# Argenia. Life on Mars, interpreting three thousand years of history

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A wrong approach to technology might transform us into simplified human beings

### What is Argenia

Despite being a precursor of generative design, developing in the early '80s the generative approach to urban design, architecture, and product design, I have always had difficulty being considered as reference to follow for people а approaching Generative Design. This is because my approach appears extremely complex. based on the logic of discontinuity, interpretative logic and not therefore difficult deductive. to understand and emulate for those accustomed to the linearity of an approach based on "problem solving".

The reason is that generative design has been successful not only as a logic towards complexity and creativity in the design process but also as a practical tool for managing forms. Even many books that have been published on art and generative design were intended to be descriptive texts of generative "techniques". So they were proposed as manuals for the use of tools to simplify the creative process. In this, they are completely distant from the attempt to define a logical approach to creativity and the development of one's own creative identity, as was and is the purpose of my experiments.

Still today, many artists and designers understand generative design as a technical instrument useful for the generation of forms, above all by using a random approach. Forms among which it is possible to choose those most suitable for their project. A sort of tool for compulsive shopping of forms without the

identification operational of the characters that reflect one's design identity. "Catch the fish" is the motto where the formal research is so expanded that it is not possible to choose the character of the fish you are trying to catch/generate. To a student who had used this motto for his doctoral thesis on generative design. I had reiterated a provocative "catch the salmon" clarifying that the construction of a generative approach have, for me, to start from the indication of the characters of what one are trying to generate. Moreover, in this specification of the characters it was appropriate make a iump to to complexity, that is, not to refer to the usual characters of an existing species of events but to the characters, even contradictory to each other, of what does not vet exist but would respond to a subjective vision of the possible future. This confirms the "visionary approach" to Generative Art

In other words, my conception of a generative approach tends to move from a linear approach to a complex one in which the discontinuity of the process is the structure for supporting human creativity.



Two generated architectures for Ravenna. The architectures were generated in only one generative act able to manage the entire complexity of the idea. C.Soddu 2017

But how to define these characters in progress? First of all, it must be considered that the referring to specific forms would lead to the repetition of what has already been experienced. Μv generative experimentation, and in parallel my teaching proposal to the students, used progressive logic based on the definition of possible characters topological through structures. The organicity of the topological definitions is independent of the forms used and can be synthesized through paradigms that identifv the possible through the multiplicity and complexity of the cross relations between events. Poincarè affirmed that creativity is to identify a new system of relations between existing events. The creative act is to "observe" the existing from a specific. and sometimes unusual, point of view. Only in a subsequent moment, forms will fill, these organic systems of relationships in various ways. This step will create the possibility of generating events all different but identifiable in the same species. The interchangeability of formal matrices is the basic concept of the generative approach I developed in the 1980s. This process can occur without interfering with the recognizability of species of the generated event that is directly related to the topological structure. The interchangeability of forms is the cornerstone of the uniqueness of every single event. As it happens in Nature.

#### **Formal Matrices**

But how are formal matrices structured in order to be interchangeable? Each shape is generated following a progressive path of transformation managed by a dynamic

idea. The same final shape can be generated by different transformation logics. For example a cube can be generated by a path that contains a sphere, a tetrahedron, a dodecahedron, and so on, or through a path that contains a cylinder and all the rotation solids, and so on. Of course, formal matrices are more complex than individual solids. Progressive geometric generation structures are related to specific design moments that tell the various design "hows", that is, the choices that are creatively addressed in the face of possible design developments. How it ends, how it turns. how it splits, how it holes, how it rests. etc. Each of these "creative occasions" contains a plurality of matrices that are, in fact, interchangeable even in different stereometric situations. They are, in fact, typical transforming forms with characters of parametric structures and therefore the final form geometrically adapts to the context.

In practice each formal matrix represents a pill of individual creativity. It is a metadesign in fieri that adapts to each possible project reflecting the characteristics of uniqueness and recognizability of the designer.

