The ancient codes of harmony

The ancient codes of harmony stem from the human vision of the complexity of nature. They allow us to think the possible, to design it and to perform its realization. The first gesture of every designer is to take, in a new application that is born from a need the opportunity to experiment with a possible harmonic code. And to operate in the evolution of the project so that this code buds and breeds beauty as a mirror of the complexity and wonder of nature.

In this design activity, project after project, every architect builds his own code. This is strongly present in diverse ways in every architect. The code of harmony born from the attention of every man to the complexity of nature, manifests itself in interpretation, which is logical and therefore feasible, of the laws of formalization of relationships. Every interpretation is different and belongs to the oneness of every architect. Every interpretative code stems from, and reveals, our approach to the world, our cultural references, our history, our present and the memory of our past.

Each idea is born as a representation of the interpretative code that is a cryptic and subjective code, even if it refers as constant to history of man. Generative art is the maximum expression of this human challenge: it traces a code as a reference to the complexity of nature, and it makes it feasible. So man is the craftsman of the possible, according to the laws of the natural harmony.

What does a code of the harmony contain? As for all codes it contains some rules that trace certain behaviors. It is not therefore a sequence, a database of events, of forms, but it defines behaviors: the transformations. To choose forms and to put them together is an activity that can also resemble that of a designer, but essentially it is the activity of the client. The designer does not choose forms but operates transformations, because only by doing so can he put a code of harmony into effect.

Between transforming and choosing forms one can trace the borderline between architects and clients, between who designs and who chooses the projected objects. This difference must be reconsidered especially today because we are going toward a hybridization in which the client wants to feel himself a designer, even if he only chooses. And the designer, using sophisticated tools, works as chooser between different solutions, in practice as a client.
To design, to create through transformations is, however, an activity that takes time. The generative design, building a usable and upgradable code, makes time virtual and therefore allows the architect, even in a speeded-up world as today is, to design and reach levels of complexity that mirror the complexity of nature and its beauty.

The project. Identification of the codes of harmony.

In every project there is a first step. The designer knows that his first act has a precise purpose: he has to trace a system of relationships that must be adaptable to each possible development. If this act involves tracing a form, the designer has to know that he is faced with two possible ways: to consider this form as an allusion to the final result, discarding other possibilities, or to use this form as a catalyst of the design evolution process. This second hypothesis represents the real design approach. The first traced form is useful, in fact, only to focus a field of reflection on our history, on the present and on the memory. This first design act is the occasion to use the code as a means of possible transformations, and the traced form is a frozen moment of this transformation process. We are not able, in fact, to transform a white sheet: we trace a form transcribing our memory a spark of the idea.

Doing this we know:

1, that we have operated by choosing one way among many possible ones, and therefore we have conditioned the result of our project;

2, that the project we are realizing won't be less attractive, in terms of satisfaction, quality and beauty then other possible project. It will be the result (or better one of the possible results) of one of our design code. The quality that we reach will be measurable by the quality and complexity of this code.

3, that an idea, concretized as a code, realizes in every architecture a cryptic writing that will also emerge when functional demands and fashion change. An idea is timeless, appreciable as the interpretation and re-reading of the built reality.

The Pantheon is timeless. This idea is by Adriano. It doesn't matter if it has been realized by transforming an existing building or if it is a new building. And it is not important who initially realized it and who transformed it. This idea is strongly identifiable by reading the adopted code: the omnidirectional structure as a concept of the universality and the relationship with nature, the north orientation, the inside perspective structure that connects man to the built space and through this to the universe but, above all, the overlapping multiplicity of possible geometries that, hidden in the apparent simplicity of the construction, manage the progressive transformation of the space and its increase in complexity. These overlapping
geometries stem from the idea of the omnidirectional structure of the space as a connection to the universe and nature: the concept of harmony as the awareness of manifold subtended relationships that build a pattern whose sense is discoverable by each man in a different but calibrated way of feeling himself a craftsman, inside the natural complexity of the possible.

