Minding Houses

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Visionary architect Marcos Novak utilizes nanotechnology in constructing houses of the future out of neurons and atomic particles. Beetle-like buildings with built-in central nervous systems and the ability to think independently are gradually coming to life and drawing closer at this moment.

LONDON -- "Neuroarchitecture is what we will see next." This was the unequivocal message when, to gain a realistic insight into architecture in the coming decades, we met him recently in London. Marcos Novak has more than once proven his ability for gazing deeply into the future of architecture. An ability of prophetic proportions, that has given him a unique authority in the world of architecture. Alongside Brian Massumi, he is one of a very small, select group thinking, plotting and planning visions for today's digital architecture; he is literally the man who, year by year, provokes an ongoing response from the international scene. Not the least in light of his often shocking clashes with established thought in architectural circles, and because many of his wildest predictions have actually come true in tangible, architectural terms.

According to Novak, nanotechnology is about to change architecture completely. Buildings that adjust and alter themselves, in real-time, during earthquakes -- and remain standing -- are just one example of what we can expect in the not so distant future, he informs us, poker-faced. A neuroarchitecture replacing bricks and mortar with intelligent, plastic nanomaterials, keeping the central nervous system of the building informed on inner and outer influences, in precisely the same way that this occurs in the human body.

Perhaps intelligent nano-houses sound more like sets for Hollywood science fiction than real houses to be built in the near future. But Novak's innovative ideas and theories of design have drawn considerable attention among architectural practitioners around the world. Leading international architects' rejection of the modernist box as the pre-eminent model of building in the 90s can be seen as a direct consequence of his ideas, amongst others. His concept of a computer-generated organic architecture, corresponding to the dynamic forms of the human body and mind, directly influenced much of the architecture of the 90s. Long before the digital "paperless design studio" for architects of the future was officially introduced -- under the auspices of Bernard Tschumi, Columbia University's sacrosanct Dean at the Graduate School of Architecture -- Novak had,

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Fig. 1

throughout the 1980s, personally developed the radically new language of form that digital design would impart on architecture.

The invasion of digital design tools at leading drawing offices worldwide that Tschumi (among others) instigated, can accordingly be seen as a mild consequence of Novak's experiments back in the 1980s. This ability to adopt new technological and scientific possibilities made him the obvious and pre-eminent main speaker at the Neuroaesthetics Conference held recently at Goldsmiths College of Art in London. [1]

As part of his proposals for merging architecture and neurology, Novak presented his hitherto most extraordinary houses, beetle-like constructions [Fig. 1, 2], commenting that neuro- and nanoarchitecture is not just a dissipated future vision at the limit of madness, but is actually being developed and tested by his students at the University of California Santa Barbara.

On his laptop in London, Novak had yet another example of sensational (yet realistic) architecture of the future: The AlloBio Building, a creature that was projected up in front of the audience in the fully packed Ian Gulland Theatre. When the project was first shown at the Architecture Biennale in Venice in 2004, it was again self-evident that Novak was pushing and shouldering architecture, in new directions, into a new era. The first time around was in the 90s, when he led the wave of digital architecture that made space tie knots back upon itself by using commercial 3D animation software like Maya and 3D Max. This resulted in an architectural form commonly known as "blob architecture," widely practised by people such as Greg Lynn, Hani Rashid & Lise-Anne Couture (Asymptote), Lars Spuybroek and Kas Oosterhuis -- the vanguard who introduced digital architecture in Venice at the Biennale 2000.

By 2004, the Arsenale was completely full of digital work -- there was nothing there that was not digital, except mine, which was bio and which was placed in the position of honor," comments Novak with a smile. "It was really recognized as the next step, and it's surprising how fast publications are popping up everywhere with biologically derived forms and buildings. The Neuro will come after that. And I think this event is going to resonate in its own way, with neuroarchitecture to follow.

The "AlloBio" notion is derived from Greek and describes an alien architecture crossing the line between the living and the dead. Until now, so-called *intelligent buildings'* reactions to human behaviour were determined by the integration of enormous amounts of electronic installations and computers within the buildings. But the walls and body of the AlloBio building are alive and sensitive, in a fundamentally different manner, not unlike human skin. The organic surfaces within the buildings or creatures are covered by hair-thin optical-fibre sensors, and are able to react to fluctuations in the given parameters, such as changes in pressure or temperature, by contracting or enlarging themselves. This architecture is comparable to a biosphere that grows and develops concurrent with its inhabitants and other outside influences. But in contrast to a plant, it also has a quick-acting nervous system with animal-like reflexes, enabling it to react instantly to threats, such as earthquakes. This living, breathing house is developed in close cooperation with molecular biologists at the California Nanosystems Institute.

As architects integrate new technologies more fully into their buildings, what they are really designing are possibilities of experience. They are not just building for practical function. They are becoming experience

Fig. 2

I have collaborated with molecular biologists where we have designed architectural things at nano-scale really, with RNA. It's almost a necessity. I mean that's where everything is going, so the AlloBio building was an exploration of the 'premise' that we are going to make buildings 'grow.' The result is not to be taken literally; it may take us a long time to actually make a growing building. It's really more of a theoretical proposition that eventually will be carried out when the right moment comes.

