

All  
Creatures  
New and  
Strange



Man, beast,  
and architecture  
mingle in Peter Yeadon's  
Transgenic Zoo, a nano-  
neighborhood that  
takes "mixed-use"  
to a new level.

BY THOMAS DE MONCHAUX

Illustrations by Karen Oxman

BIOMORPHISM AND THE BEHAVIOR OF NATURAL SYSTEMS are among the more irresistible metaphors used by contemporary designers, whether describing swoopy blobitecture or booming megacities. Peter Yeadon, architect and professor of interior architecture at the Rhode Island School of Design, wants us to understand that the design of organic matter has long outrun the metaphor of organic design. "We're already designing new forms of life and new classes of substance," Yeadon says, referring to cloning, genetically modified foods, and such technologies as the atomically scaled construction of carbon nanotubes at the NASA Ames Research Center. "So," he asks, "how can architecture acknowledge and engage this era of living products?"

The answer to this big question is to think small. Bioengineering intervenes at the scale of the cell and the DNA molecule; nanoscience goes further, literally constructing matter at the subatomic level. Often the two sciences converge, as at the University of Toronto's Institute of Biomaterials and Biomedical Engineering, where biodegradable polymer scaffolds become temporary matrices for the growth of bones and donor tissue. "They were growing human bone fragments like coral," says Yeadon, who visited the lab as part of a RISD-supported research project, "but in theory both the polymer matrix and the bone cells could be configured into architecture."

The Transgenic Zoo is Yeadon's ongoing case study of how these microscopic revolutions might manifest themselves on an architectural, and urban, scale. Sited, theoretically, along the postindustrial waterfront of Toronto, where Yeadon lived and practiced in the 1990s, the project is a response to a decades-long debate about that land, and an exercise in visionary architecture. "It's a way of splicing into the city a thought experiment on the architectural implications of emergent technologies, nanotechnologies, and biosciences," Yeadon says, referring to topics also addressed in his Future Studio, an interdisciplinary design studio at RISD whose focus is the year 2020 and beyond.

Unlike a traditional zoo that isolates visitors from an exotic population of creatures, Yeadon's concept is a mixed-use neighborhood that blurs the boundaries between normative and mutated, organism and object, inhabitant and environment, and guest and

host. In transgenic bioengineering, the genetic code from one organism is spliced into the DNA molecules of another. The late-1990s project in which goats were bioengineered to lactate spider silk, a fiber seven times stronger than steel, is one example. The Transgenic Zoo would offer similar surreal displacements and disturbances: building skins engineered from reptile scales; circulation systems adapted from the electromagnetically adhesive cells on the feet of geckos; phototropic or otherwise environment-aware elements that are half pet, half furniture; and even programmable matter that rearranges its electrons on demand for the building materials of housing and other habitats.

For Yeadon, nanoscience represents a transformative technology "that potentially corresponds to the advent of electrical power or the domestication of animals," he says. It's a transformation in which he would like architects, long engaged at the intersection of aesthetics and ethics, to intervene: "When I talk about this work with scientists," as he did at a recent Santa Fe Institute conference, "their questions are about what should happen, not what could." He adds, "While architects today are talking about 3D prototyping, the Shared Tissue Engineering Lab at the Medical University of South Carolina is already doing 3D printing of living organs such as ovaries and cartilage, with cells in a biodegradable gel matrix. And what they're making is already architecture." ✦

For more information go to [www.yeadon.net](http://www.yeadon.net)

