Biomimicry

A presentation by Claire Janish
13 April 2010, at the Klipriviersberg Conservancy AGM

Biomimicry is the conscious emulation of life's genius

Claire Janisch kindly agreed to provide the Klipriviersberg Conservancy with an insight into a rapidly growing discipline and approach to designing a sustainable environment through the study of nature. Claire is a graduate of The Biomimicry Institute's inaugural 2-Year Certificate Program (Master's equivalent) and currently heads up the biomimicry activities and projects in South Africa.

Organisms and ecosystems face the same challenges that we humans do, but they meet those challenges sustainably. The premise of biomimicry is that Life has been performing design experiments in Earth's R&D lab for 3.8 billion years and what is flourishing on the planet today are the best ideas - those that perform well in context, while economizing on energy and materials. Whatever the design challenge, the odds are high that one or more of the world's 30 million creatures has not only faced the same challenge, but has evolved effective strategies to solve it.

Nature works for maximum achievement at minimum effort. The selective pressure placed on all natural life forms minimizes and removes failures. Organisms are the consummate physicists, chemists, and engineers, and ecosystems are economies beyond compare. They can provide us with innovative and progressive solutions to the design, engineering and other challenges that we now face: energy, food production, climate control, benign chemistry, transportation, packaging, and more. The vision is to create products, processes, organizations, and policies—new ways of living—that are well-adapted to life on earth over the long haul.

A few notes taken from Claire's presentation:

- Energy and material efficiencies have already been designed by our environment; these designs can lead us to **real sustainable living**. Nature has invested in research and development for 3.8 billion years
- Earth is subject to limits and boundaries. We have to adapt and evolve in order to fit these limits, and this is something the environment has already done, it has created **conditions that are conducive to life**
- We need to look at the environment as **optimisation rather than maximisation**
- And this knowledge and mindset needs to be integrated at the **school level**

Case Studies showing the practical applications of biomimicry:

1. **Gecko tape – BAE Systems**

The development of Gecko tape was inspired by the gecko's ability to climb vertical surfaces and upside down and easily peel their feet off the surface again. This ability is due to Van der Waal's forces, which are weak intermolecular attractive forces.

The potential use of this innovation is that of any components that need to be stuck together and can easily be pulled apart and recycled, for example motor vehicle parts.

http://baesystemseducationprogramme.com/what-is-engineering/gecko.php

2. **How does nature move fluids? - Pax scientific, Pax fan, Pax water**

A path of least resistance has been identified, the core geometry that nature uses. This has been applied to the science of air movement in order to create quiet, energy efficient fluid moving technologies. The geometrically designed curves of the blades generate a powerful vortex on their downstream sides, accelerating air towards the center with markedly reduced turbulence, significantly reducing noise and energy consumption.

www.thepaxgroup.com

3. How does nature move fluids? - Whale power

Whales are massive animals that despite their size are able to make very precise movements. Using the aerodynamic study of the ridges on a whale's flipper, and applying this to the wings of planes, there was a 32% reduction in drag. This technology has also been applied to wind turbines, doubling their performance, redjucng drag and helping to create more efficient turbines.

www.whalepower.com

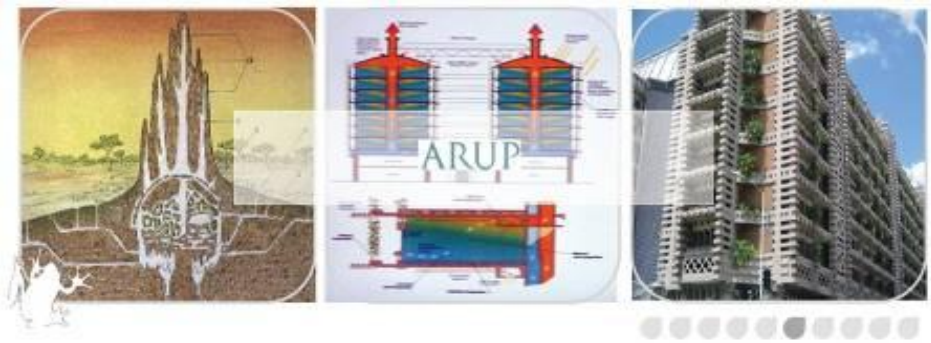
4. How does nature capture energy - Decentralised renewable energy

The way that trees are able to capture energy from the sun can be utilised for buildings. SolarBotanic can introduce artificial trees to collect solar radiation and wind energy. In this biomimicry concept their trees are fitted with Nanoleaves.

www.solarbotanic.com

www.s-m-i-t.com

5. **How does nature ventilate/cool? – Harare Eastgate centre**



The Eastgate centre in Harare has been designed and built using the same heating and cooling engineering techniques as a termite mound. This has dramatically reduced the use of energy in the building, an example of sustainable architecture that is economically viable.

www.arup.com

6. **Lightweight strong materials based on the layering of the material**

The way that these shells are structured, in a layering of their composites, can be used as a technique for building the strongest material that technology has seen.

The University of Sydney

7. **How does nature cycle carbon?**

How can we cycle carbon rather than trying to get rid of it, and use this carbon as a source of energy? In nature, our lungs are capable of extracting up to 90% of the carbon we breathe in, using carbonic anhydrase. Carbon can be made into fuel through the use of light activated

biocatalyst. Carbon Sciences is developing a breakthrough technology to recycle carbon dioxide (CO_2) emissions into gasoline and other fuels.

www.co2solutions.com

www.carbonsciences.com

www.carbozyme.us

www.novomer.com

www.calera.com

8. **How does nature make things disappear into systems? - Ecological Performance Standards**

The Biomimicry Guild is the only innovation company in the world to use a deep knowledge of biological adaptations to help designers, engineers, architects, and business leaders solve design and engineering challenges sustainably.

www.hok.com

www.biomimicryguild.com

www.lavasa.com

Other interesting website links:

www.AskNature.org

www.biomimicryinstitute.org

www.biomimicry.net

www.geniuslab.co.za

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