It is obvious from Novak's firm manner during this intense interview that he's perfectly serious about all of this. In nano-technology he sees a real possibility for architects to influence the properties of architectural

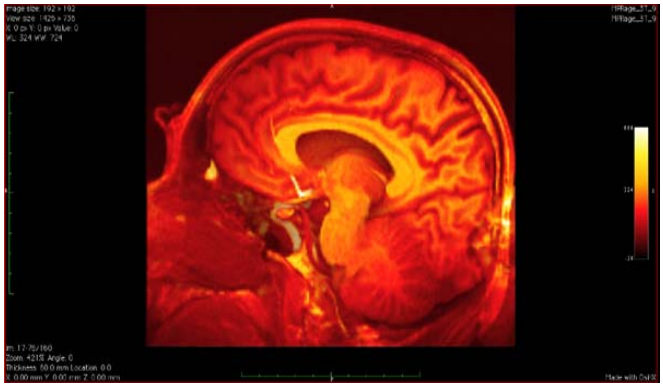

Fig. 3

materials -- within the atomic building blocks of the world. These can be very heterogeneous properties, such as organic versus inorganic, which nonetheless -- through manipulations on a nano-level -- can be combined into the same Allo-biological material:

> *Materials with properties that haven't existed before and then again other materials that are structurally far superior to what we have, which in turn will have an effect on architecture of a similar magnitude as (or greater than) the arrival of steel versus masonry, which transformed the cities. I did this thought-experiment of what would happen if you built the Eiffel Tower out of carbon nano-tubes. And they are so many times more powerful that, from a distance, the tower would be the same height, but the members would be so fine that it would be like a spider web. It would basically be translucent. And I'm not quite sure about this, but depending on how it could be built, it might be that you just lean on it and cut yourself because the members are so fine.*

Recent technological development has given scientists access to a hitherto inaccessible, new micro world of particles. Clones and new life forms are now produced in the test tubes of the bio-industry by using software simulations of genetic structures. While new knowledge about the actual functions of the neurons in the centres and connections of a pulsating and changing brain is constantly revealed through fMRI-scans, other similar techniques for producing images of the brain -- easily readable and even of aesthetic value -- are also being developed. [Fig. 3, 4, 5] Novak's

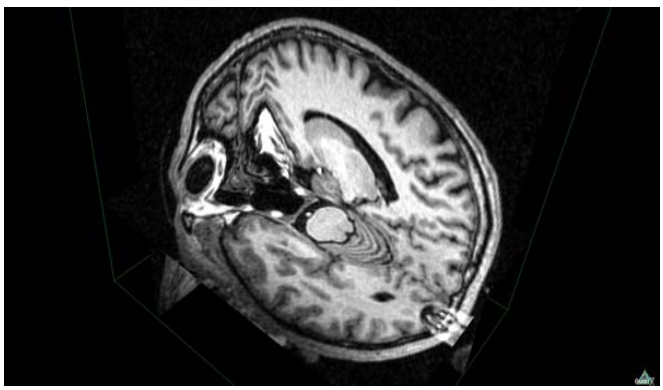

Fig. 5

AlloArchitecture is forming a biological product as new knowledge of the brain arrives. This is why he not only describes an AlloBio, but an AlloAtomar [Fig. 6, 7, 8] and even an AlloNeuro architecture. The rooms emerging in his buildings in many ways work like the human brain. And here, once again, Novak's work goes way beyond buildings employing so-called neural networks for the regulation of climate and energy-saving systems. But this is not what AlloNeuroArchitecture

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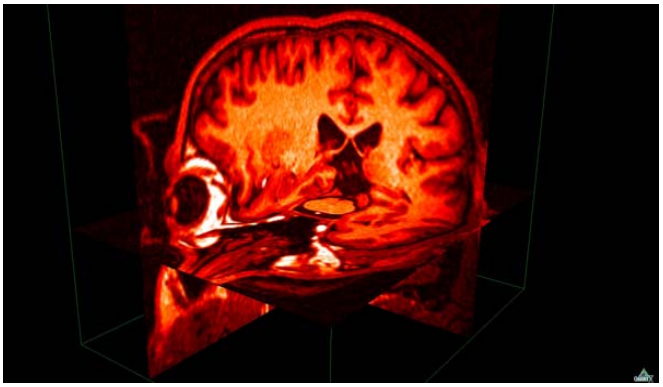

Fig. 4

is all about, and what Novak is in London to talk about -- it's about real, living houses.

