

Analysis of Biomimicry in Economy

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Abstract: *Biomimicry is a discipline of applying nature's principles and it does not only changes the ways we think about designing, producing, transporting, and distributing goods and services, but also provides opportunities to deal with complex environmental and economic problems. This research paper include the BIOMIMICRY as a global design challenge. Focus on the current topics in biomimetics to achieve ecologically sustainable product and discuss the potential of biomimetics in science, engineering, and medicine. Our propose is to become a blueprint for accomplishments that can stem from biomimetics in the next 5 years as well as providing insight into their unseen limitations. The aim of the paper was to study connection between economy and biomimicry and to point out applicability of method in growth of economy. Only tight collaborations between engineers, chemists, materials scientists and biologists will make these 'next-generation' materials a reality. Biomimetics is the study of nature and natural phenomena to understand the principles of underlying mechanisms, to obtain ideas from nature, and to apply concepts that may benefit economy with science, engineering, and medicine. This review focuses on recognizing specific examples of biomimetics, their current use, and how they will continue to be used in the future. The study shows clear connections between biomimicry and economy. Biomimicry is about innovating new technologies and economy stresses the importance of technology transfer to developing countries. Biomimicry can be applied exactly on the same sectors of economy which have most export potential in economy.*

Keywords: biomimicry, biomaterials, nature, economy, sustainability

1. Introduction

This paper entitle life the design process is always behind it, giving it meaning and support. It requires crucial steps in order to gradually understand and solve human-centered problems.

Millions of years of evolution have produced extremely efficient natural materials, which are increasingly becoming a source of inspiration for engineers. Biomimetics-the science of imitating nature-is a growing multidisciplinary field which is now leading to the fabrication of novel materials with remarkable mechanical properties.

Nature is increasingly being viewed as a model and a benchmark. It is not surprising that during millions of years of evolution the nature has created mechanisms and systems that are highly efficient, eschew waste, and are highly sustainable in a virtually closed system. We are currently at a point where we use the brain power and tools to analyze nature, and to learn from its 3.8 billion years of development. Developed networks allow professionals from different areas to work together, which is a prerequisite for biomimicry to be successful.

Nature entails 'optimizing' rather than 'maximizing' and also it is a model of sustainability since it is a 'closed loop' system. All organisms contribute to recycling Earth's major nutrients – carbon, hydrogen, oxygen, and nitrogen. If people are to prosper indefinitely, they need to act responsibly by imitating nature's closed loop. The endless possibilities that can be achieved by the collaborative relationship between design and nature are not fully utilized.

In chapters three and four the concepts of economy and biomimicry are defined, and chapter five is dedicated to analysis of the connections. Hypothesis Testing on biomimicry and its affects to economic activities will clarify the applicability of biomimicry as a tool for companies to implement biomimicry in their business.

2. Execution of the Study

Biomimicry is the science of taking inspiration from nature, its systems, processes, and elements to solve design problems in sustainable manner. The way the design process is approached is that designers look at nature, specifically organisms or ecosystems to solve a particular human need and by doing so, converting these types of behavioral processes into man-made design solutions.

It is a method of looking at natural processes found in nature and uses these processes to aid in the development of mankind. Our two major sources for inspiration for this topic were Janine Benyus' Biomimicry: Innovation Inspired by Nature, and Jane Jacobs' The Nature of Economies.

Examples of biomimetic studies include fluid-drag reduction swimsuits inspired by the structure of shark's skin, velcro fasteners modeled on burrs, shape of airplanes developed from the look of birds, and stable building structures copied from the backbone of turban shells.

Preliminaries

If the history of planet Earth was compressed into 1 year, humans would appear in the last 15 minutes of it. Out of those 15 minutes, most recent industrial progress would occur within 1 minute.

Despite this small proportion, the industrialization that took place in the last century is much greater than that from the start of mankind. Although the rapid rate of industrialization has helped to prolong life and overcome disease, it has also brought pollution and environmental destruction, which affect human survival itself. In this drift toward industrialization, men have made a continuous effort to create more products that can improve our lives. However, the survival of mankind faces the physical dilemma of living on limited resources. Solutions to the lack of resources and survival problems have not always been clear to us, although the answer can always be found within nature. An interesting method to solve these problems may lie in

biomimetics, which uses nature as the ultimate model, standard, and advisor.

