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Cosmology as a Source of Sustainable Design Ideologies

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ABSTRACT:
"Ideology" is "visionary theorizing." Alternatively, it is "a systematic body of concepts especially about human life or culture," or "a manner or the content of thinking characteristic of an individual, group, or culture."
Human beings think in concepts. The term concept describes any set of closely related ideas that we group together under a single word or image. Concepts allow us to create categories and make distinctions among things. However, if our role model, real or imagined early life experiences, or as a trauma reinforce distorted notions, some of our early incomplete or flawed rules and concepts may remain fixed as we grow older. Without concerted effort to evaluate whether, on hindsight, our early theories were accurate, and without the capacity to honestly examine how they affect our lives today as adults, rules and concepts can harden in our minds. We become slaves to our concepts and fail to realize that they are not real, but are merely ideas and constructs we established in our heads to make sense of the world. If we aren't careful, we begin to create our own reality and constantly reaffirm the myths and images we already hold. This is how mental frames are formed that produce inflexible, myopic climate-damaging thinking and behavior. Mental frames are the deeply felt beliefs, assumptions and stories we hold in our minds about the nature of other people, hoe the world works and our role in it all. Mental frames have three interlinked elements: core beliefs, core assumptions and automatic thoughts. Core beliefs are the deepest level of cognition. They are the unconditional views we hold about the world around us, including the physical environments, other humans and ourselves.
The problems that happened with the transformation to modernity had caused that most cities had eventually lost identity and character. To overcome these problems and the defects that were caused with the use of Computers that had brought change to architecture and urbanism to be a part of revolutionary social upheaval-for that- we are going to deal with generative systems in the universe that had become a source of inspiration for a number of architects.
The aim of this paper is to investigate sustainable design ideologies, as well as introducing a new vision for developing design process by getting cosmic rules and actions to be our source of inspiration, and insure that is one of main sources of getting sustainable sustainability.
Conference Topic: *"Future Intermediate Sustainable Cities: A message to future generations"*
Keywords: sustainability, design process, design ideologies, cosmic rules.

1. INTRODUCTION:

Cosmology is the science of the cosmos-its origins, structure, components, order and governing laws. Its complex and multifaceted inquiry unfolds at the intersection of philosophy, theology, and natural sciences and is sustained by the human curiosity to know how we have come to exist. In structured space, man knows where he is; direction is meaningful to him. Reinforcing this universal order are the corporeal creations of the macrocosm and the microcosm which exhibit strong directional characteristics of Knowledge. We could sum up that "The Cosmic Spiral and DNA forms the Origins of Knowledge". DNA is a single molecule with a double helix structure; it is two complementary versions of the same "text" wrapped around each other; this allows it to unwind and make copies of itself: twins! This twinning mechanism is at the heart of life since it began. Without it, one cell could not become two, and life would not exist. And, from one generation to the next, the DNA text can also be modified, so it allows both constancy and transformation. This means that beings can be the same and not the same. One of the mysteries is what drives the changes in the DNA text in evolution (fig. 1).
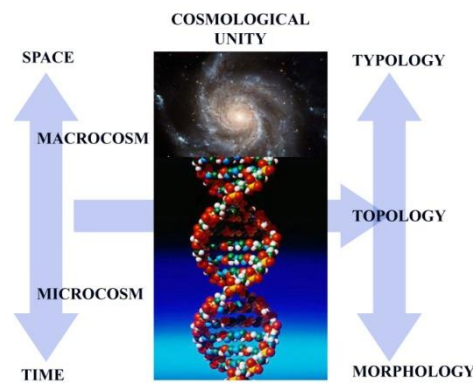

Fig.1 A **logarithmic spiral,** equiangular spiral or growth spiral is a special kind of spiral curve which often appears in nature.

