Biomimicry and the design process

What is Biomimicry?

According to the definition presented by the Biomimicry Institute, “Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature’s time-tested patterns and strategies.”. In other words, Biomimicry is a way to develop new solutions based on what the nature already proved to be well-adapted to life on Earth. If we consider that what exists in nature today is a product of more than 3.8 billion years of tests, we have to consider that we have no better examples and inspirations. Following the nature examples, we would be able to create the most efficient solutions – considering space, energy, waste, etc. This means that, to build a truly sustainable environment, we do not need to create new rules, but to follow successful rules that are all around us.

Why this kind of bio design is more interesting than the others?

The most interesting characteristic of this kind of design is that it takes the nature as its model. In the nature, animals, plants, microorganisms are truly engineers and have been designing things for their survival. They had billions of years to prove that their specie is able to live on earth by building and destroying things. “After billions of years of research and development, failures are fossils, and what surrounds us is the secret to survival.” So, the bio design learns from the natural world: it takes something that has its success established and recognized as inspiration and try to mimic its process. As a result, it can produce truly sustainable products, using less material and more design.

Who is working with this?

Biomimicry is an interdisciplinary process that involves biologists, designers, computer scientists, artists, etc. Looking for names that could represent the mass of researchers that dedicate their time to learn from the nature, I found three respectful names: Janine Benyus, Ryan Hoover and Neri Oxman.

Janine Benyus is a biologist, innovation consultant and author of the book Biomimicry: Innovation Inspired by Nature and five others. She propagates the idea that we should learn from the genius that surround us, and her favorite role is “Biologist-at-the-Design-Table”. She is also the co-founder of Biomimicry 3.8, the world’s best in biomimicry innovation consulting, training for professionals, and curricula development for educators.

Neri Oxman is the architect and designer who founded the Mediated Matter design research group at the MIT Media Lab. The focus of this research group is to intersect computational design, digital fabrication, materials science and synthetic biology, and apply its results to designs from the micro to the building scales. They create biologically inspired and engineered design fabrication technologies and tools and structures aiming to enhance the relation between the natural and the artificial environments.

Ryan Hoover is a board member of the Baltimore Under Ground Science Space where he leads research and development on bio printing. The researchers have focused on printing with plant cells and genetically engineered bacteria, and they are now exploring various approaches to bio printing, including syringe-based printing of cells suspended in agar, filament-based printing with polycaprolactone, and DLP Stereolithography with photopolymer hydrogels. They also developed a plug-in for Grasshopper called Xylinus. It generates G code directly from Rhino and Grasshopper geometries to 3D printers. The plug-in is named after *Glucanobacter xylinus*, which produces a fine microbial cellulose fiber that is being studied as a biomaterial with several compelling properties.

What is my project?

My project consists in three steps: experimenting, modeling and printing. In the experiment phase, I will build a sand box where volunteers will play with in order to produce images to be captured by a Kinect positioned on the top of the sand box and connected with Grasshopper. The images will represent the state of the sand at the time of the capture, representing regions of more or less material. Based on the results of the first phase, I will model a nature-based pattern, which is going be an interception between mimicking what exists in nature and following the points generated on Grasshopper with the experiment. The result will be – ideally – printed in 3D, laser cut and cut using the CNC machine. The idea is to see different results of the same pattern using different materials and techniques, which will be defined by the machine that is going to be used.

In what my pattern will be inspired?

The product of the second phase of my project is a pattern inspired by some elements in nature. The inspiration I chose is the epithelial tissue disposition of cells. This kind of tissue has seven different types: simple squamous, simple cuboidal, simple columnar, transitional, pseudo stratified columnar, stratified cuboidal and stratified squamous, as you see in the picture. The most interesting disposition is present on the stratified squamous type. There, you can find a clear differentiation between the surface and the most internal part, and this differentiation could be an interesting characteristic to the pattern. Also, this differences in the size and shape of the cells could have an impact on the results of the different machines (laser cutter, 3D printer and CNC) since they all will be using different materials and different techniques to produce the pattern.

References

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