In recent times, mankind has newly opened its eyes to biomimetic technology, and its efforts are being met with success.

- 1) Leonardo da Vinci's work is a fundamental example of biomimicry. He designed a "flying machine" inspired by a bird.
- 2) In the Far East, General Yi Sun-sin built the turtle ship, a warship modeled after a turtle, to fight Japanese raiders during invasions.
- 3) The Wright brothers took note of the wings of eagles and made a powered airplane that succeeded in human flight for the first time in 1903.
- 4) Biomimetics in industry

1) Velcro

The name Velcro, a common hook-and-loop fastener, comes from the French words for velvet, "velour," and hook, "crochet". In the early 1940s, Swiss engineer George de Mastral noticed the tendency of the fruit of the burr (*Xanthium strumarium*) to stick to dog's hair and used a microscope to observe the hooks on the fruit which attach to animal hair. He discovered that an elliptical fruit with a length of 1 cm had densely packed hook-like projections. These latched onto peoples' clothing or animals' hair, allowing seeds to be dispersed widely. Inspired by this burr, De Mastral used nylon to create velcro fasteners. To enhance adhesive abilities, velcro consists of a strip with round loops and a strip with burr-like hooks. For its small surface area, velcro has exceptional adhesive strength and is used extensively as a simple and practical substitute for buttons or hooks in clothing and shoes

2) Automobiles

Over the most recent decade, automobile design has not only had an influence on the exterior of cars, but also had an influence on their function. The economizing and energy efficient aspects of biomimetics have been adopted in cars as demonstrated by Daimler Chrysler's prototype bionic concept car

3) Bullet Train

The front of the Japanese bullet train was inspired by a kingfisher's beak, so that the sonic boom when the train exits a tunnel and air resistance can be minimized while acceleration and energy efficiency can be increased. This idea was taken from the observation that a kingfisher dives perpendicular to the surface of the water when hunting, causing minimal splashing. Since it simulated the rounded beak structure of the kingfisher, the Shinkansen also came to be known as the bullet train.

4) Skin Wraps

Another example is Skin Wraps, a film inspired by the micro projections on shark skin to repel gel. The use of Skin Wraps in automobiles reduced car pollution and increased fuel efficiency by 18%–20%. It has also been applied to swimsuits, bringing better results for athletes.

3. Objective

This paper aims to find out:

- 1) What kind of connections exist between economy and biomimicry.
- 2) Biomimicry helps to sustain the economy.
- 3) Can Managers and people in groups apply this/ these Innovation inspired by nature i.e biomimicry strategies in economy.
- 4) Reimagining the Future.

4. Hypothesis

It is hypothesized that by learning from nature's knowledge, initially as inspiration for solving problems but also in the wider context of asking nature for solutions to everyday problems we face, designers can develop more innovative designs that are in harmony with nature in a sustainable sense.

5. Review of Literature

According to Pauw et al "Nature-inspired design strategies are design strategies that base a significant proportion of their theory on 'learning from nature.'"

The Biomimetic Economy. This paper is to explore the nature of the economic system in relation to ecological systems and the design principal of Biomimicry. Our goal is to create a learning map that allows users interested in developing healthy economies and sustainable business practices to follow and learn from the principles. As we mapped out nature's principles in parallel to today's capitalist economic system, flaws and sustainability gaps which become immediately evident. And yet, when we analyzed the Sharing and Circular sEconomies against nature's principles, we found that these systems closely adhere to the principal tenants of Biomimicry. Mapped out the larger system boundary representing "the industry" within Instrumental Context and "the world" within Social Context.

In Europe, Japan, and the USA, biomimetics is being recognized as the technology of the future and there is increasing interest and funding. In particular, global companies such as Ford, General Electric, Herman Miller, HP, IBM, and Nike are collaborating with scientists and designing laboratories to explore novel technologies.

