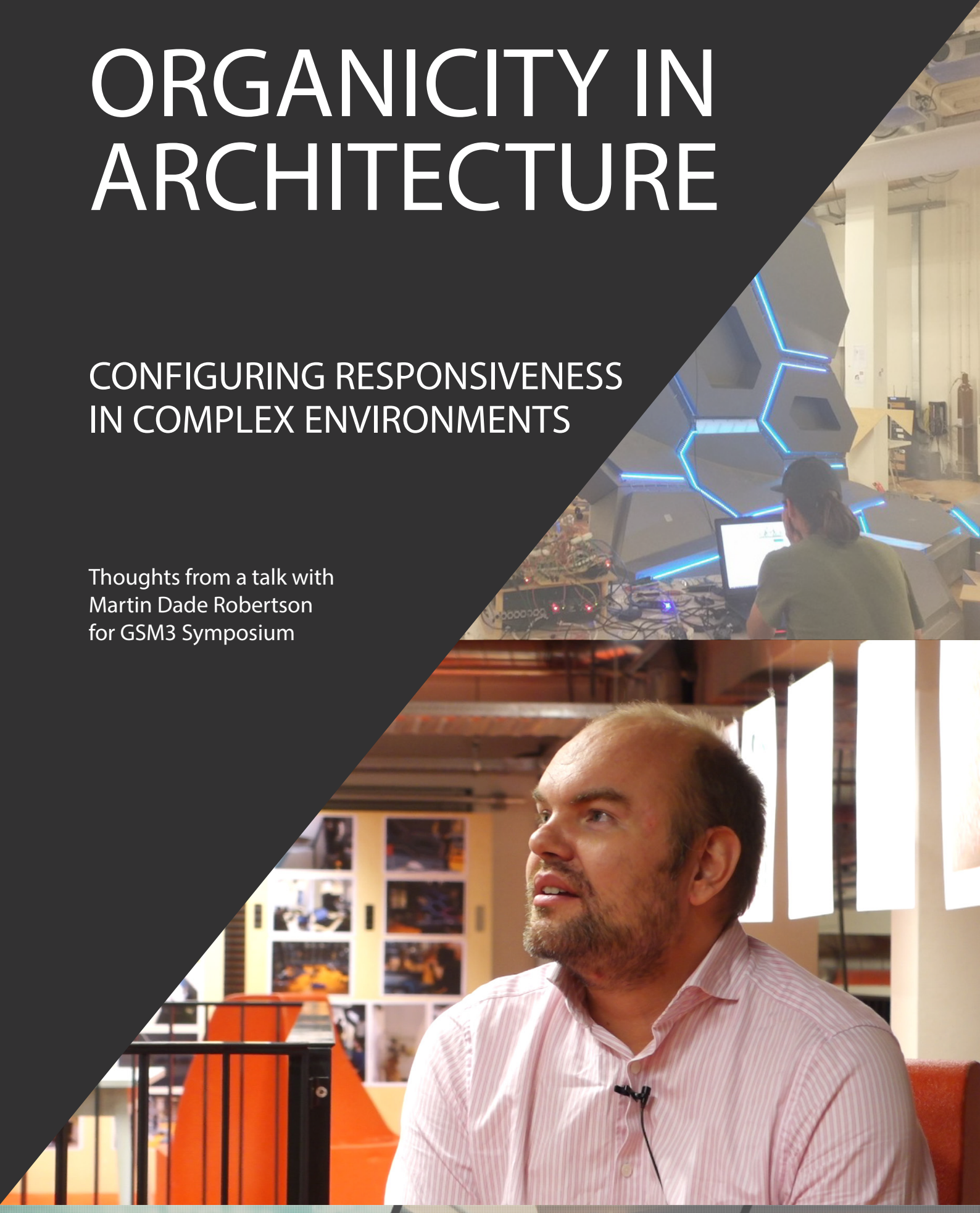
ORGANICITY IN ARCHITECTURE

CONFIGURING RESPONSIVENESS IN COMPLEX ENVIRONMENTS

Thoughts from a talk with
Martin Dade Robertson
for GSM3 Symposium



GSM3 GameSetandMatch

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When the time comes to face the new scenarios and the new situations we have before us in the contemporary world, it is really important to take into account the increasing speed with which the many technological progresses are alternating: we assist to the constant and gradual mutation of every single activity related to them, was the connection direct or indirect, in real-time or in deferred coverage. Naturally this brand new speed-rate affects all aspects of everyday life and the consequences are visible in several situations, different for type of effect and duration of period.