At the end, in the generation of the architecture, or the object or the artwork, three logical operations occur simultaneously.

1. The topological structure of the paradigm that extends and evolves in complexity throughout the design process. Each event of the initial paradigm evolves through a possible topological paradigm nested in the general paradigm that preludes to its possible formalization and manages the increase in complexity; 2. The activation of "congruent" formal matrices that generate the forms at the small scale and adapt them to the evolving context;

3. The transformation of the whole according to the logic of geometric transformation. multiple. even For example. transforming the overall structure generated by a "classical" to a "baroque" structure. from or an "orthogonal" to a "curved" structure, and so on.



Argenia generative software. The control panel of Paradigm Design and transformation rules at whole scale.

The simultaneous mix of these three logics that are already structured as contamination of more transformation matrices. generate complex results where it is not possible to distinguish the sinale matrices or the sinale transformations carried out. This is one of the characteristics of the result. The whole must appear as the result of a complex design process where the superimpositions and the logical progressions carried out make emerge an "harmony" . This is identifiable as the of contaminations result managed through harmonic numerical ratios.

# Subjectivity as Argenia's core value.

I realize that even today this approach presents considerable difficulties in following it. And this is the reason why it is not only not considered as a basic reference, but on the contrary, it is often deliberately ignored. The main reason for this difficult consideration is that this approach is based on the explication of one's design vision, one's point of view, and therefore on subjectivity. Subjectivity is used to interpret the existing in a system of relationships by defining a topological paradigm. This is not only "new" but directly reflects the subjective point of view.

I realized this with my students when they faced to my request in making explicit the characteristics of their creative peculiarity. They answered proposing a path of linear choices on the objectivity based on problem-solving and optimization, more easily controllable for them to have a positive judgment on their work.

This obstacle is and has always been the most challenging moment of the didactic path I proposed. This moment was overcome only through complex logical exercises that occupied a considerable amount of time at the beginning of the teaching process. Only after overcoming this obstacle and having cleared the logic of one's interpretative subjectivity as a scientifically manageable and acceptable structure, students were able to take full advantage of the "generative" support to their creativity, avoiding the traps of simplification and homologation.

Subjectivity is, even today, a word that generates opposition. This is the legacy of a culture of equality where everything must be objective. Subjectivity, seen as an individualistic position, is considered negative. It is a sin to be punished as out of the thinkable, out of "scientific" logic. Only recently the concept of "singularity" (a new word that defines subjectivity) has accepted in scientifical world because has carried out in the field of artificial intelligence. Finally singularity is now used for trying to manage the complexity of the contemporary world around us.

Once we pass from the objectivity to the subjectivity, from the deductive to the interpretative structure, the concept of complexity is not only enlarged but we can finally think of creatively interacting with the possible. This does not mean that technology becomes creative, but certainly, that technology can be configured as strongly active support for human creativity.

#### Argenia

Therfore the term generative design has this double aspect: it can be understood as only an instrumental technique or as a logical approach to creativity. For this reason, I called my generative approach with also the name of Argenia. developing its potentialities. Μv experiments with the generative and "argenic" approach allowed me to creatively explore some new possible fields that could not be investigated without the passage from deductive logic to interpretative logic. A passage that gains natural support by information technology.

The results have been, over time, extremely interesting and are appreciated for the potential of the interpretative logic in the transition from past to future, which is the main field of every project.

Argenia is also a generative design approach strongly identifiable by a

peculiarity: the meta-temporality. In other words, Argenia can define an approach to the past through interpretative logic and codes designed to generate threedimensional architectural, artistic, and design events as a bridge between past and future. These "operational" interpretations are based on the topological structure of historical events and prescind from the forms. The identity of Palladio architectures, for example, are in their peculiar topological paradigm able to redefine the relation among external and interior events and so on

Following this approach, forms can be considered as interchangeable events linked to contingent situations, to the historical and cultural moment, and the environmental circumstances. This interchangeability constitutes one of the main elements of the variations in the results. Using this "argenic" approach, the generated events can be considered meta-temporal because:

1. they maintain the character of the creative idea bearing specific historical references through the topological structure;

2. they reflect and interpret contemporaneity or a different historical moment through the possibility of the interchange of formal metrics.