Redrawing the Pantheon with the computer I have made some discoveries of overlapping geometries. To the apparent structure of a spherical geometry divided in two parts and of an octagonal division underlying an impending heptagonal division (the series of panels in the cupola are 28), there are other possible hidden geometries. In particular I have found myself drawing a series of elements with progressive angles of 36 degrees, tracing a further pentagonal geometric structure of the curved space. While the octagonal structure traces the sequences of the spaces, the pentagonal / decagonal one defines the rhythm of the emergent pillars. Not only this, but there is other subtended structure referring to an hexagonal

![Diagram of Pantheon geometries](http://www.generativeart.com/abst2000/soddu/soddu.htm)

**Fig. 2, Pantheon criptic geometries**. A geometry, with the moving on the transversal axle of the twelve-sided polygon that alludes to a possible scanning in 24 parts, restoring the double axle of symmetry.

What is amazing is the actuality of this space, its ability to stimulate the search, in every person who crosses it, a personal point of view, to answer in this way to the unpredictable needs of each person, to be a boundless continuum of possible subjective "discoveries". And one hardly realizes that the inside is double. An original layout of the attic internal facade exist together with a more recent layout that completely transforms the structure of the inside front. The idea is so strong and explicit that the two layouts, despite their strong difference, appear only as two possible and interchangeable scenarios of the same design idea.

Ever Bernini, building above the Pantheon the famous ears, then demolished, has not done anything else other than to produce a further possible scenario of the idea of Adriano of his code.
The code, in fact, represents the idea. Every possible scenarios of a project, that is born from different initial acts or, as in the case of the Pantheon, from subsequent cultural contingencies, is nothing more then one of the possible representations of this idea. Obviously it happens if whoever continues the work is able to recognize the code and to interpret it, to read the cryptic composition score. This is because every use of the code is an interpretation of the same.

The generative approach to the project, realizing the code realizes the idea as a product that is autonomous from possible further applications, from possible evolutions, from possible contingencies. The generative code, as an Idea-product, is the essence of the creativeness of each architect or artist. It is the idea, the concept, realized through an operative metaproject whose performances are predictable in terms of quality, clarity and recognizability, but are unpredictable as formal results. We can ask the question: these results, although unpredictable, are they also surprising?

To transcribe an event, a memory as a code.

If, with a pencil, we scribble on a sheet of paper, we have represented what surrounds us with a bidimensional image. The scribble can allude to an event of our memory, to a thought, an aesthetic emotion, an object that fascinates us, a system of relationships. If this scribble is our initial design act, we have to make it in such a way that it is legible usable to build our code. It all starts when we look at this form with the eyes of the designer. At this moment each bidimensional trace assumes unexpected characteristics:

1. It is the representation of manifold and possible three-dimensional events that defines a universe in transformation. A universe whose forms oscillate following our possible keys of reading that are the representation of our creative and designing strength. But they also follow the interpretative oneness of every single moment of ours activity. Only by reading bidimensional objects as possible representations of three-dimensional events can we find an unexpected universe of possible and manifold parallel spaces. All these spaces, however, are characterized by our identity. Parallel and possible spaces are endless, but all mirror a specific approach to the world, a subjective interpretation of what surrounds us. If we don't succeed in operating manifold and amazing interpretations of our sketches, how would we be able, at the end of our design or artistic project, to reach the quality that allows us to overcome time, englobing in our work a multiple stratification of possible meanings, an adaptive sense that allows any user to read and to choose the specific and unpredictable meaning that he is looking for? How will we be able, in other words, to build an idea, a concept that gives quality to our works?
2. It is the representation of a dynamics of transformation where the sketch is only the first static trace of a process, of a progressive transformation that reveals our evolutionary idea, that tells as we would like to transform the environment in which we live. We immediately realize that a unique dynamics of transformation doesn't exist in our interpretation of the trace. The possible transformations are manifold and they tell, in direct and essential way, our oneness and the oneness of designers. The stratified multiplicity of these transformations is the representation of our design code.

From the sketch a code emerges, a design idea as a code of transformation. This reveals once more a theoretical and practical aspect that is often forgotten: the designer doesn't create a form but operates transformations. The generative project is the construction of a corpus of laws which shows not only the complexity but also the synthetic and communicative clarity of the transformations, not of all possible transformations. Each designer, each artist is unique, as is every man. A generative project relates to and makes performable a set of particular and subjective codes. The oneness of these evolutionary codes emerges from the interpretation of what surrounds us as a dynamic moment toward a possible increasing complexity and, particularly, it emerges from the possible evolutionary visions that the designer himself can find in his sketch.