Between 2005 and 2008, the market size for products and construction projects that applied biomimetics was estimated to be above \$1.5 billion. By 2025, industry analysts project that products and services in biomimicry will increase to \$1 trillion in market size. In the US alone, it is expected to have a \$35 billion market with over 1.6 million new job opportunities.

5.1 Present and future of biomimetics

In promoting the coexistence of nature and humans, the economic, environmental, and social aspects of biomimicry are increasingly in demand and greater is the scope of application. Developed countries are actively investing in research to build the foundations for future innovation and development in biomimicry.

Jonathon Porritt (2007, 138) defines capital as “a stock of anything that has the capacity to generate a flow of benefits which are valued by humans.” Where the Sustainable development comes right down to one all-important challenge: is it possible to conceptualize and then operationalize an alternative model of capitalism – one that allows for the sustainable management of the different capital assets upon which we rely so that the yield from those different assets sustains us now, as well as in the future.

5.2 Economy

An economy applies to everyone from individuals to entities such as corporations and governments. The economy of a particular region or country is governed by its culture, laws, history, and geography, among other factors, and it evolves due to necessity. For this reason, no two economies are the same. The world economy refers to all of the economic activity within each country and between countries around the world. It makes sense that as the population of the world has increased, and as technologies such as air travel and the Internet have made communication between people throughout the world easier, that the world economy has grown. It has also become more important and more complex. When one country does well, other countries see a boost in their economies. Conversely, when one country does poorly, other countries can suffer. The countries of the world are now interdependent. Basically, this means that we all have an interest in working together. As a business owner, you have an interest in making sure that India is able to meet the demands of its consumers.

5.3 What Is the Future for Biomimicry?

Real sustainability is being in harmony with nature by learning to participate as co-creators in the immense beauty of life. Anything less is unsustainable.

BCI: Biomimicry for Creative Innovation.

5.4 Why is Biomimicry a Smart Thing for Sustainable Business?

We in business find ourselves operating in increasingly volatile and transformational times. Businesses that wish to not just survive but also thrive in the years ahead are those that are agile, responsive and adaptable. Such firms of the future are able to continually redesign themselves for resilience. The characteristics we found with great abundance in Nature. The more we tune into the natural world around us, the more we open up to the answers all around us in Nature. After all, nature has been dealing with transformation and volatility for over 3.8 billion years. Biomimicry offers a framework and toolset for understanding how to best explore and apply Nature’s strategies for sustainable business and beyond.

In the words of Albert Einstein: *“Look deep into Nature and you will find the answers.”*

Nature: Nature, in this case, is defined as the surrounding organisms in our everyday lives, the way “something” breathes, lives, mates, eats, survives with those around it;

those that are similar and those that are different. It is an ever-lasting cycle that has become adapted to survive and allowing its surroundings to survive with it. It is also meant by “nature” as the surrounding environment in which an organism is affected causing it to be adapted in order to survive. This is relevant in its similarity and comparability to a product during its development process.

5.6 Why Nature?

Everything surrounding us is in one way or another natural or has come into contact with nature. Historically speaking, nothing is older, wiser or more sophisticated than nature. Because of this nature has been adapted to suit its natural environment, creating with it a life-system. Nature has been developed into a sustainable community creating several key principles that allow it to survive and maintain its everlasting position on Earth.

According to Vakili and Shu, nature has developed by considering minimal needs of organisms, tolerance, adaption, environmental sustainability, independence, self-regulation, precision, diversity and self-assembly. By following these principles, natural organisms are able to survive in a community without damaging or threatening one another. It is this appreciation and understanding of its surrounding that is of inspiration and importance to a designer.

The What, Why and How of Business Inspired by Nature

Allison Bernett and Cas Smith,

Biomimicry offers a strategic advantage in sustainable product design, research, and development. Organizations that study nature as a source of innovation have already transformed a wide array of industries. Leveraging biomimicry’s unique approach to research and design can ultimately lead to sustainable, profitable technologies that increase revenues, mitigate risk, and reduce costs.