# First generative argenic experimentation

My first experimentation with generative design, as I developed it in the mid-80s, was precisely the possibility of defining a meta-temporal idea of a kind of urban event identifiable as a medieval Italian city. It was a matter of constructing a design idea that was capable of narrating a "historical" code but that was also transferable to environmental and temporal contexts different from the original one. The idea was born from the topological interpretation of the paintings of Giotto and Simone Martini whose matrix was further developable in spatial multiple arrangements. The results of these generations and their recognizability as a medieval city could disregard the forms used and could take on different historical contexts and temporalities depending on the formal matrices used

The recognizability of the results is one of the characteristics of the generative argenic approach. It is a generative design of species where every single generated event, like every individual of the same species, is recognizable as belonging to its species even if it has different forms. Moreover. the generatively designed species can evolve, as species evolve in nature, assuming from time to time formal matrices that reflect the contextuality and the historical and cultural environment in evolution.

#### **Baroque and Venetian Argenias**



Three "baroque" architecture. The STL file used for the 3D printing is generated directly in unique generative act. C.Soddu 2018.

Baroc Argenias were, perhaps, the most successful experiment. This is thanks to the re-interpretation of the transformations of the classical structure of architecture towards the Baroque. This interpretative logic is identifiable in the architectures by Francesco Borromini, This can be made operative by narrating these logics of transformation through algorithms of generative geometry. This was the basis for the generation of architectures that maintained their baroque identity but had the possibility to generate spaces that could disregard their original historical lconfiguration. In other words, Argenia generates metatemporal architectures capable of reflecting contemporaneity while maintaining their species identity, in this case, their Baroque identity.

This is done not through the repurposing of forms but through topological structures proper to the generating idea. This approach is strongly explicit also in the generated cities to represent the Venetian identity that I developed by interpreting the topological structures of Canaletto.



In these generated cities there is no typical Venetian form but the urban character is strongly recognizable as a Venetian Idea.



The meta-temporal nuraghes The Argenic experimentation that I propose in this 24th conference of Generative Art is linked to Sardinia, and its most famous megalithic architectures, the Nuraghes. The goal is to generate meta-temporal "Nuraghes" that can be experienced in the contemporary world while maintaining their primitive recognizability.

This operation was carried out through the topological interpretation of the Nuragic idea at various scales and then through the generative interpretation of the geometric structures identifiable in these architectures. This abstraction of the idea disregards the peculiarities of historical time and of construction techniques. It prefers to work on the compositional logic for the organizational structure of the architecture. The aim is to structure the possibility to leave the specific historical location for trying to place themselves within any time possible, reflecting some recognizable characters.



Visions of argenic Nuraghes inMars environment.

Therefore I found myself in front of multiple generative outcomes that retraced the history of the last three thousand years. In particular, from the Middle Ages to Renaissance and Baroque Nuraghes up to Nuraghes that reflect the complexity of the contemporary world.

### Argenic Nuraghes species. Project for habitat on Mars

Nuraghes have been the symbol and expression of culture in Sardinia since the second/third millennium BC, the time of the Egyptian Pyramids, until the first centuries. Not much is known about these architectures. What we can ascertain is that they were isolated constructions and had the basic appearance of cones. In that, with the external shell inclined, they have a geometric structure that we find in many architectures of their epoch, beginning with the pyramids, not only Egyptian.



Vertical section of a generated Nuraghe. The generated STL file has the full exterior and interior events as shown in the section. The image was made slicing the stl file. Interior and exterior events are connected following the topological paradigm.

