

HISTORY OF BIOMIMICRY

The term biomimicry was invented and published by famous biologist Janine Benyus in 1982 in her most significant 1997 book “Biomimicry Innovation Inspired by Nature”. She defined biomimicry as the “emerging science that investigates nature’s models and imitates their pattern to address human challenges” in his book.

The Sagrada Familia Church in Barcelona which was designed by Architect Antoni Gaudi in 1882, has the functional shapes ever inspired by nature. It is the largest unfinished church in the world. The church was designed by combining Gothic and curvilinear Art Nouveau and modelled columns in such a way that gives the resemblances of branching canopies of the trees to tackle the static challenges involved in sustaining the vault.

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FIGURE 1:FIGURE 2:

Antoni Gaudi was well known for fusing architectural forms with natural structure. He took the structural inspirations from plants and trees that was very unique.

One of the earliest examples of biomimicry is the study of birds to help humans fly. Leonardo Da Vinci was a passionate birder, he made numerous sketches and notes about his observations. Although his attempt of creating flying machine was unsuccessful, the wright brothers reportedly derived their inspiration for their 1903 airplane from birds.

The wings of flying machine that Leonardo Da Vinci designed closely resembled those used by bats.

From the beginning nature has always been the inspiration for the construction of architectural building. During ancient Egyptian civilization in old temples lotus plant (which was the holy plant for Egyptians) was used as the model for the columns . During Greek and Roman era, the inspiration for decorated structural columns of the classical order were trees and flora.The columns appeared widely in Greek and Roman architecture was inspired by Acanthus plant (fig.a). Numerous plants and trees were the inspiration of designs and decorations were employed in the building ornamentations during this time.

APPLICATION OF BIOMIMICRY IN INTERIOR DESIGN

To assist individuals in learning and using biomimicry, the biomimicry institute designed a technique called design spiral

FIGURE 3: DESIGN SPIRAL BY BIOMIMICRY INSTITUTE

APPROACHES OF BIOMIMICRY IN DESIGN

There are two types of approaches of biomimicry in design

1) Direct Approach – Problem Based Approach / Top-Down Approach

2) Indirect Approach – Solution Based Approach / Bottom-Up Approach

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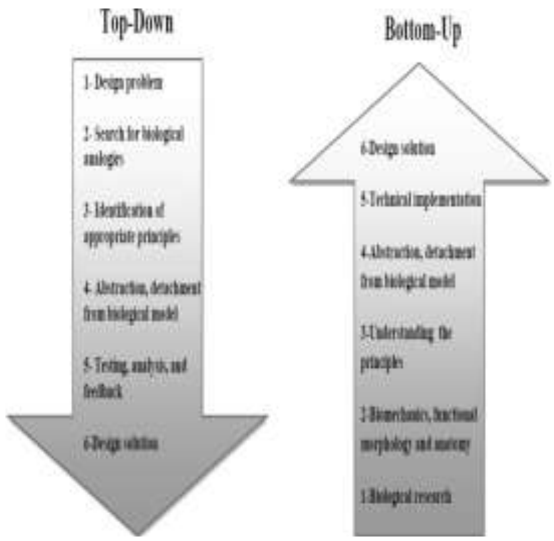

FIGURE 4: Biomimicry Top-Down and Bottom-Up Approach

(Biomimicry as an Approach for Bio-inspired Structure with the Aid of Computation - Google Search, n.d.)

DIRECT APPROACH – PROBLEM BASED APPROACH

In this approach firstly difficulties are identified and then seek for the solutions in the living world. After that biologist compare these problems to the creatures that have found the solution for the related problem . the good leaders of these strategies are the good designers who established the initial goals and constraints for the designs .

The pattern of the problem driven is biologically inspired design that is dynamic and non linear in reality which is a series of process , since the results commonly impacts the earlier stages offering related feedback and refinement cycles .

The bionic car prototype from Diamler Chrysler's is one of the examples of such strategy. The car design is inspired from the by the box fish (ostracon meleagris) considering it's a box like structure in order to produce a big volume short wheel base vehicle.

