THE WAY NATURE DESIGNS

Could the ultimate outcome of parametric design be the elimination of design itself?

Recently, an architect I know wrote on social media, "Today, parametric modeling allows us to design the way nature does." This remark takes perhaps the oldest idea in architecture—that buildings can mimic living things—and updates it for the computer age.

In the earliest treatise on architecture, Vitruvius explained architecture as an imitation of nature. Two millennia later, Frank Lloyd Wright defined "organic architecture" as "building the way nature builds." Both theorists used nature as a metaphor, and the idea that parametrics now can emulate nature literally is extremely compelling.

HOW NATURE WORKS

First, let's be clear that when designers speak of "nature," often they really mean just the subset of nature that includes living things. This is even true of some scientists, in fact. Janine Benyus, the brilliant biologist who has popularized the concept of biomimicry over the past two decades, defines the term this way:

"Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time-tested patterns and strategies."

But the term actually refers more narrowly to "the design and production of materials, structures, and systems that are modelled on biological entities and processes." Biomimicry mimics biology, living systems—it's right there in the name.

"The core idea," Benyus explains, "is that life has been on Earth for 3.8 billion years and has learned during that time what works and what lasts and how to fit in here."

But nature is more than biology, of course. Duke University professor Adrian Bejan insists that physics, not biology, defines the most common processes in nature. His Constructal Law shows that, in nature, non-living and living things both are organized around consistent patterns that aid the flow of energy and matter. Think of the similar shapes of lightning bolts and coastlines, as well as trees and lungs. Some of these shapes evolved biologically, through evolutionary adaptation, but all work gracefully with natural physical processes.

"The designs we see in nature are not the result of chance," says Bejan. "They rise naturally, spontaneously, because they enhance access to flow."

Nevertheless, Bejan's use of "design" gets to the heart of my question. The first definition of that word is "to create, fashion, execute, or construct according to plan." Is it accurate to refer to nature as having a "plan"? Unless you take a theological point of view, nature has no motives, no intentions, no agenda, no plan. By and large, physical forces operate through Newtonian laws. Darwin scientists have defined evolutionary biology as an ongoing series of random mutations that either give organisms a survival advantage or do not. What works survives; what doesn't dies.

Louis Sullivan borrowed his famous mantra, "form follows function," from pre-Darwinian biology. But according to evolution, forms appear arbitrarily and only sometimes function. The line should have been, "form, then maybe function," but it doesn't have quite the same ring to it.

DESIGNING HOW NATURE DESIGNS

So, designing "the way nature designs" might mean randomly producing geometries, most of which would fail. A cynical view of design and construction might see this as how we already operate, but no matter how you look at it, design generally involves a set of intentions.

I opened my book, *The Shape of Green: Aesthetics, Ecology, and Design* (2012), with this definition: "Design is shape with purpose." But nature has no purposes. "Nature doesn't ask your permission," wrote Dostoevsky. "It doesn't care about your wishes, or whether you like its laws or not. You're obliged to accept it as it is, and consequently all its results as well." Despite Wordsworth's poem about "Nature's holy plan," nature in fact has no plan, holy or otherwise. Therefore, designing like nature is arguably a contradiction in terms.

This is especially true of parametric design, which by definition is built around a set of "parameters." Wikipedia describes it as centered on "the relationship between design intent and design response." However, it's possible that computational design eventually could be automated so that it literally follows the processes of evolutionary biology, but sped up—tinkering with thousands of variations and keeping the ones that

Pictured: Thorncrown Chapel, Eureka Springs, Ark.

work well in a given context. But to approximate nature this process would need to remove the designer from the equation and entirely escape the control of human intention. As design behaves more and more like nature, will it cease to be "design" at all?

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