The topological idea at the base of the Nuraghes is the relationship with the external environment which is differentiated and characterized especially in the vertical relationship and in the horizontal one. Vertical works on how from the ground it develops and ends towards the sky. Horizontal is defined on how it passes from an internal volume whose character is accentuated by the inclination of the envelope, to the external environment where the same inclination, seen from outside, and the circularity of the structure redefines the uniqueness of the architecture in the natural context The external environment is also, for the most part, devoid of other constructions, and the dominant position of each nuraghe is, at least, suitable for control as wide as possible of the territory. The Nuraghe is a solitary architecture even if, sometimes, and probably in later historical periods, they were surrounded by small urban systems.



Not only. The system that defines the relationship among the various events of the Nuraghe is one of the characters that I have read by interpreting the models of nuraghe that have been discovered in Mont'e Prama together with the statues of the so-called giants.



The relationship that existed between the conical base and the elements at the top of the cone strongly identifies the primitive idea of the Nuraghe, also in the relationships between the single elements that compose these vertical spatial system.

In these models, the upper part, formed by stone events jutting outwards and a terrace with a central construction and, probably, other wooden events, constitute the natural completion of the Nuragic idea.



The argenic project as my project of the species "Nuraghi" has been developed by interpreting these found models and by widening and further characterizing the topological role of the single events. A fundamental element of re-proposing the Nuragic recognizability was the relationship with the surrounding environment. This is the uniqueness of the event inside the Sardinian morphological context in which it was inserted

This topological idea is in tune with the hypothesis of constructions suitable for the first colonization of an uninhabited and, in some ways, inhospitable but fascinating planet like Mars.

Mars appears as an opportunity for the explicit design of the Nuraghe as a possible interpretation of a bridge between ancient Sardinian environment and a possible development of a generative architectural structure that inhabits it humanizing.

The generation of Nuragic patterns as events of the species that I have designed attempts to go beyond the time of the Nuraghi. The goal is to achieve a meta-temporality that works in our contemporary, focusing a timeless interest within a topological setting and Sardinian culture.



The hypothesis of using these for the first architectures human colonization of Mars increases the topological, functional, and symbolic structure of the idea and the complexity of these architectures. To make the Nuragic idea travel through time as if it were capable of acquiring "experience" in the three thousand years just gone is like making it proceed through Roman, Medieval, Renaissance, Baroque and contemporary time in a way that is capable of absorbing and "transforming" these experiences, producing innovation and evolutionary capacity.

On a functional level, the events that are generated in the topological image of the models, are reconsidered as events that focus on the human needs of living on Mars. There are towers or "artificial trees" capable of repurposing oxygen generation through an artificialization of chlorophyll function, external surfaces articulated in projecting events, like spatial mosaics, capable of controlling indoor-outdoor temperature the difference, antennas and communication management events, reduced outwardfacing, but located in a way that allows human control of the territory, all built with simple structural events, with holes that require only to manage the force of gravity and with events that constitute the external surfaces inclined concerning verticality.

But it is above all the idea of the symbolic function that gives strength to this proposal of meta-temporal Nuraghes for Mars. The architecture that is born solitarv and that builds а strona relationship between the inhabitants and the external space explicitly and creatively defines the relationship with Mars and builds a self-awareness to the inhabitants who will attempt this planetary adventure.



These images are the generated metatime Nuraghes. All these Nuraghes are generated by a single generative project of species. All 3D models are completely generated as stl files and used without any changing for the images and for printing 3D.





3D prints of meta-time generated Nuraghes.

Each model was generated using the same Argenic Project of Species based on the topological interpretation of the Nuraghes. Each Argenic Nuraghe if different also because the evolutionary generation has different context of references belonging to different cultural European traditions. From Roman to Medieval, from Renaissance to Baroque until contemporary era, the Argenic Project interprets and communicates the last 3 thousand years of Human culture.

#### References

https://soddu.it https://generativedesign.com https://generativeart.com https://artscience-ebookshop.com/