"Inexhaustible" Inspiration: Thomas Knittel Talks Biomimicry

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Biomimicry expert, Thomas Knittel

A building shaped like a butterfly. A skyscraper modeled after self-cooling termite mounds. A structure in arid climate inspired by a desert snail. Biomimicry, the application of nature's principles to solve problems, is an emerging influence in modern day green building and other design and technology.

Last month, USGBC staff were fortunate enough to hear from architect, biomimicry specialist and HOK VP Thomas Knittel, who visited our office in DC and gave a stunning presentation on biomimicry as part of USGBC's Leadership Institute, our new leadership development initiative for staff.

I caught up with Thomas after the presentation to pick his brain even more.

Amy King: HOK is USGBC's partner on Project Haiti, our effort to build a LEED Platinum orphanage and children's center in Port-au-Prince. How have you been able to integrate Life's Principles into the project?

Thomas Knittel: Life's Principles were developed by Biomimicry 3.8 to describe the overarching patterns found amongst species surviving and thriving on Earth. For me, this set of six principles and 20 sub-principles identifies what you could call system-level success. Whether it is dynamism critical to homeostasis (Gaia Hypothesis), or individual parts operating in the system, these patterns are not just an ethical overlay, but common sense if we want to continue living on a planet with limited resources.

Nature doesn't have a concept of credit. Self-limits are important, and when we see this as liberation, we will open a whole new area of innovation. In Haiti there are extreme limits, more than anyone would normally choose to have. In Haiti we are working really hard at being resource efficient and locally attuned and responsive with some success. We would like to move farther into the territory of using life-friendly chemistry, but this is a challenge for everything we do. Our building industry, like most of what we fabricate, is based on "heat, beat and treat." Evolving to survive, integrating development with growth, and adapting to changing conditions require a generational mindset and long term thinking, but that's the beauty revealed in adaption. In turn, we have to take steps today to achieve them. In Project Haiti, we have worked with USGBC to deal with the very real limitations of a dis-functional electrical grid and outbreaks of cholera. It reminds us we are lucky to have the ability to pursue a LEED Platinum project in Haiti, which is pretty noble, given the situation. Life's Principles becomes a filter we return to, and brings a recursiveness that is needed in a normally linear process.

AK: What do those of us who aren't designers have to learn from biomimicry?

TK: The study of biomimicry requires opening the mind and learning from a vast database nature has accrued. I think it is inexhaustible. Designers may have an easier entry point because we are already trained in ideation, are constantly seeking precedents, and look for the horizontal transfer of ideas from other disciplines. I recently completed the inaugural Biomimicry Specialty Certificate program, and the cohort was about half designers and the others were from a diverse range of backgrounds: biologists, scientists, engineers and strategists. It was amazing for me to see non-designers translate concepts to actionable ideas. Bio-inspiration in areas related to physicality may be more apparent to designers, but equally important are biological principles at systems levels. Non-designers may be the ones who can make the greatest contributions in this area.

For instance, when we design buildings, we have traditionally designed for peak conditions to satisfy constant ambient conditions. However, the human body is a thermal heating and cooling mechanism and sensation is based upon change, not stasis. Buildings don't consume energy, people do. There are several great

principles in nature to rethink how we can shift to a bio-centric approach. For example, pollinators cooperate in the consumption of fixed resources, and biologists call this 'resource-partitioning guilds.' They consume at different times of day, place or seasons to not overtake the resource. We've also learned from nutrient cycling in organic soil that the rate of consumption is key to maintaining resources. A forest maintains its resources by growing within the limits of a key-slow factor, such as nitrogen. The insight to this natural system becomes a trigger to discuss what any system, whether energy, social or economic looks like when the slowest part of that cycle is the most important part to protect and cultivate, and that the rate of consumption is as important as the quantity itself

These are just a few examples of how non-designers may be well equipped to bring to light biomimetic principles in social, organizational and economic arenas. They may also lead to how we rethink buildings operationally, which in turn will change how we design them.

AK: HOK just published the Genius of the Biome report. Tell us about it and your future plans to leverage technology and GIS.

TK: The Genius of Biome (GoB) report came out of our strategic alliance with Biomimicry 3.8 (founded by Janine Beynus and Dayna Baumeister). It is a genius of place of the Temperate Broadleaf Forest, which covers the east coast of the U.S. and stretches across Europe and Asia, where we have several offices. It describes the strategies and designs adopted by living organisms and their ecosystem level relationships, and are intended to stimulate innovation and deep thinking about the unique challenges of the biome. We structured it around re-occurring challenge areas: water, energy and materials, and also social and economic categories because they are important to our clients and communities. Our project-based FIT (Fully Integrated Thinking) approach typically expands this to 14 categories to include education, culture, food atmosphere, etc.

The GoB frames questions in a way that can align with a biological strategy. "How does nature...(reduce erosion)?" It then looks at the design of an organism or ecological process and how it solves the challenge. This is abstracted into a design principle leading to ideation; ideally on real projects. It has also led to a concept I am developing with HOK Product Design.

For me, the potential of the Genius of Biome reports lie at different levels. For example, while we were working on the report, I was designing a mixed-use project in Wuhan, China with a series of green roofs at different elevations around an outdoor entertainment district. The GoB described how beaver dams control erosion in the watershed, and the design principle was a series of leaky barriers. The insight to connect the roofs as a system became an example of how the GoB could impact designs in process. But the real value is much deeper. I think the more we catalogue how adaptions among organisms have solved the biotic/abiotic equation in a given place, we will imagine how we can apply them to our own challenges in significant ways.

The future of the GoB is unfolding. We published it internally on our intranet, and are exploring how to share it with a larger audience. I imagine GoB's for the other 17 biomes, linked to GIS-based ecological performance standards populated in an open-source framework, but this is just a dream for now.

AK: At USGBC, we emphasize the importance of servant leadership. Who has been the biggest mentor in your career and why?

TK: I worked for well-known environmentalist and principal at BNIM Bob Berkebile for almost 15 years, first as a student, then as an intern earning my license, then later for 10 years at the same time the USGBC was emerging. His enthusiasm, passion and energy is known by many. He has a talent of navigating any situation with grace and wisdom. Once, when I was in my late twenties, we flew to Des Moines to present a retirement community design to a client. He hadn't seen the latest work. The client wasn't happy. He clearly had two choices, and he stood by what I had done. Somehow that stuck with me over the years. I think of how important it is to have institutional resolve, respect and support each other. If we fail, we fail together.

His accomplishments are well known amongst the design community and it was a real pleasure to have the chance to work with him.

AK: What is the future for biomimicry?

TK: I think biomimicry is one way of thinking deeply about a place, or trigger ideas beyond our normal solution set. I think biomimicry will increase the overlaps of cross-disciplinary thinking, and engage the sciences and arts in new ways.

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