

Celestino Soddu

## The design of morphogenesis. An experimental research about the logical procedures in design processes.

(DEMETRA Magazine, #1,1994)



*In this image, the sequence of the 3D architectural models is automatically generated using my Genetic Design Software. Every model is different but belongs to the same genetic code, to the same genetic IDEA.*

The target of the "design of morphogenesis" is to operate with experimental tools inside the field of the temporal evolution of artificial sphere, using the progressive systematic falsification of the scientific developing procedures.

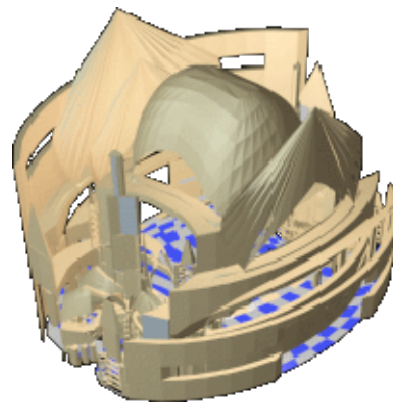
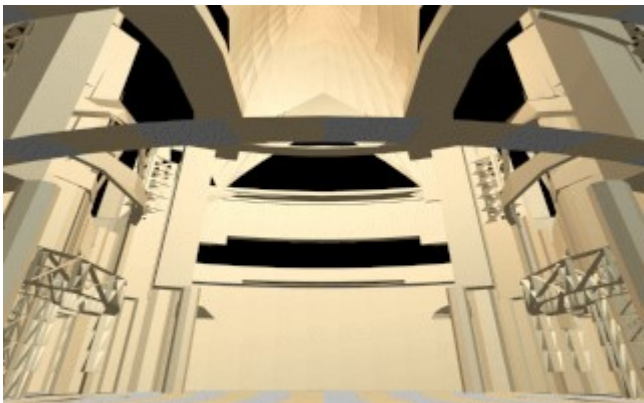
This research prefers the logic procedure to the event, the meta-design to the design. And I have considered as faces of the same logic of evolution: 1st, the design procedures that are unpredictable but, at the same time, increase the identity of the designing idea; 2nd, the evolution of the environmental systems, that are also unpredictable but identifiable by the power of self-organizing structure that fights to increase its peculiarity.

These evolution procedures are identifiable by the complex frame of stratified orders, by the recognisable density of sense that appears in all the events generated by the same dynamic system. The challenge has been the experimental realisation of an AI original software, a Design of Morphogenesis,

to simulate the logical procedures of some specific (and subjective) approach to the increasing complexity. Each time we use it, this tool generates a sequence of ever different virtual scenarios that we can identify as belonging to the same species of architecture, of the environment; as following the same logical procedures, the same design approach.

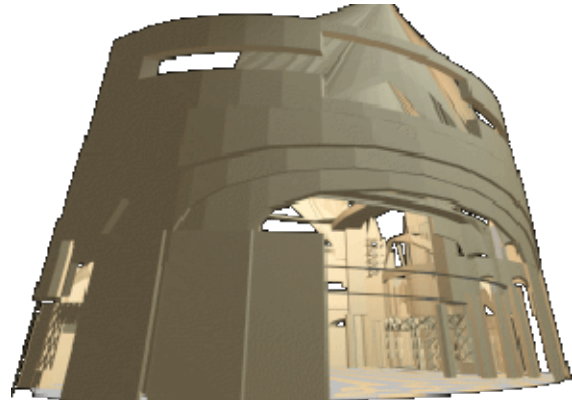
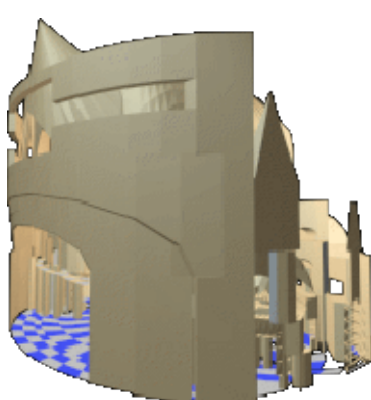
This tool is, in fact, a "design of species", and we can use it as an artificial DNA to generate a multiplicity of architectural or environmental possible events.

It is based on a presumed homology between natural and artificial spheres, and they're belonging to the world of chaotic systems. Following possible consonances between natural and artificial evolution systems, we can think that, like the DNA in nature, we can assign to the "design of morphogenesis" the power to control the evolution procedures and to define the complexity of possible meanings/performings, the stratification of multiple orders, the mode of contamination between orders and between different disciplinary fields, and, shortly, the recognisability of every events the system can generate, apart from the subjective identity of everyone.