The cars chassis and structure are both biomimetic that is been build based on how trees may develop in a way that minimises stress concentrations through the computer modelling technique .

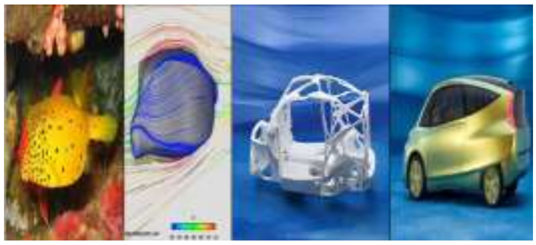

Figure 5: Daimler Crysler bionic car inspired by the box fish and tree growth patterns (source: Pedersen Zari, M. 2007)

The bionic car serves as an example. As a result the imitation of box fish making , making it more fuel efficient . to determine the imitation of the tree development patterns, minimal amount of material is required in the buildings of the auto mobile and is more resource-efficient. The automobile itself, however, is not a novel mode of transportation. Instead, minor upgrades to current technologies have been done without a new look at the vehicle as a solution to personal transportation. M. Pedersen Zari (2007)

If designers are able to observe, they can investigate potential biomimetic solutions without a deep scientific understanding or even in cooperation with a biologist or ecologist. ecosystems, living things, or have access to current biological studies. However, due to a lack of scientific understanding, the application of such biological information to a context including human design may only reach a basic level. For instance, it is simple to duplicate the shapes and some mechanical features of creatures, but more challenging to mimic other features like chemical processes without the help of scientists. (Pedersen Zari, M. 2007).

At Design Intelligence lab in 2006, the research was held in Georgia Institute Of Technology by Michael Helms, Swaroop S. Vattam and Ashok K. Goel also defined this approach through 6 different steps which is similar to biomimicry institute

This approach was found to have different naming " Design looking to biology" (Perdersen Zari, M.2007), " Top Down Approach " (Jean Knippers, 2009), Problem –Driven Biologically Inspired design(Michael Helms, Swaroop S.

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Vattam and Ashok K. Goel, 2009) all referring to the same meaning (PDF) Biomimicry as a Problem Solving Methodology in Interior Architecture. Available from: https://www.researchgate.net/publication/257716571_Biomimicry_as_a_Problem_Solving_Methodology_in_Interior_Architecture [accessed Apr 10 2023].

INDIRECT APPROACH – SOLUTION BASED APPROACH

When biological information affects human design, the collaborative design process initially depends on the people having the relevant knowledge of biological and ecological research rather than difficulties identified human design. One of the most popular examples from scientific analysis oflotus flower emerging clean from swampy waters . the design innovation led to many innovations as detailed by Baumeister, including Sto's Lotusan paint which enables building to be self-cleaning.

At Design Intelligence lab in 2006, the research was held in Georgia Institute Of Technology by Michael Helms, Swaroop S. Vattam and Ashok K. Goel also defined this approach through 7 different steps.

(Michael Helms, Swaroop S. Vattam and Ashok K. Goel, 2009).

APPLICATION OF BIOMIMICRY BY FAMOUS ARCHITECTS

NEXI OXMAN:

Neri Oxman is an American-Israeli architect, designer and professor who currently teaches at the Massachusetts Institute of Technology (MIT). Oxman is known for her pioneering work in the field of biomimicry, which involves drawing inspiration from nature to solve complex design problems.

Through her work, Oxman has demonstrated how biomimicry can be applied to interior design.

Oxman believes that biomimicry can revolutionize the field of interior design, unlocking new possibilities for sustainable and efficient building practices. By studying the structural and functional properties of natural materials, such as self-healing abilities or flexibility, Oxman has developed novel design solutions that mimic biological systems within interior spaces. For instance, Oxman has experimented with 3D printing techniques that imitate spider webs to create structural support within building interiors. Additionally, Oxman has explored the use of biodegradable materials to reduce waste and enable a closed-loop approach to interior design.

