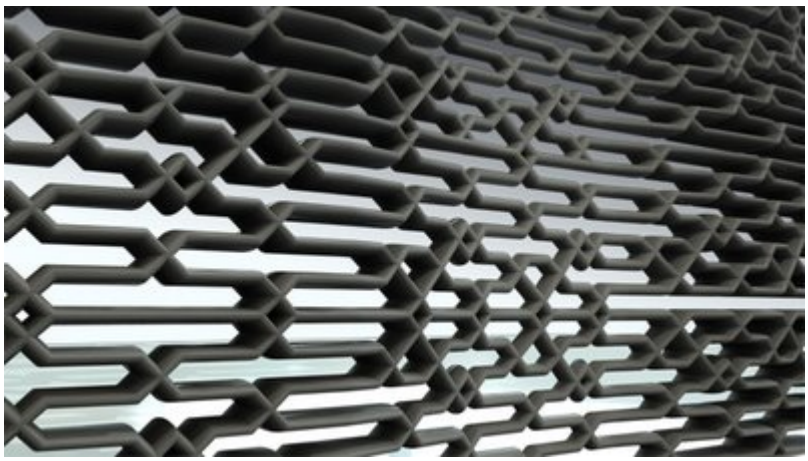
Morphocreative



As the discourse and exploration into computation as architectural design continues, more insight is being offered into the potentials of tomorrow's digitally charged world. New techniques for form generation and fitness criteria in which to test these forms are developing at a remarkable pace. Architects are becoming part biologist and part computer scientist, studying the natural world in order to implement biological growth strategies into digitally simulated environments to achieve a complexity that is unpredictable and beyond the individual will of the designer. Virtual agents are programmed with behavioral information that can be translated into formal patterns, populations, and structural systems. Evolutionary techniques propagate agents through mating and mutation breeding an offspring that contains a mix of its parent agents creating a sort of 'genetic vitality' that is then subject to the fitness criteria of the environment being designed. These reproduced generations can take on any number of attributes. Architecturally, they can be volumes of space that represent rooms, they can be panelized shapes that create a surfacing system, and they can be structural members that form a mesh... Whatever the interpretation *is* the will of the designer.

The power of these evolutionary computing tools is undeniably potent, and the result of a well constructed system is visually amazing. Yet the seduction of the presented product may be misleading, the concept of 'hands-off' design / bio-mimetic evolutionary processes has a fundamental flaw, and the research of generative morphogenetic design often overlooks the one of the most basic reasons for architecture to exist in the first place.

Thousands of years ago, at the beginning of mankind's recorded history, architecture was created out of necessity for shelter from the natural world. Throughout the centuries, it has represented many monumental ideals of man's philosophy; the immortality of the pyramid, the grandeur of the palace, the might of the fortress, the divinity of the cathedral... It has provided solitude for the individual, comfort for the family, kinship for the community, commerce for the city, and headquaters for the nation. Architecture has throughout history served mankind for specific purposes and offered a reading of human culture that invigorates the health of societal networks. Unfortunately, it has also represented man's conquest over nature rather than our symbiosm with it. And nature continues to prove that it is more powerful, more beautiful, more intelligent, and through increased capability and investigation, we discover its designs are more amazingly complex and fascinating.

What can we learn from nature in order to better understand how to deploy natural systems into architectural design? Evolutionary processes in nature are contained within species and environment. Small genetic alterations are presented through mating and mixing of the gene pool, but this is always done within a species, kind with kind and type with type. Mutations in

biological organisms do not enhance the organism or its performance, but rather contaminate it. Sometimes, these mutations can be passed on devitalizing the genealogy through each successive generation. When introduced to a fitness function such as the environment, natural selection demands the survival of the strongest and best equipped for the environment, allowing them to mate and pass on the fittest genes into the next generation gene pool. The mutations die out and do not survive.

Evolution through adaptation is evident within species who adapt to their habitat, strengthening their genetic chances for survival to the next generation. However, no scientific evidence shows evolution between species at a genetic level. In order to be tested by the fitness criteria, a complete phenotypic model must be presented. From the entire organism to the individual systems within the organism, a completed phenotype must be tested. The test cannot occur at any level lower than the completed whole, due to the fact that the complex systems are more than the sum of the individual parts that compose them. The skeletal system, the muscular system, circulatory system, must all be complete in order to test against the fitness criteria and ensure they are strong enough to survive and be passed on. Each organ in the biological body must be complete to perform its function. An organism could not survive without complete lungs to breathe, or with a complete heart to pump...the organism would not live while small mutations to an incomplete lung were being tested to see if it could provide for the respiratory needs of the body. How would it pass on genetic information if it does not survive? A single bone does not perform its function apart from the adjacent bones of the skeletal system, and this compressive structure needs the muscular system to operate it. The muscle needs blood from the circulatory system, which carries oxygen from the respiratory system...and so on. Every complex system at every level within the natural world is more than the sum of its parts and critical to the phenotype's condition of survival and genetic continuation. Where do the specific phenotypes come from? They must be designed.

How does this inform the architectural trajectory? Design is inevitable. There are always fitness criteria in which to test and measure the performance of every generation, but at every level, it is up to the designer to impose their design judgment upon the work. Just as in the complexity of the natural, design is undeniable, so too in the search for generative techniques in architecture. In the sight of architecture's potential and the proliferation of seducing forms being produced in today's academic arenas, the architect must not overlook the consideration of its human users. This does not imply that architecture cannot exist without people...it can. Nor does this imply that architecture cannot strive beyond the reach of this planet's current physical reality, including gravity, solar and atmospheric conditions, and time. What it does imply, that the human race is an existing species, expected to adapt and survive and not expected to evolve into another species. Architecture will continue to be designed by humans and for humans, creating a better tomorrow and ensuring the genetic vitality of our cultures.

The quest to mimic the natural environment through architectural research and development is noble. It is inevitably the path toward a future where man-made architecture becomes more like biological organisms co-existing with nature rather than attempting to control it. Through this partnership the world will be enhanced with a human / nature symbiosis rich with architectural complexity, variation, interest and fascination.

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