*(This image, and the others that follow, show one of the 3Dmodel automatically generated using the morpho-genetic design software BASILICA)*

In this topic, the creativity of the designer has been connected with the variation of unpredictable subjective and cultural approach to the development of the artificial environment. And this system has been simulated with the progressive stratification of new points of view, generated by the unpredictable resonance between a set of parallel algorithms representing the primitive points of view. Practically, we can design the morphogenetic codes of an environment that, in the meantime is growing up. The environmental design, as the design of species, can directly operate the dynamic flowing of the system, identifying the sensitive parameters with the simulation of a connected sequence of possible scenarios. Generating a universe of possible virtual realities we can design considering some difficult topics like the dynamic saving of differences that become every day more important in front of the homologation of the increasingly international and interdependent world.



Every morphogenetical project is a subjective meta-design for the reason that it is not an optimized arrangement but a system that can generate a lot of possible parallel scenarios. We can manage the evolution of this project not changing the final arrangement but operating on the parameters of the evolution code.

The evaluation of quality is the evaluation of the reliability in front of unpredictable events and requests. This type of reliability is typical of the living systems, and it is based on a self-organizing process and on the continuous interchangeability of components.

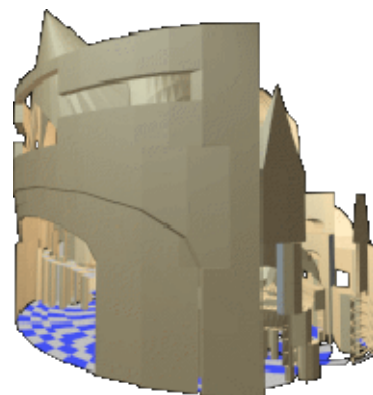
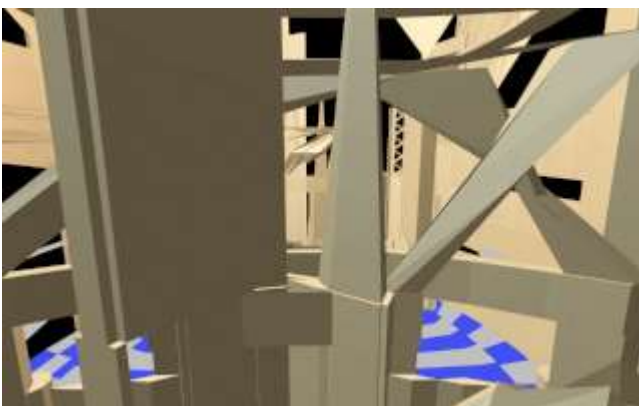
In designing the simulation, two are the most important topics: The complexity and the relationship between species and individual.

To manage the complexity I referred to the concept that the complexity is not generable ex-novo but only using a process to stratify sense into a flowing simulation of a temporally irreversible path. We can activate and control this stratification if we design a system with a self-organizing paradigm that can keep sense, (practise) during the simulated time flowing.

To built this paradigm I referred to the chaotic dynamic systems that are suitable to be controlled by algorithms, but that can produce ever different events.

I have used a fractal but non-deterministic logical frame. In other terms, every decision cycle has inside, nidified, a lot of other cycles, and so on. The structure of these cycles is, as in fractal objects, ever the same. The differences and the unpredictability were born from the resonance with the other cycles, from the time of activation and from the ever different flow of information.

Each cycle represents a whole structure in simulating the decision choices. It operates the transformation of the answers into possible shapes. This device is designed by:



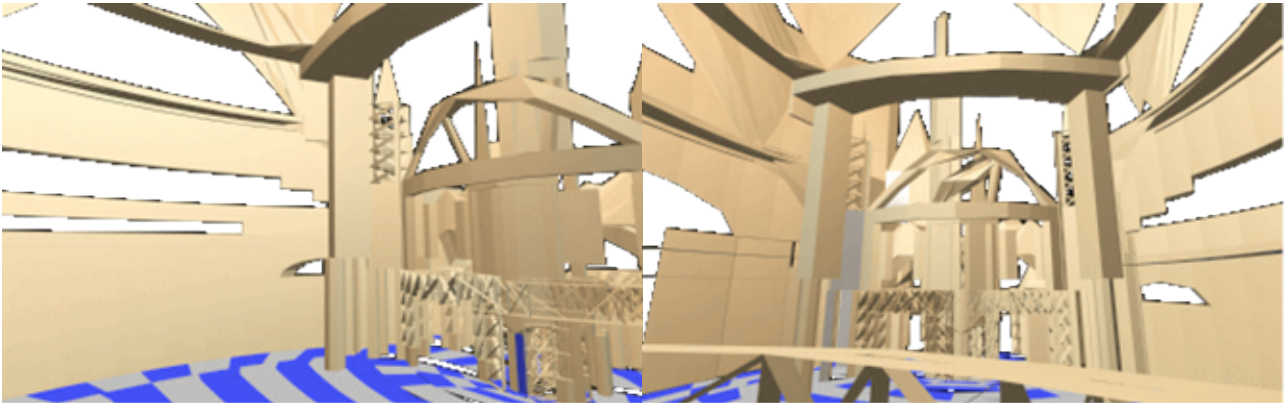
1. The use of a paradigm to control the auto-organization procedures. This tool represents and controls the gained complexity but, in the meantime, represent the adaptively to the incoming developments. It is the device that allows us to reply to an answer putting one of the possible formal matrixes into the paradigm.
2. The identification and sharing of the random margins between answers and shaping reply. The system uses and represents these margins as "operable fields" for the designing choices to improve the project evolution.
3. The set of possible formal matrixes, that are abstract shapes but usable in giving body to a set of possible performances. These formal matrixes are not a database. They are extemporary generated by the bound-up cycles, by a set of simultaneous devices operating into a series of different fields, like geometry, dimension, materials, technology, complexity, and so on.

