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BIOMIMICRY: NATURE'S OPERATING INSTRUCTIONS FOR ENERGY EFFICIENT FLUID HANDLING

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ABSTRACT

Technology development is a constant search for the next improvement. Across the planet, businesses, scientists, and engineers spend time, effort, and money searching for profitable solutions—many of which create new downstream problems, which must then also be resolved by technology. Biomimicry suggests another path: Engineers and scientists can learn from 3.8 billion years of safe, sustainable innovation and apply it to human goals. Biomimicry holds the key to addressing many of the challenges we face in terms of reducing both energy usage and our carbon footprint.

Biomimicry is the rapidly emerging scientific discipline of employing nature to advance sustainable technology. Examples of biomimicry include everything from solar cells that mimic tree leaves, to pharmaceutical breakthroughs based on the biology of lizards, to non-toxic adhesives that emulate sharkskin, to highly profitable businesses that use organizational practices based on redwood forests.

My specialty as a biomimic is in the observation of natural fluid flows. I grew up on the beaches of Western Australia and spent twelve years as a naturalist and boat captain with the government's Fisheries and Wildlife Department. My fascination with the high efficiency of water flow and animal movement led me to found and grow a series of biomimetic research and manufacturing companies that develop, patent, and license fluid handling products and applications including more efficient fans, pumps, mixers, and a novel thermodynamic cooling cycle. I will share examples of biomimicry in other fields and in our companies, the improvements that we see in fluid handling performance based on natural flow geometries, and how our scientists and engineers use computational fluid dynamics tools to advance our work.

Why do we need biomimicry right now? We live in a period that has more trained researchers, engineers, and doctors than in all of history combined. Yet despite all this knowledge and means, our future success as a race is in jeopardy. All wealth, historically, has been derived from natural resources. Given the abundance of nature, it has been easy to think of nature as inexhaustible. Early humans and societies were able to live off our planet's resources, but human creativity and specialized technology has since leveraged the earth's resources to the point where seven billion people must extract a living from these same supplies. Now our remarkable ability to invent has created such powerful technologies that we are pulling out materials, from petroleum to ocean fish to everything in between, much faster than nature can restore them.

I am convinced that nature is the best source of answers to the technological and design challenges that we face as humans. Nature is, after all, clean, green, and sustainable. Following nature's design mastery, we *can* achieve scientific excellence and economic sustainability while protecting our planet.