

## Ecological Thinking for Radical Transformation

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[Adapted from Denise DeLuca's presentation *Ecological Thinking for Radical Transformation* presented at the seminar *Human Nature* hosted by the Antonia Ax:son Johnson Foundation for Sustainable Development 01 August 2012 in Bjäre, Sweden.]

### Human Nature

Neuroscientists are beginning to understand the uniquely human aspects of human nature. They have discovered, for example, that we humans are unique in our ability to understand time and consequences, and have a unique capacity for empathy and tolerance, imagination and creativity. In this paper, I'd like to explore the nature side of human nature. I'd like to make the point that humans, nature, and human nature are– or could be – seamlessly interconnected components of an endless positive virtuous cycle, and that by re-connecting this cycle we can lead ourselves into an era of sustainability.

First I'd like to emphasize that humans are part of nature, and a very small part at that. We share the earth with somewhere between 10 and 30 million different species of organisms. To put that number in perspective, let compare humans to ants. There are over 12,000 species of ants that are known to exist. Scientists estimate there are at least 1.5 million ants on the planet for each human being. The estimated 10,000 trillion individual ants alive at any one time weigh about as much as all human beings combined.

Humans are also part of nature's cycles, and nature's cycles are part of us. To illustrate that point, let's all take a deep breath. With that single breath you just inhaled 10 sextillion atoms of air. Owing to the ceaseless circulation of air around the earth, over one year's time you breathe in oxygen molecules exhaled by every other person alive, as well as by everyone who ever lived. Right now you may be breathing atoms that were once inside the lungs of Carl Linnaeus, Astrid Lindgren, Alfred Nobel, Ingemar Stenmark, Ingrid Bergman, The Dalai Lama, Buddha.

And think of the last meal you ate. You are, with the help of whole ecosystem of bacteria that you host in your gut, transforming bits of bread and cheese, soup and salad, cookies and coffee, into bits of muscle and heat and movement and even thought! So we are very much an integral part of nature and nature's cycles.

We are beginning to re-appreciate our roles in nature and we are beginning to recognize that not only can we learn incredible things *about* nature; we can learn incredible things *from* nature.

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For example, we're beginning to recognize that all life on earth is created using just a handful of elements (mostly C, H, O and N) -- the very molecules you are breathing and digesting right now -- and using just the instructions contained in the four base pairs of DNA. We are beginning to recognize that nature achieves functionality, diversity, complexity, beauty and sustainability out of simplicity.

## **Biomimicry for Design**

Biomimicry, or innovation inspired by nature, is all about learning *from* nature, looking to nature for ideas to inspire our technologies. Biomimicry has generated some clever technologies that you are already familiar with: Vecro, inspired by burrs; corrugation, inspired by scallop shells; and solar voltaics, inspired by photosynthesis.

There are actually a multitude of scientists, architects, designers, and engineers around the world who are looking to nature as model, measure, and mentor to come up with design solutions that are innovative and sustainable. But we have barely begun to understand and emulate the incredible materials, processes, and systems found in nature.

For example, in nature you'll find packaging that allows for infinite proportional growth, that sequesters carbon, uses only locally available and abundant resources, and a manufacturing process based on self-organization. (e.g. spiral-shaped sea shells)

In nature you can find perfect and optimal geometries that are adaptable, fit for purpose, and completely biodegradable. (e.g. honeycombs)

In nature, you'll find large groups of individuals that are able to perfectly coordinate their activities without a leader. (e.g. beehives)

In nature you can find gorgeous colorful waterproof multifunctional materials that are beneficial to the environment at the end of their useful life. (e.g. peacock feathers)

In nature you'll find materials made out of thing like dead flies and spit that are many times stronger than environmentally-harmful man-made materials and yet are so delicate you can hardly see or feel them. (e.g. spider webs)

In nature you'll find organisms that can collect drinking water in a place where it never ever rains. (e.g. Namibian beetles)

What is the message here? There are somewhere between 10 and 30 million different species living on earth today, and only one of them relies on fossil fuels and toxic chemistries. All of us -- humans and the rest of the organisms in nature -- have to learn to survive and thrive within the constraints of the earth or we will eventually go extinct. These constraints are pretty well known.