To memorize our own code of harmony we are can use various languages. The codes of Leonardo da Vinci are written and drawn codes: they are sketches for personal use, for rediscovering interpretations and supplying further interpretations to annotate a latere. But there is a language that makes these annotations directly usable, and that operates and directly represents the transformations: the algorithms. To a designer it doesn't matter if A=n but if A=A+1, that is if A transforms itself and "how" it transforms itself. If we use an algorithmic language to represent our idea we gather two opportunities: we use the proper language of transformations and we represent our idea in an "executable" form, that is directly operational. We realize in other words a Generative Project, an operational subjective meta-project, a full idea-product that has in itself the fullness of possible results, manifold events identifiable in the same idea.

Construction and use of a Generative Project.

When we identify a logic, a "how" an object can transforms itself, we read the object of this transformation from a particular point of view which is able to represent it through a system of roles and relationships. In other terms we decipher the structure of the object that we want to transform through a paradigm. This paradigm is not intrinsic to the object. If the object is our occasion of project, the paradigm cannot be only represented by functional roles and relationships, even if obviously such functional needs exist in each specific occasion of project. The paradigm will be built by interpretations, in terms of roles and relationships, of the functional needs that the customer has expressed and of his subtended needs, external and subjective. Each designer has his own paradigm to approach the objects that surround him and, naturally, of thinkable and possible objects. This subjective paradigm is the main part of the interpretative and evolutionary code. It belongs to the idea.

This paradigm of interpreting the possible world comes from the search for harmony, for awareness, for the complexity and beauty of nature. Often it comes even from the idea of the human body as a code of interpreting every possible object: the "legs" of a table, the headlights of cars as "eyes", etc.

The interpretative paradigm is a constant, even though it is in evolution, in the activity of every designer and it identifies him. The man of Leonardo, with the his arms widespread in the circle and, in the same time, in the square is an organizational paradigm of the possible. The structure of the human body is meter and code of interpretation, proposal and evolution of each possible artificial events, identified with the square and the circle. It is, at the same time, the organizational and logical structure that allows the designer to act the "design transformations" from the square to the circle, and vice versa. The squaring of the circle: myth, unreachable goal of designing minds.
To build a Generative Project it is necessary to put together the two logics that identify the designer’s activity: the paradigm that defines roles and relationships inside possible incoming events and the laws of transformation, the algorithms that explain our idea of the possible events as an evolution of the present. A generative code with these elements, paradigm and laws of transformation, can become, in a progressive increase of complexity, a code of metaproject rules that identifies the character, the recognizability and the communicative clarity of every possible event that we could still design; before not only designing it, but knowing what the object will be: a table, a school, a skyscraper, a lamp.

Paradigm and algorithms of transformation define in fact the "how" to operate and not the "what" to do or to choose. These tools define therefore the job of designing and not that of buyer and client. The client chooses between one form and another, between one object and another, and his specificity is to identify the object of his taste. The designer transforms the events into possible objects, and his specificity is to see over the existing events, to be a "visionary" man. The limit of the client is to ask for the impossible world, the challenge of the designer is to transform it into possible one.

Borromini, in this approach, has been a great teacher. I imagine the request made to Borromini for the church of Sant’Agnese in Piazza Navona: I want the church be present in the whole square, inside the square but, at the same time at the limit of it; the dome has to be present in all the square, it has to move itself amplifying the character of the square that is a lengthened elliptic Roman passage. Impossible applications that, indeed, were made possible by a series of design transformations by Borromini operating with his architectural code. The dome "walks" and is the "central" presence in the square. It is amplified, not obscured by the fountain of Bernini, as well as by the turrets and the curved geometry of the facade. Bernini, in fact, with his fountain succeed in developing the idea of Borromini because this idea, as all timeless ideas of the architecture, is able of to live and to nourish itself on the unpredictable, stretching itself in multiple and amazing representations, but maintaining unchanged character and quality. This is so even today: an incomplete restoration has give Sant’Agnese two colors: the dome, although darker, maintains its strength and its dynamics presence in the square, highlighting even more the conceptual structure of the idea.