Moreover, Oxman's research has led to the development of new technologies and materials that advance biomimicry in interior design.

For example, she and her team have created a series of biologically-inspired building blocks using 3D printing technology that can be used to create lightweight but sturdy structures for interior spaces. Furthermore, Oxman has incorporated living organisms, such as bacteria and fungi, into interior design to create functional and aesthetically pleasing designs. In conclusion, Neri Oxman is a prominent figure in the field of biomimicry and has made significant contributions to interior design through her research and innovative design solutions

PROJECTS :

THE SILK PAVILION

Her notable works include the Silk Pavilion, which was developed in collaboration with the Mediated Matter Group at MIT. The Silk Pavilion is an awe-inspiring structure that mimics the natural process of silkworms spinning their cocoons. At the heart of Neri Oxman's work is a deep understanding and appreciation for nature. Her designs blend biological principles, technological advancements, and innovative materials to create sustainable solutions that can change the way we view design.

The Silk Pavilion, created by designer and architect Neri Oxman in 2013, is a revolutionary project that showcases the potential of digital fabrication techniques in combination with natural materials. The project is a stunning example of biomimicry, as it takes inspiration from the natural processes of silkworms in order to create an elaborate and intricate pavilion structure. The design process of the Silk Pavilion involved analysing silkworms' spinning behaviour and then using computational modelling to simulate and optimize it. This allowed for the creation of an intricate framework, onto which silkworms could spin their cocoons. The resulting structure offers a beautiful and innovative depiction of the intersection between nature and technology, as well as an exciting vision for the future of sustainable architecture. Furthermore, the use of silk as a

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building material provides a number of benefits. For instance, the material is lightweight, flexible and strong, making it an ideal candidate for use in architectural structures.

THE SYNTHETIC APIARY

The Synthetic Apiary is a research project by Neri Oxman and the Mediated Matter Group at the Massachusetts Institute of Technology (MIT).

It aims to create an enclosed ecosystem that emulates the natural conditions of a beehive. The project is based on the principle of biomimicry, which involves using nature as a source of inspiration for designing sustainable solutions to complex problems.

The Synthetic Apiary is a prime example of the potential benefits that can be achieved through interdisciplinary collaboration between fields such as design, biology and engineering.

It is a technology that allows for the controlled environment reproduction of honeybee colonies utilizes biomimicry, taking inspiration from the natural processes and structures of bee colonies to create an artificial environment that can sustain a bee population

that is otherwise threatened by environmental factors such as climate change, pesticide use, and disease.

The Synthetic Apiary represents a ground breaking innovation in the field of beekeeping, as it allows for the creation of an ideal habitat that mimics the unique conditions necessary for honeybees to thrive, including temperature and humidity control, consistent food availability, and protection from predators.

Furthermore, the Synthetic Apiary technology can be used to study and research bee behaviour and biology in a controlled environment. This innovation in beekeeping has the potential to revolutionize not only the honey industry, but also contribute to overall environmental conservation efforts.

With the current rapid decline in global honeybee populations, technology such as the Synthetic Apiary is vital to ensuring the survival of this important species and maintaining and delicate the balance of our eco system b

The Synthetic Apiary is a prime example of how biomimicry can be used to create sustainable and innovative solutions to pressing environmental challenges.

Moreover, the Synthetic Apiary technology can be applied to other pollinator species and facilitate their propagation in a controlled environmental setting. By addressing the challenges of honeybee colony collapse disorder through biomimicry, the Synthetic Apiary represents a significant step towards creating more resilient and sustainable

The synthetic apiary has promising implications in sustainability, as it can potentially be used to preserve and safeguard various plant species that rely on pollination by honeybees. The biomimetic approach used in the Synthetic Apiary technology showcases the advantages of taking cues from nature to solve complex problems. Moreover, the Synthetic Apiary represents an example of how biomimicry can be applied in various fields beyond interior design and architecture. In conclusion, the use of biomimicry in interiors has led to innovative and sustainable solutions that have significant implications for environmental conservation efforts.