> *What this conference defines is not artificial neural networks; it's about the real thing. There is no difference between the human and the architectural, as there was when we are speaking of artificial neural networks. At this point in time, we actually have a bit of history to work with. When I started doing this, there was no history and so I could make statements and appear to be totally crazy. Now I'm only half crazy! But what happened then was that the things we made in the virtual world began to affect things that we made in the real world. So the shapes that are now being built have all previously been explored virtually. The things that I am doing in the virtual world, with actual neural data, will eventually be what gets built. What I enjoy doing is identifying the necessary elements, then prototyping them, and then they get absorbed by NOX or Kas Oosterhuis, who will actually bring them one step closer to real-*

Fig. 6

I mean that's where everything is going, so the AlloBio building was an exploration of the 'premise' that we are going to make buildings 'grow.' The result is not to be taken literally; it may take us a long time to actually make a growing building.

ization and eventually get them absorbed into the culture. But we are also building these things -- for example, this thing that is similar to a globe, a 21c globe that you can hold in your hand. But it has fibre-optic sensors everywhere so you don't even have to touch it, it's inside a biosphere and you can just approach it, and as you interact with it, you modify the biosphere. Even though we're building it as an interface for the biosphere it's actually part of this project called Transaura -- which posits that a building will have a second skin of interactivity. So what I'm doing with my students, at this moment, is building interfaces for these spheres, that eventually will be the devices by which the brain-data gains control; to actually make the virtual world, we have been looking at external skeleton-structures and biological forms such as dyadems, plankton and echinoderms. We have been developing these in the form of rapid prototypes, based on a bio mathematical language derived from these skeletal studies.

Novak's inspiration was unmistakably felt when two odd houses were built on the artificially constructed island Neeltje Jans by the Rotterdam / Holland based drawing offices NOX and Kaas Oosterhuis' ONL Office in 1997 -- an event that has since been ascribed epoch-making influence in architecture worldwide. *H20eXPO*, the saltwater pavilion by NOX, was especially sensational. From a distance, the 65 meter-long building appears to be a very long and deformed sea snake built out of curved, high-gloss steel. This remarkable exterior is mirrored in the interior by a revolutionary new form of 3-dimensionality. Instead of a traditional box-formed room, with easily graspable geometrical forms, one surprisingly falls into a dynamically changing space with no concrete points of orientation. The Hullabaloo House of the computer age that, its widespread entertainment value aside, did not only have a humorous purpose, but was intended to illustrate that spatiality, the human body and human consciousness were capable of interacting with each other in an equal and dynamically developing relationship -- a house in a constant process of ongoing self-renewal, and dialogue with its visitors. The interior of the *H20eXPO* had been modelled on observations and analyses of hidden patterns lying behind people's motions in different types of rooms. The result of this process is a space where walls and floors melt together and new hybrid forms of room and furniture-like structures arise, and float or merge indifferently in and

Fig. 7

out of each other. With the *H20eXPO*, NOX have created a so-called motorical room that, thanks to animation software, has been realized not merely as a computer model but as an actual building -- a room that simply removes the classical architectural distinction between walls and floors, and between function and form. A "bluish" atmosphere of constantly changing form and structure is created inside the room. Consisting of enormous banks of sensor-controlled lamps, it interacts with the behaviour and movement of the visitors. The room synchronizes itself in real-time to movements of the body and, as it were, answers and reacts to the brain impulses carried out by the body. This building was the crystallization of Novak's predictions concerning neuro-architecture as (a) liquid architecture -- one of his earlier visions that specifically combined the constellation of plastic architecture and new technology, gaining him design-guru status amongst the next generation of architects. In short, liquid architecture has set the agenda for architecture at the beginning of the 21st century.

Fig. 8

But not only architects are seeking new insights from Novak. At the conference in London, renowned Danish neurobiologist and anthropologist Andreas Roepstorff pointed out that Novak -- with concepts such as liquid architecture - has also influenced other research areas such as brain research:

> *Some of the conclusions that we apparently are heading towards at the moment could involve the perspective of liquid architecture, in that we conceptually cannot understand or comprehend the human brain without it. The brain clearly has a certain determining form, but one that changes over time. We can see that some of the ways in which he has been thinking about form and structure are simply epoch-making in relation to our work, and can provide us with a language which, on the one han,d is groundbreaking and, on the other, can assist us in understanding how these brain processes unfold. And it is incredible that his computer models of these processes can help formulate a new language.*

Novak's lifelong project of renewing architecture goes back to when, as a young student of architecture, he discovered that something fundamental was missing in the architecture of his own time: "I think it all started when I experienced a deep division between architecture and the world that it was supposed to be a part of. Admittedly architecture had renewed itself through the 70s and 80s, but in a very unfortunate way, that simply did not work."

Novak revitalized architecture by reuniting it with developments in, and the application of, new technologies. This began with his involvement in computer science in the late 70s, when he was the only architect among the programmers in the Computer Science Department at the University of Ohio. These were absolute groundbreaking years in the history of information technology-based architecture. But since then, computer science has been augmented by nanotechnology, molecular biology and neuroscience as integral design tools. For Novak, these are essential and necessary tools for architects.

> *It is not at all unlikely that in a couple of years' time we will see students at schools of architecture worldwide designing their own particles. Nanotechnology and the new materials that this technology enables already heavily influence the world around us. Architecture must follow the times. For architecture, therefore, the point is to be constantly abreast of culture's development, moving and reacting at the same pace, instead of waiting 20, 30 or 80 years.*

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References

http://www.artbrain.org/events.html