Transforming an organization into a Business Inspired by Nature is a journey that begins with exploring new concepts, ideas, and tools. Natural resources can gain access to a number of innovations how organizations can utilize ecological thinking for radical transformation. These resources can be accessed via the tabs to the left .

Nature provides a rich, yet largely unexplored, library of technologies that process and manage information, materials, and energy. While the idea of looking to nature for solutions has steadily become more accepted in innovation circles, many people are still surprised by the breadth and depth of the movement. Despite the challenges of bringing an innovation from inspiration to commercialization, increasingly, innovative companies are abstracting ideas from nature to open the way to technological breakthroughs, creating profitable products that are often unattainable using conventional approaches to product design and development.

5.8 The concepts behind Business Inspired by Nature

Biomimicry Spur Creative Innovation. There are many levels at which Nature's inspiration can spur our innate creative potential. At one level, the biomimicry methodology requires us to reframe our design challenge and ask entirely different questions. Biomimicry asks us to explore how nature solves our design challenges or more specifically, the strategies nature uses to perform the functions our design needs to perform. This reframing, pausing, reflecting, exploring and attuning with nature's wisdom generates a burst of creativity for all stakeholders involved in the process, which itself then leads to further exponential co-creativity within performing teams.

What can often be over-looked or under-valued in our rationalistic paradigm is the sensuous and soulful as well as the scientific aspects of nature's inspiration. In attuning ourselves with nature, we allow an opportunity for our analytical left-brain and contextualizing right brain hemispheres to align and also for our head, heart and hands to cohere.

Which can bring profound shifts for individual and collective logic, leading to further bursts of creativity where innovation is truly transformative in challenging business-as-usual methods and mind-sets.

6. Future of Biomimicry

6.1 Understanding the need for transformation and What New Direction Will Biomimicry Take in the Coming Years?

As explored in *The Nature of Business*, think of applied biomimicry—or rather “Nature's inspiration”—as layers within a pyramid: with “places” at the base of the pyramid, then “products,” then “processes,” then “people” and finally “purpose” at the top.

There is a plethora of nature-inspired applications at the “places” level (architecture and infrastructure) and also at the “product” level (biomimetic design). One only has to conduct a Google search for “biomimicry” to come across a great variety of ways that we are copying nature's forms for the emulation of our human designs. There is plenty of work to do for biomimetic designers and architects in the years ahead and much to be done to align our ways of designing to that of nature.

In India, a new hill resort and a bio-mimetic city named Lavasa has been constructed by HCC Group with the help of an architectural firm, HOK. Spread across 12,000 acres in a Western Ghats valley located outside Pune, the new city has been designed using Biomimetic technology. The idea was to restore 70% of the deforested land through detailed landscaping, reforestation and slope greening, reduce 30% of carbon emissions, 65% of potable water consumption, and 95% of waste sent to landfills. The site's original ecosystem was a moist deciduous forest, which was converted into an arid landscape in recent times.

6.2 Biomimicry and Process

At the “process” level, there has been applied inspiration from nature in the areas of energy and resource flows for many years: for instance, industrial ecology, where the waste output of one process becomes the food input of another. Cradle-to-cradle and “circular economy” processes apply ecological-thinking for inter-organizational manufacturing processes.

It is interesting and still embryonic ally emerging that, the embodiment of nature's inspiration at the informational process flow level. This can explore technological processes for instance, the internet forms a similar pattern to mycelium webs found in soil beneath our feet and also the rich domain of human interactions, team dynamics, leadership approaches and stakeholder relations.

6.3 Biomimicry and People

This brings us to the next level up the pyramid where the emergent future of nature's inspiration ventures into people. There are obvious nature-inspired ways of translating behaviors and patterns of communication from the natural world for human relations; for instance, the different leadership approaches we find in flocks and herds as well as the behaviors we find in swarms and super-organisms such as ant colonies and beehives. Yet, what is sometimes overlooked is that we too are very much expressions of nature.

The leadership-of-the-future is asking us to attune with our own authentic human nature – a shift from egotistic, heroic, command-and-control leadership to heartfelt, emergent, ecologically-attuned leadership approaches.