Focusing the insight so exclude everything but what concerns architecture's sphere (in all of its fields and approaches), it becomes completely clear that the very first implication is a drastic and evident change of paradigm.

The many new ways in which every new design/constructive/theoretical/methodologic approach can be employed brought to a never-so-strong awareness of the architectural phenomenon, but on the other hand it didn't affect the architectural language the same way: collateral to the consciousness we're realizing an incredible growth in the quantity of the scopes of architecture and architects, together with a widening of contents and perspectives of the projects. This change process is so powerful that results in architecture been contaminating and interpenetrating with many other branches of the knowledge, especially in the past decades.

At the historic moment we are, this influences are showing up mainly in the theoretical level of the architectural dialogue so much that, in some designs, it is now almost impossible to determine the limit between architecture and natural sciences and to distinguish one from the other. It is in fact possible to state that we went much further than what we should have done standing to Marco Vitruvio Pollione: the issue is nomore to develop an architecture that mimics nature in its volumes, shapes and proportions, it's to explicitly involve nature's dynamics, rules and features. We were given the chance to do so thanks to the tools made available by the technological progress that are now allowing us to overtake, for instance, the esthetical criteria that Antoni Gaudí adopted to bring nature in his masterpieces: we are moving directly towards the embodyment of nature as a fundamental part of our production.

At this junction it is reasonable to talk about the occurrence of a different relation between architecture and organicity, by whom the characterization of architecture as an organic being finds an unprecedented definition that transcends the form and involves mainly the ambits of micro-configurability and micro-adaptability, not so much in absolute dimensions but relatively to the overall scale of the project. As a demonstration it is actually possible to find these traits both in the research program held by Martin Dade Robertson and in the projects developed throught the course of the Hyperbody Studio(s).
It could be said that these mechanics through which "Bacilla-Filla" takes advantage of the metabolism of E. Coli to build highly complex structures to fill the micro-fractures in the concrete (consolidating the foundations plates in existing buildings) are attributable to the principles behind (for instance) the kinetic properties and customizability implemented in the projects for the student housing planned for the TGV platform.

In both situations are primarily recognizable some features typical of complex systems identifiable as organism with biological or pseudo-biological apparatuses and behaviors including:

a phisical and functional hierarchical organization with

mutation

ex. timetable-based or activity-based architecture involves a brand new conception of spaces

change of paradigm

additive manufacturing;
subtractive manufacturing;
digital manufacturing;
parametric generation;
all of these are different algorithms/approaches.

limit

bio-mimicry, swarm behavior, fractal scalability, sensing and feedbacks are borderline elements

embodyment of nature

more than an emulation of nature: nature is a building technology!

micro-configurability/adaptability

modifications of basic parameters and devices has to be deeply integrated and starts from the micro scale of the project

complex systems / organism

in the last decades the weaknesses of static and predefined designs is showing up

several separate “nuclei” (zones or agents or organs) with their own peculiar properties and functions, but just one single “locus” (common space or environment or system) that becomes the setting within which boundaries the nuclei find their field of action;

the connection to a substrate provided with intrinsic properties and specific morphological/topological traits that defines and limits the possible scenarios in which the generative evolutionary processes can establish;

the interaction with an outer indepependent environment that provides stimuli and inform the system through its outer membrane (physical or apparent) allowing it to prepare an adequate response, define the parameters for adaptation and re-configure itself;

