

## Design for the New Economy - What Would Nature Do?

**Biomimicry is the imitation of natural processes by humans when designing and creating technology or other systems to solve complex human problems.** Nature has inspired design throughout history. Aircraft wings, tire treads, digital displays and Velcro all have this in common. Biomimicry was popularized in 1997 by **Janine Benyus** in her book ***Biomimicry: Innovation Inspired by Nature*** and gained the world's attention when she appeared in a 2009 TED Talk. Janine founded The Biomimicry Institute for education, public policy development and consulting. Entire economic sectors including agriculture, energy, medicine, architecture, transportation and manufacturing can benefit from design changes which mimic natural processes.

In Harare, Zimbabwe the Eastgate Building was modeled after the self-cooling mounds of termites. The building uses 90% less energy on ventilation than most conventional buildings of its size. The Shinkansen Bullet Train of the West Japan Railway Company was the first high speed train in the world and travels at speeds up to 320 kilometers per hour. The train's chief engineer, who is an avid birdwatcher noticed the ability of Kingfishers to dive into the water with very little splash in order to catch fish. He modeled the train's front end after the Kingfisher's beak reducing energy use by 15% while increasing speed by 10%. Another lesson from nature in the area of medicine came from observing Chimpanzees.

Chimpanzees when facing parasitic illness have used trees of the *Vernonia* genus to heal themselves. Further analysis of these trees revealed chemical compounds which could help humans recover from similar illnesses such as hookworms. These three examples are only the tip of the iceberg in an entire range of natural solutions which are revealed at <http://www.asknature.org/collections>. Specific case studies where enterprise has recently benefited from Biomimicry are also available for viewing at this site.

Observation of nature reveals elegant design, intricate physics and chemistry managing sophisticated cyclical systems tested through the ages by time and natural selection. Nature avoids stress concentrations, makes things from fewer components and takes advantage of diffusion, surface tension and laminar flow. Nature's engines are isothermal and nature's factories build things larger not smaller than themselves. Complex systems in nature such as nitrogen fixation, the carbon cycle, self-assembly and healing appear to be effortless, energy and resource efficient. The first question designers and manufacturing engineers should ask themselves when seeking a desired outcome is **"what would Nature do?"** As society shifts from the linear production economy to the more sophisticated and resource efficient circular production economy, manufacturers will increasingly rely on Biomimicry to remain competitive in the new economy.



Self-healing appendages and camouflage in this lizard are two attributes man has learned to mimic in product design

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## The Impact of Air Transport on Your Corporate Carbon Footprint

Air transport has grown in popularity around the world and the greenhouse gas emissions caused by aviation have increased globally by 83% between 1990 and 2006. A single round trip flight from New York to San Francisco creates a warming effect equivalent to between two to three tonnes of carbon dioxide (CO<sub>2</sub>) per person depending on the type of jet aircraft. **To put things into perspective this one flight represents 13% of the 19 tonnes of CO<sub>2</sub> that the average American creates in one year and 25% of the 10 tonnes of CO<sub>2</sub> that the average European creates in one year.** Good management of air transport can significantly improve your overall corporate carbon footprint and profits.

The European Union (EU) recognized the heavy contribution of aviation to climate change, and set up the European Union Emissions Trading System to combat the effects caused by it and other industries. In America and Asia where similar laws have not been passed, airlines have taken a different approach. ATAG (Air Transport Action Group) which represents the aviation industry including manufacturers, airlines, airports, and the travel industry has presented a four pillar climate action plan. **This plan includes: improving fuel efficiency by 17% between 2010 and 2020 through the acquisition of 12,000 new aircraft at a cost of \$1.3 trillion; capping its net emissions at the 2020 level; halving net emissions based on 2005 levels by 2050 through advanced technologies and sustainable aviation fuels, and by taking 4 steps to cut aviation CO<sub>2</sub> through technology innovation, operational improvements, infrastructure efficiencies, and smart economic measures.** These include alternative fuel sources that cut emissions by 80%, reducing aircraft weight and improving wing design, as well as reforming air traffic management systems and working with governments to design a global market based system which accounts for emissions fairly and only once. The driving force behind these initiatives is the linkage between greenhouse emissions caused by aviation

fuel which has more than tripled in price in the past decade threatening the sustainability of the industry.

While air travel is extremely convenient in terms of reducing travel time **for 3.1 billion passengers and 51 million tonnes of air freight in 2013**, other lower cost and less carbon intensive alternatives are becoming more competitive. Electric high speed passenger and freight rail service is increasing in use in Japan, China and Europe. Freight has already moved via high speed rail from China to Belgium. China is planning a high speed rail system to North America through Siberia and the Bering Strait. Worldwide AEROS Corp. has introduced the ML866 prototype rigid helium airship which requires minimal crew to haul up to 66 tonnes of air freight. While the AEROS focus is mostly on mining and military they have proposed opening up their fleet to a wide range of pursuits in the future including leisure travel as an alternative to seaborne cruise liners. Seaborne shipping is not to be discounted as it along with rail and road transport manage 99% of the freight worldwide and all are increasingly more cost effective and carbon efficient than air cargo.

Businesses can significantly reduce their carbon footprint and costs by carefully monitoring travel and freight by air. They can still operate effectively by considering the following:

- 1) **Using teleconferencing and telecommuting to handle long distance meetings and projects.**
- 2) **Managing travel in a strategic manner, flying to hubs, staying longer and traveling by ground options.**
- 3) **Managing business related frequent flyer points which are known to drive up travel costs by 8%, and travel frequency by 15%.**
- 4) **Managing courier shipments to travel by ground unless goods are perishable or time sensitive.**
- 5) **Offsetting carbon emissions to fund renewable energy projects.**

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When we can be of service, please contact Chris at **604-328-7253** or at **[chris@biocentric.ca](mailto:chris@biocentric.ca)**