Whether it's creating a sustainable honeybee population through the Synthetic Apiary, designing buildings that are better suited to their natural surroundings or developing eco-friendly materials, the incorporation of biomimicry in interior design has proven to be a valuable tool for achieving sustainable outcomes.

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MICHAEL PAWLYN :

Michael Pawlyn, a British architect born 30 September 1967, is one of the co-founders of the Architects Declare movement as well as a pioneer of biomimetic architecture. As well as his role as a principal architect on The Eden Project, he frequently speaks at events about innovation and sustainability. A revised edition of Biomimicry in Architecture was published in 2016, with a foreword by Ellen MacArthur. The Sahara Forest Project - an effort to supply fresh water, food, and renewable energy in arid conditions - was one of his three founding projects. He remains an active partner and design manager for the project.

BIOMIMETIC OFFICE:

As society faces the challenges of sustainability and resource depletion, biomimicry has become an increasingly important approach to innovative design. One area where biomimicry has a great potential to achieve sustainable design is in interiors, particularly office spaces. Michael Pawlyn is a pioneer of biomimicry in architecture and has developed the concept of bio-inspired design, which involves studying nature's processes to create sustainable solutions.

In his work, "Biomimicry in Architecture", Pawlyn highlights the application of biomimicry to office interiors as a way to create more efficient and sustainable workspaces that reflect the principles of nature. For instance, in his recent project, "The Biomimetic Office", Pawlyn drew inspiration from the spook fish’s ability to focus low light to create a lighting system that reduces energy consumption and minimizes eyestrain for office workers. Pawlyn also incorporated the stack effect, whereby convective airflow from cool to warm is utilized to regulate temperature and ensure efficient use of energy. Furthermore, the Biomimetic Office Building's glazed glass exterior mirrors a mollusc’s iridescent shell, while support columns that double as encasing for energy systems echo the efficiency of a spinal column. Pawlyn's work highlights the importance of incorporating biomimicry into interior design, particularly in office spaces.
The design which uses biomimicry to rethink the work place into a self-heated, self-cool, self-ventilated, that is also a net producer of energy. It has mirror like structure that reflects light
These can focus very low level of light coming out from the ocean and focuses on that and it reflects on retina.

THE SAHARA PROJECT:

The Sahara Forest Project in Qatar uses a convergence of technologies to harness the abundance of sea water to generate electricity and grow fresh fruit.A little more than a year and a half ago, engineer Bill Watts, biomimicry proponent Michael Pawlyn, and an international

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environmental organisation, the Bellona Foundation, pledged to 'turn the [Sahara] desert green' with an ambitious project that included a salt-water cooled greenhouse for growing cucumbers as well as electricity and heat generation to be made using sun-soaked mirrors and steam-driven turbines.

The Sahara Forest Project was established in one of Qatar's driest regions after a ten-month rigorous construction period supported by Yara International ASA and Qatar Fertiliser Company (QAFCO). Even though the Sahara has changed significantly over the past nine months, the initiative did have its first cucumber harvest in December 2012 and its first barley crop in April of this year."We have managed to continue highly productive agriculture throughout the hot summer and we are doing that with a 50% saving in fresh water compared to the conventional way of doing things," said Pawlyn, speaking at the Sustainability Innovation Summit in London this month.

The Sahara project is centred on the complexity and ingenuity of bio-mimicry, as opposed to 'simple' human made systems. For example, the seawater-cooled greenhouse where the cucumbers are grown is inspired by technology from the Namibian fog-basking beetle, which has evolved a way of harvesting its own fresh water in a desert.

"For just about every challenge we face there will be examples we can turn to in nature," Pawlyn explained.