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Fig. 5,6 Sant’Agnese by Borromini
To operate with Generative Codes.

A generative code, composed of an interpretation paradigm and of transformation (algorithmic) engines, can be realized as a logical and operational control structure of the project or, better still, of the possible projects. This is due to the fact that the algorithms are logical structures of the representation of the transformations that can be operated with manifold and different objects and on different occasions.

Inside a generative code we can find all what needs as to "how" to transform events, but there is not the object, the occasion of these transformations. To pass from the code to three-dimensional scenarios of architecture that represent, for instance, the museum located in Fresno (fig. 8,9), with a defined number of exhibition rooms, each one with its peculiarity, with a defined number of offices and services, with precise relationships between public and work spaces, with specific sequences of paths, etc., it is necessary to turn these applications into an organizational paradigm, a mirror of that interpretation paradigm, that contains and interpret the specific requests of the client, the functional aspects and the technical and material options. All these "choices" are, or they can be, the expression of the customer. The organizational paradigm doesn't define ex-novo how to organize roles and relationships but it connects the roles and the relationships identified in the interpretation paradigm with the functional specifies required by the client. This connection, these "fitting" is made possible by two facts, an extraordinary and one ordinary. The first concerns the possibility of defining some exceptions that are specific of the design occasion. These exceptions may also be the occasions to increase, to evolve the structure of the generative code. Following this method, project after project, the code grows in quality and uniqueness. The second concerns the usual design activity. The connection, the "fitting" is made possible by the fact that the logics, roles and relationships present in the interpretation paradigm, can be slotted in one inside the subsequent. The same paradigm is a fractal or fractal object. Every role present in the paradigm can and must contain in itself the whole paradigm, and so on. The structure of the functional needs of the client finds, in this increasing complexity and in the potentiality of functional performances, a wide space to express itself through the paradigmatic interpretation, also multiple, of the possible evolutions. At the same time the more the paradigm consolidates, the more the occasions grows to apply the code of harmony. In other terms we can affirm that the more the requirements of the client are complex and "impossible", the more the potentialities of the generative code are made operational, and therefore doesn't remain unexpressed. And consequently if the control of the code, taking advantages of the occasion for specific requirements, work on all levels, from the global to the detail, it increases the communicative clarity, the identity and the quality of the project.
Fig. 8,9 Central Valley Fresno Museum, by C. Soddu, E. Colabella, M. Codignola
Once we have inserted the organizational paradigm in the generative code, we have conceived a new architecture, (or better a new kind of architecture) that however will be inside the designer’s concept of architecture. To create it, it is necessary to sparkle an evolutionary process, emulating design life. In this artificial life, as in the real design life, we need a first act, a sketch, a catalytic event that can be used for priming the dances of transformation, it not being possible to transform the nothing. This priming can also
be caused by using a random factor, because the form is not important, but the topic is the dynamic interpretation, the possible following transformations. But this sparkle is what determines the difference among individuals, even if these individuals have the same quality, character and identity of species and, above all, each individual reflects a same idea of harmony and beauty. However they will be unique and unrepeatable if the catalyst is always different.

The individual and the species. The reason for a production of objects, all different but all belonging to the same concept, to the same species.

If we walk in a pine wood, every pine is different from the other. Every tree is, by itself, unpredictable. But is it also surprising? Certainly not. We know it already even if we have never seen it. An exceptional tree can be amazing, but only the first time we meet it. Then it becomes indistinguishable from the others. It belongs to our memory knowledge. Last year I edited the proceedings of the GA’98 conference. Each book had a different cover. Or better still, on the cover of each book there was an image of a different architecture, realized with my generative code. I had put under a showcase, well lined up, about twenty volumes. At first nobody realized that all the covers were different. But when this difference was discovered, each person wanted to choose the book "he liked most". Until that time all the books were identical.

I happens this way, when we choose a bunch of flowers at florist’s shop. They are practically indistinguishable at first sight, but we still spend a lot of time choosing "ours". It represents the identity of natural events, our identity. The rediscovery of the oneness in industrial objects responds to the need to light again, in the artificial ware that surrounds us, the greatness, the charm and the beauty of nature, to rediscover these features also in ourselves.
Fig. 9 Generated Woman Portraits, a generative artwork by Celestino Soddu

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