For example, the rich stream of ecological psychology explores the human psyche and its attunement with the natural world. In gaining a deeper resonance with our true self, we open up to our deeper sense of purpose whereon the purpose of our organizations and wider stakeholder community may align.

6.4 Biomimicry and Purpose

This brings us to the pinnacle of the pyramid: purpose.

Ultimately, real sustainability is being in harmony with nature by learning to participate as co-creators in the immense beauty of life. Anything less is unsustainable. The more we open ourselves up to our inner nature, our local neighborhood and the wider world around us the more we attune with the wisdom in our midst. The diversity of our individuality is what makes for the richness and resilience of our collectivity: the co-creativity of life spawns from diversity within unity.

This wisdom is as relevant for politics (true democratic representation) as it is for sustainable business and for community regeneration. In short, nature's inspiration can help us realign minds, hearts and souls with nature. It helps us remember that we *are* nature.

The bright future of biomimicry lies in its scientific, sensuous and soulful understanding of nature's wisdom beyond the confines of yesterday's divisive logic of dog-eat-dog competition and isolating separateness. The majority of past biomimetic materials have been developed in Europe, and the functional mimics mostly originated from nanoscale or microscale parts of insects and plants. In recent years, due to the advancement of nanotechnology, a new wave of biomimetics is being extended to the imitation of animals. Europe is at the center of development, and the USA and Japan are actively participating in research. Forefront of biomimetics research is being advanced by nanotechnology and is vigorously developed through the use of scanning electron microscopy-like electron microscopies that enable us to observe and analyze the structure, function, and physical properties of natural organisms. With these tools of nanotechnology, biomimetic engineers can investigate at the scale of single cells, especially for cell organelles and interactions between cells. The biomimetic analysis of communities of cell organelles and their structures would give us insights on how to develop nano scale constructs that may behave or function as the cellular constructs perform.

6.5 Semantics in Nature

In nature there are sets of processes and strategies followed in order to help adapt, evolve and survive in the world, and it happens sustainably and in its community. Certain patterns can be found in nature that allows it to develop successfully.

These can be categorized into:

- Communication patterns: processing information, and encoding and decoding
- Shape patterns
- Growth patterns

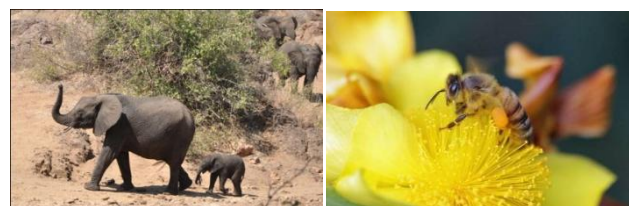
Communication Patterns in Nature: Processing Information, Encoding and Decoding

In order to survive in a community with one another different species must be able to communicate successfully. The interesting thing and almost basic thing to consider in communication patterns in nature are that it is done without relying on verbal language. The language barrier in nature is automatically broken down between species and communication and understanding is created. For example, some species of bees (figure) use signals to communicate to other bees to mark if the flower should be visited again for

nectar or not. "Researchers suspect that because of bumblebees are social insects, individual members of a hive leave marks" to help track the best blossom

Another example for the method of decoding "natural" messages by organisms is the development of marking on certain flowers that aid in drawing pollinators to it. The markings also enable the flower to discourage insect herbivores by "containing ultraviolet pigments".

Finally, species use different senses to communicate danger or stress to similar as well as other species in surrounding areas. For example, an elephant uses low-frequency vibrations produced by "stomping their feet" to communicate to others that there is danger. "The vibrations produce by its feet travel rapidly through the ground and are sensed through the feet of other elephants as far away as 31 miles (50 km)"



By using their different senses different organisms are capable of communicating different messages to one another in order to survive and co-exist in community. Although humans do this sub-consciously through body language and facial expression they are still confined to communicating only using sounds. The communication patterns found in nature can aid us in developing new products that can break down communicating gaps for users.