"I do think it is going to be one of the most powerful sources of innovation and it's going to facilitate the growing partnership from the industrial age to the ecological age"

It brings 3 technologies together

1) Solar Energy
2) Desert Revegetation Technique
3) The salt water cold green house inspired by beetle

The Sahara project's use of saltwater, which is abundant, to power energy, cool greenhouses, and produce freshwater for irrigation or consumption is one of its most amazing design ideas.

It employs a concentrated solar power plant (CSP) to generate electricity. The CSP uses mirrors to focus solar radiation to produce steam at temperatures high enough to operate a steam turbine, which in turn drives a generator to generate electricity.

This is combined with a seawater cooling system so that the complex's greenhouses' roofs can be used to dissipate waste heat from the CSP process.

This kind of innovative, complementing "connect the dots" approach is what gives the Sahara Forest Project its ambition and originality.

To reduce waste and integrate various components of proven technologies together so they operate as a complex, flowing system akin to the body of a Namibian fog-basking beetle, everything in the project is purposefully synergized together.

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JANINE BENYUS:

Biologist Janine is also a writer, innovation consultant, and self-described "nature nerd." Though she may not have invented the term, her 1997 book Biomimicry: Innovation Inspired by Nature did much to popularise it.

She refers to an emerging field of study called "biomimicry" that imitates nature's patterns and mechanisms (such as solar cells that resemble leaves) in order to build a more liveable and sustainable world. Since the publication of the book, Janine has advanced the field of biomimicry by giving talks about what can be learned from the creative genius that exists all around us.

Through two TED speeches, hundreds of conference keynotes, and a dozen movies, including 11th Hour, Harmony, Second Nature: The Biomimicry Evolution, and The Nature of Things with David Suzuki, which broadcast in 71 countries, Janine has personally introduced millions of people to the biomimicry meme. She has won numerous honours, including the Rachel Carson Environmental Ethics Award, the Lud Browman Award for Science Writing in Society, the Barrows and Heinz Distinguished Lectureships, The Gothenburg Award for Sustainable Development (2013), The Heinz Award (2011), TIME magazine's Hero of the Environment (2008), and United Nations Environment Programme's Champion of the Earth for Science and Technology (2009). Janine received the RSA Bicentenary Medal in 2022 for her outstanding work in regenerative design.

Her biomimicry work has been highlighted in numerous publications, including Nature, Fortune, Forbes, Newsweek, Esquire, The Economist, Time, and Wired. One of the Most Influential Designers in the World, according to BusinessWeek in 2010, was Janine. She was presented the Cooper-Hewitt National Design Mind Award by the Smithsonian Institution in 2012 in honour of a visionary who has made a significant contribution to design theory, practise, or public awareness.

ESSENTIAL ELEMENTS OF BIOMIMICRY:

EMULATE: The scientific, research-based practice of learning from and then replicating nature’s forms, processes, and ecosystems to create more regenerative designs.

ETHOS: The philosophy of understanding how life works and creating designs that continuously support and create conditions conducive to life.

(RE)CONNECTS: It encourages to observe and spend time in nature to understand how life works so that we have better ethos to emulate biological strategies in our design

By infusing biological strategies in design, we can transform sustainable innovations.

BULLET TRAIN:

The design movement pioneered by biologist and writer Janine Benyus.It was called bullet train because it was rounded Infront but every time it went into a tunnel it would build up a pressure wave then it would create like a sonic boom when it exited so the engineer boss said find a way to quite this train. The goal was to cut out the extremely loud claps that occurred when Japan’s bullet train emerged from tunnels. Engineers looked towards the kingfisher, which dives seamlessly into water. A nosecone designed after bird’s beak solved the issue.

INSECT THEORY:

There is one insect called Critter that is found in Namibian Desert, it has no fresh water that its able to drink but it drinks water out of fog. It has got bumps on the back of its wing and cover those bumps, those bumps act like a magnet for water, they have the water loving tips and waxy sides and the fog comes in and it builds up on the tips then it goes down on the sides then it goes into critters mouth.