Similarly to what can be observed in nature It is nonetheless equally relevant to consider how the development and the evolution of a complex system of this kind is actually supported by recursive procedures, going on in a loop succession. The role of those iterative processes, is to allow the “organism” to adapt to the environment in order to survive/be more efficient/effective and are defined depending on both direct and indirect stimulus provided from the external conditions. These inputs are then translated into informations to which the system will feedbacks through the generation or modification of its shapes and features. In other words, the changes the organism has to perform to meet the spatial and functional requirements are properly defined by some sensing systems that are differently configued and designed depending on many factors (ex. scale of project, needings, and other parameters to recognize) and consist in several morphological and behavioral modifications to adapt to every possible scenario occurring.

It is also possible to recognize that (again) both in the “Bacilla-filla” and in the Hyperbody case-studies, not only there are common phisical and methodological traits, but also common behavioral schemes: they show that the dynamics through which they perform the modifications consist in responses that are self-induced or induced through one or the few individual agents that are more directly connected to the reception of that input. They immediately trigger/activate either the local reconfiguration or communicate the need of a global redefinition of the entire system, enabling a plan comparable to a swarm behavior, to a collective feedback or a series of individual adaptation to local situations.

To summarize the entire process of determination/self-determination of the complex system in analysis, being it the “Bacilla-Filla” or the student housings at the TGV platform, it is easy to determine four main phases of the iterative functional response of the complex system:

Sensing - through which the system acknowledges the interi ors and exteriors situations through which defining the parameters of variation;

Actuation - in which the system evaluates, programs and defines the kind, the extension and the entity of the response and performs it;

Genesis - in which the individual/combined action or interaction of one/few/many nuclei determines practically the change through the manifestation of its properties;

Synthesis - in which all the previous phases find their realization in a final functional object. Often it is the establishment of a

organization

the segregation of the roles is essential: it has to be clear the purpose of each element and each has to fulfill certain tasks

connection

it isimpossible to evaluate and to design even the smallest item if it has not any relation with all the others around inside and outside the system

interaction

the continuous cooperation and contribution of all the agents is essential; interaction allows improvements

recursive procedures

succession of loops in the entire lifecycle

feedbacks

definition of situation of ideal use
decoding rules
applying operating protocols
provide restitution of adequacy

behavioral schemes

differently from static systems it is relevant the presence of behavioral schemes: non standard architecture involves interpretation and consequently self-reorganization

swarm behavior / collective feedback

functional response

sensing

ex. defining a particular season/period/external conditions or detecting comfort deficits

actuation

ex. identification of an ideal configuration or a kinetic action of the single agents (individually or collectively)

genesis

ex. morphogenesis: a change in the shape and in the spatial features of the system itself

new reality made by the new mutated adequate system and the informing environment; that becomes the starting point for the iteration of the following cycles, that will take over again from the Sensing of the present state, now become a substrate.

The overall life-cycle becomes truly effective only when it involves successively all the scales of the project, so when it's implemented to different levels in different ways for different purposes through different dynamics, or trascends them all. In the majority of the scenarios, that result is obtainable through a "hacking" process, consisting in a modification, alteration, alternative use or improvement of an exhisting trait of an object or a property of it with the purpose of identifing the ways that could allow to control it through a non-standard approach, unleashing the potential under every posible side of it.

If every step is approached effectively in the most correct and integrated way, the final object will result in a flawless continuous and intuitive mechanism/organism, exemplary in what happens when the sensing is implemented directly in the level of microstructures (ex. the DNA in the living beings or the human necessities in the social structures): in this case the material synthesis will output automatically and naturally in the best, ideal, and reasonable form in the bigger scales of the system (ex. the cells and the organisms for the DNA and the cities and the cultures for the social structures) without any need of intermediation or human intervention. This is, at the very end, just a clear and true parametric design.

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synthesis

ex. material-synthesis, behavior developement; a final object affecting actually reality

substrate

ex. microfractures in concrete foundation plates or a (rheotomic) surfaces or a structural element

hacking

non-standard approach

parametric design