Shape Pattern

A bee has to eat eight pounds of honey to make a single pound of wax to safely store her honey and larvae in. It's an expensive proposition, and it has to be done efficiently. The ancient Greeks understood that modular hexagonal honeycomb makes the most storage possible with the least amount of material. Architects and designers are tapping this for all sorts of applications. Panelite, in New York, offers hexagonal Clear Shade insulating glass. It passively regulates heat, while still letting in lots of light. The Sinosteel skyscraper in Tianjin, China uses honeycomb windows the same way.



Growth Pattern

Biologists of different biological disciplines ranging from botany to ecology and micro-biology, robotics engineers, architects, designers, and artists collaborated to work with

the slime-mold as co-designer, investigate material systems with mycelium, and translate growth into novel 3D mobile printers. The slime mold experiments looked at the organisms' network creation within a three-dimensional

space grid, thus taking existing research a step further and showing how the slime could adopt this specific space-grid environment

New pathways for future projects taking architectural design closer to biological growth were laid with the described experiments. The open access policy that the authors took on for the project's results allows for other researchers to learn from the GrAB experiments and build on this knowledge. We believe that the widespread adoption of nature-inspired design and business solutions will catalyze a new era in industry that benefits both people and the planet.

6.6 Global benefit

The inspiration and ideas offered by ask nature are facilitating the creation of radically innovative, sustainable products and services around the globe.

How will we feed nine billion in 2050?

Nature has the answers. Biomimicry is the best strategy for creating more resilient food systems. Whether addressing waste, growing methods, pest management, packaging, preservation and distribution, soil quality – or a changing climate – nature offers innumerable strategies for solving issues around food and agriculture in innovative ways. And nature does so while supporting community and minimizing water use, energy use, and waste.

The Biomimicry is partnering with the food and conservation experts to solicit nature inspired solutions toward improving our food systems. From 2019- 2022, our Global Design Challenge will mobilize thousands of students and professionals around the world to tackle challenges around food. Our goal: show how modeling nature can provide viable solutions to reduce hunger and address industry challenges, while creating conditions conducive to all life. “Move over genetic engineering; biomimicry seems the better bet for solving global hunger.”

7. Hypothesis Testing

Economist turn to nature for guidance and inspiration, yet it is almost always done subconsciously. Several studies regarding the true meaning and understanding of how and why a design should learn from nature exist yet the process of learning how to create a design process using knowledge gained from observing nature is limited. We as economist have lost touch of where our materials come from and where they go. By addressing these issues, sustainable, innovative, reduced products can be developed. The main issue we now face is that by the time a economist looks to nature and asks it for help during the manufacturing process the design problem has already been solved; how it will be produced is already known and only a natural inspiration .

Therefore, it is hypothesized that by learning from nature's knowledge, initially as inspiration for solving problems but also in the wider context of asking nature for solutions to everyday problems we face, economist can develop more innovative designs that are in harmony with nature in a sustainable sense.

Null hypothesis: The proportion of product design uses in the industry who would use a technological ways.

Alternative hypothesis: The proportion of Machine in the industry who would use design based on natural resource is higher than the proportion who would use method which is artificial resource based.

Changing Technology with Natural resources

Higher technology use rates were observed in the active natural resource at 80 weeks (46.7% vs 20%) ($P < .001$) and at 1 year (27.5% vs 14.2%) ($P = .011$). (Hurt et al., 1994, p. 595)

Conclusion: p-values are quite small: less than 0.001 for difference after 80 weeks and equal to 0.011 for difference after a year. Therefore, rates of quitting technology are significantly higher using a natural resources than using technology after 80 weeks and after 2 year.

We conducted two-tailed tests for possibility the mean natural design score could actually be higher for those whose technology based are more. The CI provides evidence of the direction in which the difference falls. The p-value simply tells us there is a statistically significant difference.

The endless possibilities that can be achieved by the collaborative relationship between design and nature are not fully utilized. The relationship between nature and design is a vital one that must be improved consciously in order to enhance the innovation and sustainability of a product design. This can be achieved by considering the principles of life found in how strategies of survival are developed in nature, evolution and growth as well as through deeper understandings of survival techniques and processes used in nature every day. This article discusses the meaning of design strategies and the differences between Inspired by nature and inspired by technology.

