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The natural mother of invention

Biomimicry, the science of using nature to inspire design, is a growing area of business entrepreneurship.

From the earliest cave paintings to Beethoven's *Pastoral Symphony*, nature has inspired the arts. Increasingly it has inspired design. Whether it's da Vinci's study of birds for his early attempts at flight or, more recently, the study of why burrs tenaciously cling to socks that inspired Velcro, nature continues to offer both wonder and solutions.

"Everything in nature is a combination of hundreds, if not thousands, of millions of solutions to the things that humans are facing," says Jay Harman, an entrepreneur and biomimeticist. "Every single organism in nature is a remarkable library of invention."

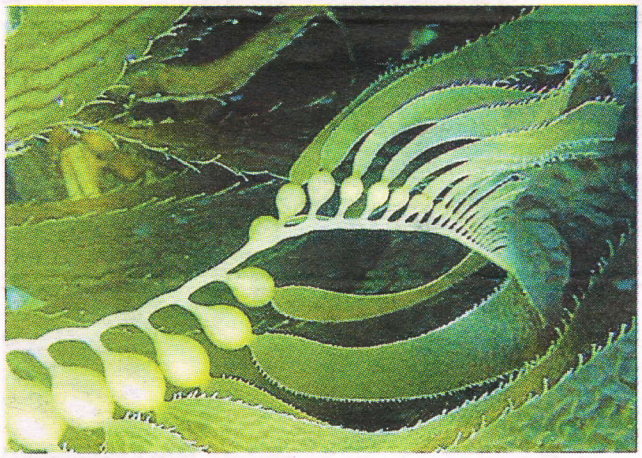
Lotus flowers' ability to repel water and dirt from their petals generated the Lotusan range of paints that self-clean buildings. The microbe-resistant properties of sharkskin helped the inventors of Sharklet devise an adhesive pattern for medical devices and consumer goods that inhibit bacterial contamination. A blue mussel's ability to cling to rocks inspired a new soy-based glue that's used in making PureBond non-toxic plywood and veneers (which normally use formaldehyde-based glues that release toxic fumes).

"The beauty is nature has already modelled everything for us," says Harman, whose book *The Shark's Paintbrush* (shortlisted for this year's Ashurst Prize for Business Literature) champions numerous examples of biomimetics. "It can be far more profitable, it's non-toxic, it doesn't damage our environment. When nature designs something it's always creating the conditions for life."

One of his "hero companies" is Flor Carpets. Not only are they fully recyclable, the carpets mimic the patterns of the forest floor so tiles can be laid in any direction and replaced easily. "This is a company that is 100 per cent biomimicked," says Harman. "It's totally focused on zero waste, zero emissions and it's an $800 million a year business."

An adjunct professor at Curtin University's sustainability department, Harman runs Pax Scientific, a private California-based research and design company specialising in fluid dynamics. He will visit Melbourne this month to explain the potential of biomimetics for business and the education sector.

"With our modern tools and capabilities and industrial systems we can shift over to this model really quickly," he says. "It's a runaway success in the areas that have been adopted already. Australia has one of the most diverse collections of ecosystems in the world to study. There are wonderful opportunities to look at nature and adapt nature's principles into industry."



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> JAY HARMAN

Art imitates life: (From top) Seaweed and a snail inspired Jay Harman's impeller; carpet tiles designed to mimic the forest floor.

While trend forecaster Colourways is bringing Harman to Australia, there are indications that this is more than a fleeting fashion. As Harman explains: "A research centre in southern California, the Point Loma Nazarene University, has done exhaustive research into biomimicry and its implications. They're saying that within 12 years biomimicry will create $1 trillion of GDP. Ten years after that it will be $3 trillion."

A West Australian, Harman grew up fascinated with water. A diver since the age of nine and a fisheries and wildlife officer later in life, fish and seaweed provided early models for his designs of boats and surfboards. Gradually he set upon a common shape, the whirlpool.

"The shape of all that movement in our universe is vortical or turbulent," he says. "Nature is always moving everything in the same patterns as the whirlpool in your bath when you pull the plug. Our heart muscles are designed that way. Our renal system, the trachea where we breathe in and out of, all mimic the geometry of whirlpools. That's what I've been focused on my whole life."

By studying the fluid dynamics of whirlpools his company has been able to design fans and impellers that can be applied to everything from quieter wind turbines to more efficient refrigerators. "[Pax has] at least 250 patents around the world granted or in process," he says. "The last person that seems to have ever worked on this subject was 500 years ago. Leonardo da Vinci was obsessed with this subject for the last 10 years of his life."

Indeed, the Italian polymath is a poster boy for biomimetics. As da Vinci declared: "Those who are inspired by a model other than nature ... are labouring in vain."

colourways.com.au; paxscientific.com