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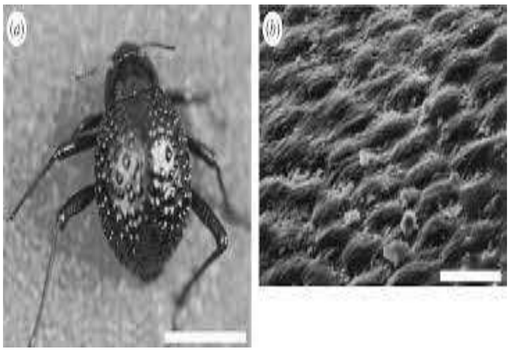


BASIC PRINCIPLES OF BIOMIMICRY – Janine Benyus

- Nature runs on sunlight
- Nature uses the energy it needs
- Nature fits form to function
- Nature recycles everything
- Nature rewards cooperation
- Nature banks on diversity
- Nature demands local expertise
- Nature taps the power of limit
- Nature curbs excesses from within.

EXAMPLES OF SUSTAINABLE BIOMIMICY APPLIED TO BUILDINGS AND INTERIOR SPACES

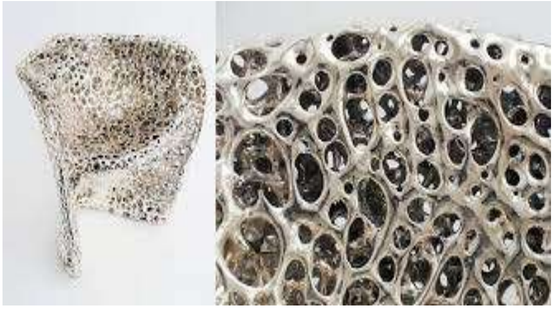
- **THE BONE CHAIR BY JORIS LAARMAN**

The Bone Chair was created from a computer-generated design and refined for aluminium specifications. It had to be cast in one piece in such a way that no bubbles would show on the surface.

Phil Verdult of Heerhugowaard had years of experience with casting processes and experimented with 3D printed ceramic moulds. This resulted in the first aluminium Bone Chair, which is part of the permanent collection of many museums.

- **THE CELLULAR CHAIR BY MATHIAS BENGTSSON**

The "Cellular Chair," created by Bengtsson using a unique computer programme he developed himself and based on the evolution of cellular bone tissues, is organic in both form and structure. Rather than being composed, the chair has "grown" by adhering to the growth logic of a living organism.



- **SHARK SKIN**

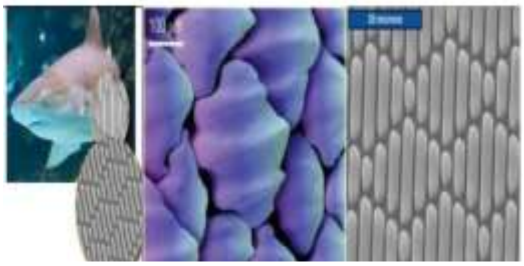
Sharks are well-known aquatic creatures with exceptionally pristine skin. Their skin is formed up of tiny "dermal denticles" or placoid scales, which resemble tiny teeth. These tiny scales benefit the shark in a variety of ways, including providing protection from predators, enabling smooth, low-friction swimming, and preventing the biofouling phenomena, which occurs when marine organisms attach themselves to shark skin.

A group of researchers from the University of Florida were motivated to develop a material with a structured underlying layer they named Sharklet AF because it may be similar to the placoids found in shark skin after examining the capacity of shark skin to resist bio-fouling. This artificial surface material is restrictive.

This artificial surface material prevents the development of pathogenic bacteria. These film-based surface protection products, made possible by Sharklet technology, can be applied to surfaces that may be exposed to germs and bacteria, such as those in hospitals and public bathrooms.

These skins have the potential to be used to make workshop mats, whose surface adhesion qualities can be improved by adding adhesive to the skins' reverse side.

The goods rely solely on the Sharklet pattern to limit bacterial development and are free of environmental-harming chemicals, disinfectants, and toxins. They are therefore a marketable and long-lasting product.