Although this in itself relates to our basic human instinct in what we are born familiar to and how problems in nature are solved: by using information and shape according to Dayna Baumeister, there are much more possibilities that can be utilized. We as natural beings have “a desire to be more like the organisms we admire”

And therefore the potential for a designer of utilizing nature as a mentor during the design process is far greater than what we currently know. Therefore, it is hypothesized that by learning from nature's knowledge, initially as inspiration for solving problems but also in the wider context of asking nature for solutions to everyday problems we face, designers can develop more innovative designs that are in harmony with nature in a sustainable sense.

8. Conclusion

Therefore, design can be compared to nature in:

- 1) The developmental and process approach.
- 2) The understanding of how nature grows, adapts and survives.

a) What kind of connections exist between economy and biomimicry.

The process starts from the design table. The products should be designed in a way that the whole lifespan of the product is taken into account. The attention should be paid on energy consumption, raw materials extracted, transportation need and recyclability. But first of all, an important questions to ask and answer: is the product necessary and is it part of a larger economy that works on the behalf of nature and people. Thinking about necessity is really important since it screens out the products that are not needed. There are hundreds of thousands of products produced every day that have no significance whatsoever.

Profits are basically the main reason business is done at the first place. Therefore it is important to find out if the product has an economically viable role (Biomimicry Guild 2008-2010a). When designing using nature as an inspiration, it may turn out to be an expensive and long lasting project. Learning how nature's processes could be applied to the production of a specific product, could take years of studying. Of course the viability should be considered always when creating something totally new and innovative.

Our creativity for new materials and innovation is limited by how much we are able to employ the great idea bank of nature. Every organism on Earth has evolved through adaptation and survival of the fittest. The creatures have lost what made them weak and kept those technologies that kept them strong. As human beings, we have the responsibility to be stewards of this idea bank to increase the quality of living while overcoming the degenerative forces that may destroy the environment and the human condition. Advancements in biomimetics hold the key to more cooperative evolution and technological development.

Therefore, by using this approach, theoretically it might help designs develop in a more natural, sustainable way while still aiding to the end-need of the user, and the final form of the product. The product/nature comparison will be linked on in the paper are in strategy development phases to develop a process that incorporates understandings successfully.

b) Does Biomimicry helps to sustain the economy.

Biomimicry is really comprehensive: it provides innovative solutions to environmental problems and answers to sustainability dilemma, but it is an ideology, too. By studying nature people learn to respect it and understand the importance of conservation, in other words, the more people, especially business people, are aware of the potential of biomimicry, the more they want to protect biodiversity – every loss of species is a potential loss for new sustainable and profitable innovation. Adopting this ideology may affect on the way we see ourselves in the world's order.

Organizations and people in groups can apply this/ these Innovation inspired by nature i.e biomimicry strategies in economy.

Biomimicry really help any organization requires a substantial investment in both time and money. The larger the organization, the bigger the investment usually is. This

raises a question: is design innovated by nature only for those companies that can afford to experiment new ways of doing their business? Not only the potential high price tag for product design gone wrong, meaning that the product won't sell, but also the fact that using biomimicry in design requires know-how and advanced technology may turn out to be a stumbling stone. Smaller companies don't have their own designer or engineer sections where they could develop new innovations. Sure they can always hire someone to do that, but again, it costs money.

c) Reimagining the Future

Businesses that wish to not just survive but also thrive in the years ahead are those that are agile, responsive and adaptable. Such firms of the future are able to continually redesign themselves for resilience.

These are characteristics we find with great abundance in Nature. The more we tune into the natural world around us, the more we open up to the answers all around us in Nature

After all, nature has been dealing with transformation and volatility for over 3.8 billion years.

9. Acknowledgments

Acknowledgements go to our sleeping partners and collaborating scientists: Moritz Dörstelmann, Rangel Karaivanov, Joseph Hofmarcher, Kourosh Asgar-Irani, Bika Sibila Rebek, Josip Bajecer, Lisa Sommerhuber, Natasha Chayaamor, Andreas Körner, Rafael Sánchez Herrera, Ceren Yönetim, Laura Mesa Arango, Mariya Korolova.

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