There is an intelligence base in our DNA and a consciousness as well. **"Consciousness" carries different baggage than "intelligence."** Many would define human consciousness as different from, say, animal consciousness, because humans are conscious of being conscious. It is not known whether there is a "consciousness" inside our cells; for now, the question seems out of reach; we have a hard enough time understanding our own consciousness—though we use it most of the time. **Intelligence** comes from the Latin inter-legere, to choose between. There seems to be **a capacity to make choices** operating inside each cell in our body, down to the level of individual proteins and enzymes. DNA itself is a kind of "text" that functions through a coding system called "genetic code," which is strikingly similar to codes used by human beings. The structure of DNA as we know it is made up of letters and thus has a specific text and language. You could say our bodies are made up of language, yet we assume that speech arises from the mind. How do we access this hidden language?
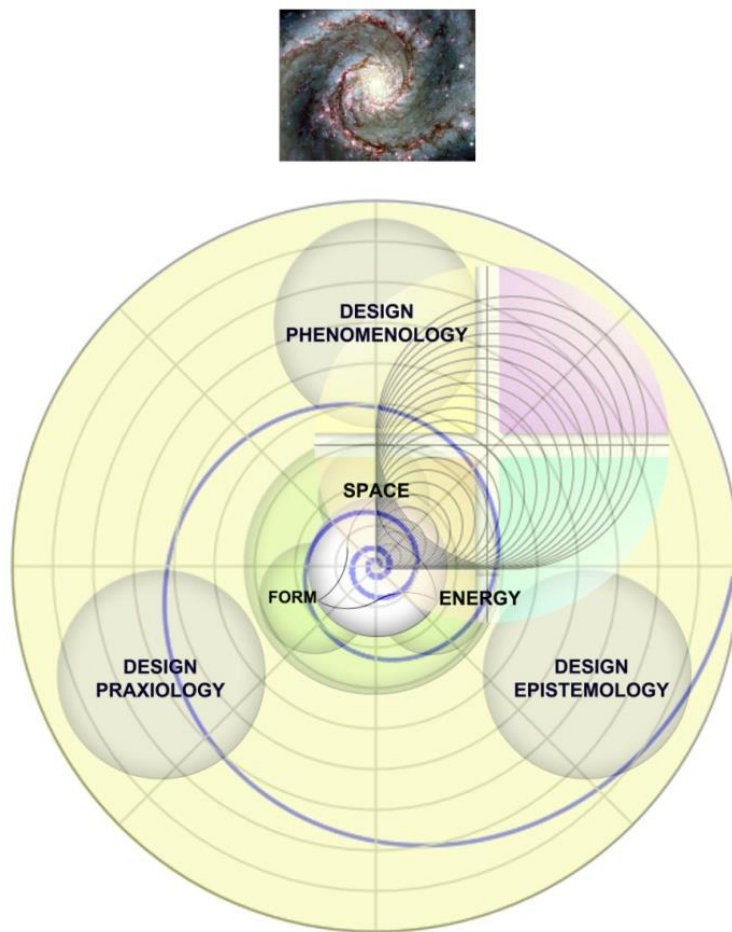
Fig.2 Sustainable cosmological ideologies.

This is the observation that to investigate the cosmic spiral. Our hypothesis is that it is connected to the double helix of DNA inside virtually all living beings. And DNA itself is a symbolic linguistics code. So, yes, in at least one important way, the living world is inherently symbolic. We are made of living language. Within this living world is the "place" of man, who as microcosm contains all that makes up the macrocosm. In this regard, sustainable cosmological ideologies fall into three main categories based on people, process and urban environment: First, Design epistemology- study of designerly ways of knowing. Second, Design praxeology- study of the practices and processes of design. Third, Design phenomenology-study of the form and configuration of artifacts (fig. 2). The symbol of the Cosmic Spiral is a central theme in our research. Why is there such a consistent system of natural symbols in the world? Is the world inherently symbolic?