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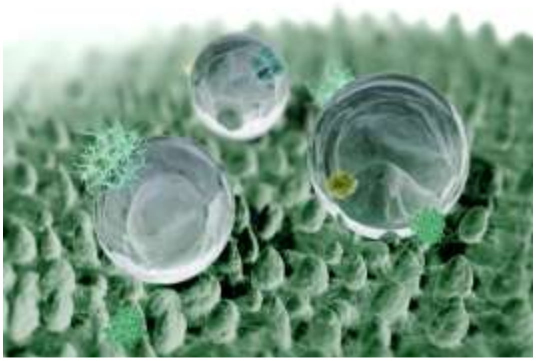
- **LOTUS LEAF**

Certain plants have been known to have water repellent tendencies. One common example is the lotus plant. Both the flower and leaf of the lotus plant have a rough, bumpy exterior which naturally wards off dust and dirt thereby creating a clean surface. The smallest of wind drafts are able to cause a slight change in the angle of the plant which in turn enables dirt to be removed without much effort. Dirt is also carried along with any water droplet that rolls of the leaf.

This water repellent tendency became the focus of the German company, Ispo, who conducted research on it and were able to emerge with a paint having similar properties. The paint employs a micro-structure modelled after the hydrophobic leaves of the lotus plant which minimizes the contact area for water and dirt making it naturally resistant to the growth of mould, mildew and algae. According to Buczynski, this paint is not only cost effective but is also environmentally friendly thus making it a sustainable product. The idea has led to the development of other building materials such as paints, tiles, textiles and glass which can be used with minimal maintenance and material replacement costs.



- **TERMITE MOUNDS**

One of nature's remarkable engineers is the ermite. By creating vertical chimneys to vent heat and gas, they naturally control the temperature inside their dens. Air is drawn in at the base of the mound, down through enclosures with muddy walls, and up via a channel to the apex of the termite mound using a system of finely calibrated convection currents. The diligent termites continuously create new vents and seal off existing ones to control the temperature.

The Eastgate Centre in Zimbabwe is a structure that was built to function according to these principles. Vertical atriums were used in the construction of this 333,000 square foot commercial and office complex to draw heat upward and outward. Building's concrete slabs are kept cool while.

The building's concrete slabs are kept cool by night air being drawn in through intake fans.

The building doesn't have a traditional heating or cooling system, but Bonanate adds that by employing a ventilation system that costs approximately one-tenth as much as an air conditioning system in a structure of similar size, it uses 90 percent less energy to heat and cool.

II. CONCLUSION:

The main objective of this study was to assess some potential applications of biomimicry in the discipline of interior architecture. Though the word "biomimicry" in interior design is still relatively new, the use of sustainable bio-inspired materials and products is rising. When employed as an approach for problem solutions, biomimicry has the ability to address a wide range of difficulties in our structures and interior areas. For instance, the examples provided in this paper have demonstrated how biomimicry can be used in a variety of contexts to solve a myriad of problems. Indoor thermal regulation is one such area where the use

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of biomimicry can considerably minimise the needless energy requirements for heating and cooling.

As the globe looks for solutions to the numerous issues it is currently facing, sustainability has emerged as a significant topic of discussion. In order to fully handle sustainability, natural solutions from nature must be looked for.

Because biomimetics not only offers exciting opportunities for future design advances but also solutions to many of the earth's existing difficulties, designers and architects must explore for ways to incorporate biomimicry into their projects.

This essay has looked at a variety of natural species that have unique qualities that have led to biomimicry in architecture and interior design. Design issues like window insulation, indoor heat control, intelligent colour-changing windows, germ resistance, and self-cleaning paints, among others, have been addressed using these qualities.

Although the applications of biomimicry in the field of interior architecture are currently very limited, it is anticipated that there are many more possibilities out there that further investigation is likely to reveal. In order to identify other sustainable biomimetic technologies that can be used in our interior environments, this report urges further study.

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