

On Growth and Form:
The engineering of nature

Association of Collegiate
Schools of Architecture

East Central Region

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Introduction

Philip Beesley

"Matter as such produces nothing, changes nothing, does nothing...[it] can never act as matter alone, but only as seats of energy and as centres of force."

D'Arcy Wentworth Thompson, *On Growth and Form* (1917)

D'Arcy Wentworth Thompson, the first biomathematician, saw that all science and learning were one. He said that all animals and plants could be understood in terms of pure mathematics. An astonishing optimism accompanied this work, giving a vision of the physical world as a great symphony of harmonious forces. Thompson said,

"no organic forms exist save such are in conformity with physical and mathematical laws... The form, then, of any portion of matter, whether it be living or dead, and the changes of form which are apparent in its movements and in its growth, may in all cases be described as due to the action of force. In short, the form of an object is a 'diagram of forces'."

Thompson went far beyond the encyclopaedic and essentially static systems of nineteenth century biology. He conceived form as a product of dynamic flux. But this optimism falters. Looking into the future, *Scientific American Magazine* in their "Key Technologies of the 21st Century" 150th anniversary issue amended their usual tradition of American confidence with a mounting, anxious vertigo:

"The truth is that as technologies pile on technologies at an uneven pace, it becomes impossible to predict precisely what patterns will emerge. Can anyone today truly foresee what the world will be like if, for example, genetic engineering matures rapidly to its full potential? If organisms can be tailored to serve any function even becoming living spaceship, can anyone guess what a 21st-century factory will look like?"

Introduction continued

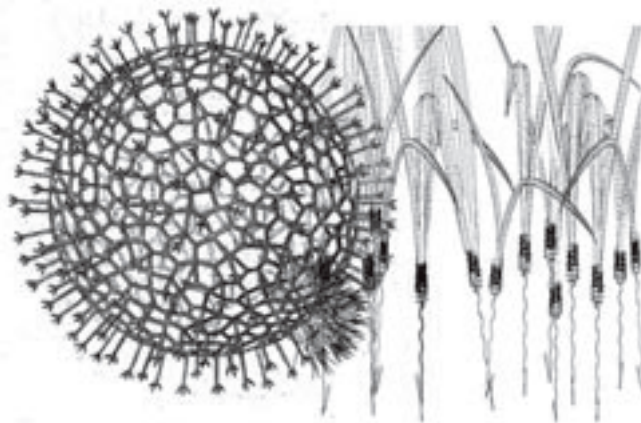
On the other hand we can turn to the Jesuit theologian Pierre Teilhard de Chardin, whose mid-Twentieth century writings captured surging hopes in emerging human experience. He conceived a central role for human consciousness in the evolution of planet earth. He called this collective consciousness the *noosphere* and envisioned it as a veil literally enveloping the earth, floating above the stratosphere.

What does happen when our traditional experience of nature is replaced? The projects of this conference offer new qualities. One kind, borne of patient craft and engineering, pursues new elegant optimums. Buckminster Fuller's tradition and the continuing research of Frei Otto's Institute for Lightweight Structures are like this. On the other hand, another quality is radical and almost deliberately unstable. The experiments in artificial intelligence and genetic development seen in this conference speak of continuous, restless transformation. The altered nature within those projects may invoke the tragic implications of Mary Shelley's *Frankenstein*, but the critical culture surrounding this work has moved from simple anxiety about tampering with Life. The projects seen within this conference suggest poignant, integrated involvement in complex systems. Donna Haraway says,

"We're inside of what we make, and it's inside of us... I am not interested in policing the boundaries between nature and culture - quite the opposite, I am edified by the traffic."ⁱⁱ

An uncanny quality of hybrid living things emerges. Richard Dawkins' 'The Selfish Gene' gives a picture of the fundamental effect that synthetic new materials can have on the entire environment. This environment includes human culture as well as physical structures. He says that causal influence radiates out from the material, but its power does not decay with distance. It travels wherever it can, along the avenues of inanimate structures and of animate biology, of bodily form, of cultural imagination and industrial production.ⁱⁱⁱ Changing, and inexorably transforming our world.

In this conference we want to explore the complex interweavings between nature and artifice that make our world.



ⁱ Key Technologies for the 21st Century: Scientific American—A Special Issue, W. H. Freeman and Company, New York, 1995

ⁱⁱ Haraway, D. J. (1991) *Simians, Cyborgs, and Women: The Reinvention of Nature*. Free Association Books.

ⁱⁱⁱ Richard Dawkins, *The Selfish Gene*, 1983, 237-8. Dawkins describes how complex living systems are transformed by dynamic exchanges of inanimate materials.