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Earth is water based – the “blue planet”. This suggests that sustainable designs rely on water-based chemistry. Earth is constantly changing and somewhat unpredictable. This suggests that sustainable designs should be responsive, adaptive, and resilient. Earth has limited resources -- even the amount of solar energy reaching the earth is limited. This suggests that sustainable designs should use resources cleverly, addressing multiple functions and creating value through consumption.

All of the other organisms in nature -- with small brains or even no brains at all, with instructions borne of just 4 base pairs in DNA and using a just handful of elements -- have created an immeasurable diversity of design solutions and processes and systems that are incredibly efficient and elegant and beautiful, and that have survived for almost 4 billion years.

Humans on the other hand -- with our large brains and uniqueness, our machines and factories, our cars and computers, and our incredible capacity to extract natural resources -- have come up with some very clever, highly desirable, and impressive inventions, but we are proving ourselves to be unsustainable. How clever is that? We thought we were building pillars of industry, but we now know we have created castles of sand.

What is the answer? Biomimicry for design, or innovation inspired by nature, is an important part of the answer. By understanding and then applying the geometries, chemistries, processes and integrated systems approach we see in nature, we can create far more sustainable design technologies. However, a bigger, deeper, answer lies in human nature, and in ecological thinking for radical transformation.

To achieve an era of sustainability, we need a radical new vision – an incredibly beautiful and compelling vision -- of what ‘sustainable’ means to humans. We need radically different ways of interacting, communicating, collaborating, and co-creating with each other. We need to create conditions where we can fully deploy our imaginative brains, where we can be tolerant of and empathetic to each other and to the rest of nature, and where we can be both creative and productive. And we can learn all of this from nature -- using our own human nature to apply ecological thinking to achieve the radical transformation needed to achieve an era of sustainability.

## **The Real 10**

To create designs inspired by nature you need biologists and engineers and designers -- people from all disciplines and walks of life -- to be able to communicate and collaborate and co-create. That is the big challenge that biomimicry for design is taking on. Yet there is an even bigger challenge.

Right now we tend to limit our vision to what we think can be done based on past experiences. If we create a scale of 1 to 10 based on our past (P) experiences, we tend to

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limit ourselves to striving for a “P10”. For example, when we talk about sustainability goals we talk about changing light bulbs, planting trees, increasing the efficiency of our cars. These are all laudable goals, yet if we accomplished every single one of these goals, we’d still only achieve an era of “less bad”.

We also tend to believe that we must strive for either profit OR for sustainability. Those that are high performers, as in business, believe they have to sacrifice profit to gain sustainability. Those that have a high level of human and environmental awareness fear that increasing performance can only come at the cost of sustainability.

Self-imposed constraints based on past experiences inhibit us from generating the vision that we need to create an era of sustainability. The “Real 10” is what we see in nature. The Real 10 is off the “P” scale, out-performing our present business thinking and out-striving our present sustainability thinking. What can we learn from nature about how to transform from a P10 to an R10?

We can learn to be synergistic rather than independent.  
We can learn to be collaborative rather than competitive.  
We can learn to leverage collective intelligence rather than top-down control.  
We can learn to embrace diversity and adaptability rather than trying to resist change.  
We can learn to be open source rather than close source.  
We can learn to optimize across the many rather than maximize for the few.  
We can learn to seek return on engagement rather than return on investment.  
We can learn to think and work in dynamic systems rather than in linear chains.  
We can learn to think and work in dynamic systems rather than in linear chains.  
We can learn to consider the very long term while we address the very short term.  
We can learn to be emergent rather than predictive and pre-planned.  
We can learn to be effective, not just efficient.

We are beginning to realize that our old business models are not sustainable, and we already know that our manufacturing models are not sustainable. We are reaching the end of an era, and are ready to envision and create a new era, an era of sustainability.

We can learn from nature how to transform our organizations into dynamic co-creative adaptable responsive life-supporting –sustainable – systems. We can put the nature back in human nature and allow humans to reintegrate into the positive virtuous cycles of nature. We can, using the imagination, empathy, creativity, and spirituality of our human nature, and with youthful curiosity and vigor, lead ourselves into an era of sustainability. We can learn from nature how to use ecological thinking for radical transformation.

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