Every formal matrix is, therefore, the extemporary production of the contaminations and resonance into a set of different subsystems performed as a following paradigm/random margin/formal matrix, in a subsequent homothetic complexity that looks like a fractal shape.

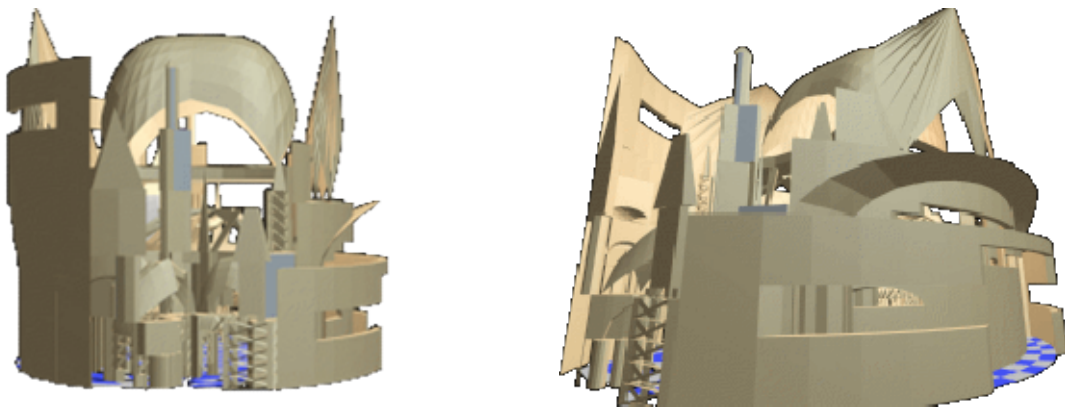
At the end of every cycle (and of the related and multiple progressive modifications) the result is

1. An increasing complexity, and the related passage into a more evolved representation of answers, and together the proliferation of the same answer.

2. The production of needs, for the reason that every event we design was born also using subjective and random postures. It was not necessary before but it began necessary after the choice: it is a part of the project history. This happens also if we, later, remove it because we consider this event as an obsolete one. The event is into the project history, and we can appreciate its contribution as time patina. A time patina that measures the gained complexity, the growth of the specific identity of the project, shaped by the past research occasions used as training events.



I have experimented these tools in many fields: the characterisation of environmental shape in the medieval towns, and its relationship with the contamination between natural and artificial events, the role of materials and technologies in a historical town, a research about the possible new evolution of modern environments like EUR, the evaluation of possible new identity of the suburbs, the development of the natural/artificial environments like the valleys of Alps, the contamination between nature and architecture in the towns in front of the sea.



More, in the field of architecture, the experimentation on materials, like the new possibility that is given by the steel components production, on technology innovations and on component approach in building industrialisation

All these experimentation opportunities have remained in the project/software as a progressive stratification of complexity. I updated my projects not changing one algorithm with a more peculiar one, but redefining the possible field of the past ones and inserting the new one as a new possible point of view that can live together.

Like all scientific experimentations, I used the progressive falsifications and not the linear deterministic paths. I have improved my research with progressive attempts in a variation of the parameters and in using new morphogenetic algorithms in catalyzing the global process. Every effort has been never entirely negative or affirmative. And so we can stratify it, according to the reduction of its possibility to trust the evolution.

This research procedure has improved my experimental tools with the representation of the multiplicity of possible paths to gain the complexity, with a set of interconnected frames of possible orders. The parallel refining of the mathematical models of the evolution paradigms has gone together with the progressive flowing from subjective to inter-subjective credibility.

But, furthermore, this experimentation improves our reflections on the extraordinary path of the designing ideas, on the possible explicitness of the idea in architectural events, on the possibility, for every designer, to tell, perhaps, ever the same fable, but ever different and more rich, improved and shaped by the unpredictability of ever new hearers.