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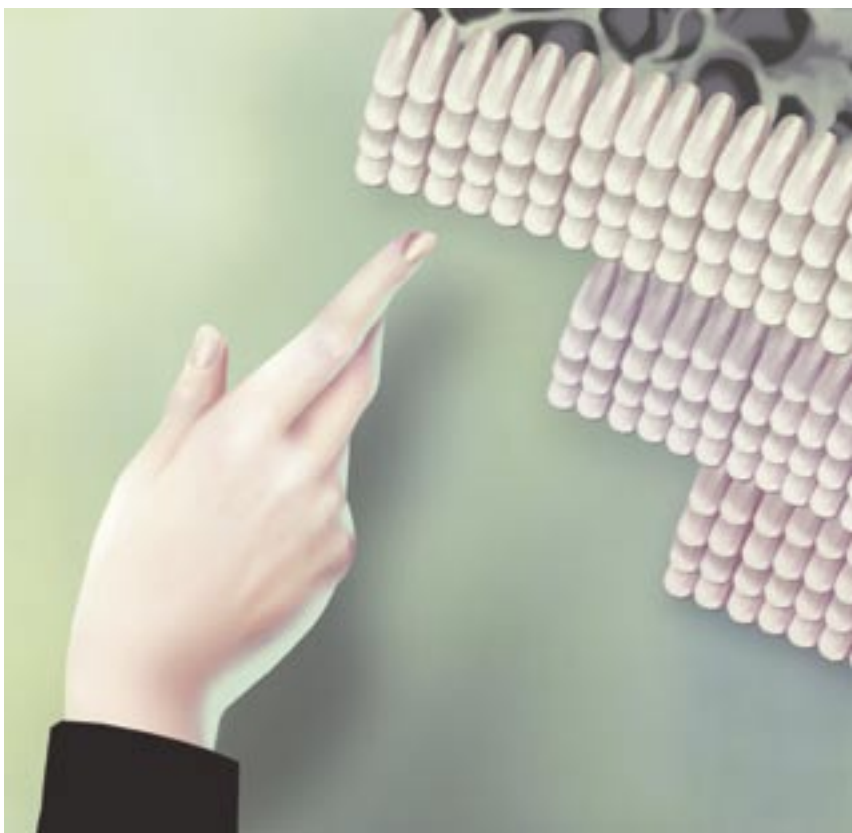
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#### GECKOVATOR

**In actual fact:** Gecko feet sprout millions of tiny hair-like protrusions called setae. One seta has hundreds of spatula-shaped tips, each 200 nanometers in diameter, that generate an atomic interplay with whatever surface they encounter. As electrons in the tips of the setae move about, the atoms fluctuate from positive to negative, provoking an attraction/repulsion dance that enables the gecko's foot to adhere to any surface. This phenomenon is known as Van der Waals forces in quantum physics. Manchester University in the U.K. has developed a tape of synthetic setae that will enable humans to mimic geckos.

**In the Transgenic Zoo:** Self-climbing conveyance devices called Geckovators would replace conventional elevators and interior corridors. People would move freely along the facades of the buildings to get to the desired suite.





#### HOMEOWN GROWN ORGANS

**In actual fact:** As tens of thousands of people wait for organ transplants in America alone, bioengineers are working toward a scenario in which you will be able to grow your own organs. Polymer scaffolds are already used to grow cartilage, skin, bones, pancreases, livers, kidneys, and other organs. The scaffolds are precisely formed and contain tiny pores that are planted with an initial distribution of cells, which guide the regeneration of additional cells and enable growth to occur. As the cells multiply, the biodegradable scaffolds decompose, eventually leaving an intact organ.

**In the Transgenic Zoo:** Polymer scaffolds could be used to grow human nails of varying size for a neighborhood beauty salon. Decoration, of both architecture and the human body, would become one living organism.



#### BIOARCHITECTURE

**In actual fact:** The radial symmetry of a jellyfish allows it to respond to food or danger from most directions. Jellyfish do not have brains; they rely on an elementary nervous system that perceives light, odor, and other stimuli through receptors. An interconnected nerve net conducts impulses around the jellyfish's entire body. The stronger the stimulus, the larger the response.

**In the Transgenic Zoo:** Environments would provide a coordinated response to sensory stimuli, whereby the architecture is also considered a form of life and is animated by interactions. Buildings would feature abundant surfaces for a receptive molecular coating, nanometers thick, of peptides and proteins that serve as messengers. Often called "molecular Lego" because of their ability to form particular molecular structures, peptides can self-assemble and disassemble and conform to environmental influences. For instance, a building might seal off its openings at the first sign of harmful gases in the environment, or defend itself against water damage by transforming its facade into water-repellent reptile scales.