The three basic elements forming balanced intelligent unity in universe are also expanding - from the ideological point of view spirally- in an algorithmic way through time progress and knowledge processes. Cosmology exists in architecture through its cosmological origins, structure, components, order and governing laws and that exists in three main phenomena's of **space**, **form** and **energy** (fig. 3).
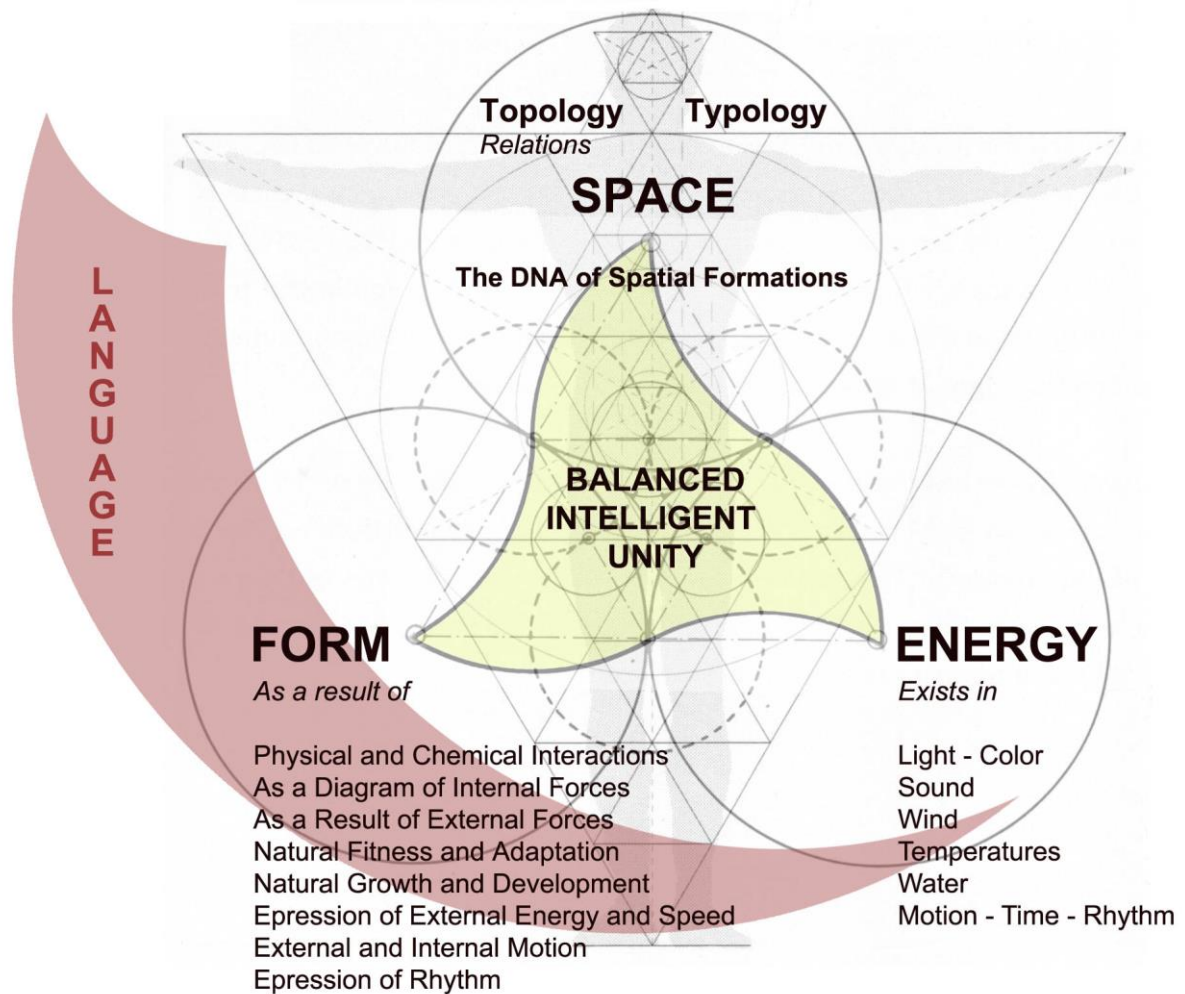
Fig.3 The three basic elements forming balanced intelligent unity in universe.

2. ELEMENTS OF BALANCED INTELLIGENT UNITY:

2.1 Space:

One can in fact, see design and planning, from the land scape of a region to the furniture arrangement of a room as the organization of space for different purposes and according to different rules which reflect the needs, values and desires of the groups or individuals designing the space and represent the congruence (or lack of it) between social and physical space. This is not to deny the importance of the shape, proportions and sensory quality of spaces and their enclosing elements, as well as their symbolic meaning, but these all occur within a spatial framework of genome like relations and space organization is hence the key element and the most useful for comparing environments and studying the rules of their organization. When we mention "genome like" we are dealing with the built environment as a series of relationships among spatial elements. The built environment has a structure and is not a random assemblage of things. It both reflects and facilitates relations and transactions between people and the physical elements of the

world. These relationships in the physical environment are primarily spatial – basically objects and people are related through separation in and by space, (Rapoport, 1997).

While space organization does express meaning and has communicative and symbolic properties, meaning is frequently expressed through signs, materials, colors, forms, landscaping and the like-i.e., through the iconic aspects of the built environment. Thus meaning may coincide with space organization or may represent a separate, non-coinciding, symbolic system through which different settings become indicators of social position and a way of asserting social identity to oneself and others. This means, of course, that physical elements in the environment takes on varying meanings and their influence and importance, and their effect on behavior, change accordingly (Rapoport, 1997). Spatial experiences can be divided into three categories:

A. Spatial practice to the "sets" characteristic of each social configuration and interaction.

B. Perceived representations of space, refers to space as "encrypted reality" or as the conceptualized impression of scientists, architects, urban planners, and "social engineers".

C. Conceived and representational spaces, or spaces as they are lived and described in associated symbols and images.

The building displaces pre-industrial spiritually with a structurally ordered reproduction of scientific rationalism, as a rival to religion in providing meaning to the world. The interior spaces that this structure makes possible- and through which this procession is planned for maximum effect- is grand narrative in **microcosm**, revealed by natural light, a tectonic explanation of a universal history of belief in progress and a break with the past.

There is **a hidden unity under the surface of life's diversity**; this unity is associated with the double helix shape (or two entwined serpents, a twisted ladder, a spiral staircase, two vines wrapped around each other).

As the design of urban spaces is often approached as a recombination problem, hierarchies are often used for guiding the recombination process. **Some hierarchies encode abstraction levels, while others represent part-of relationships.** Various degrees of abstractness in a hierarchy of functions can be helpful in urban reformations that obtains their revitalization needs from within; i.e., by reverting to the inner forces that are able to nurture a living culture and re-establish a sense of presence, integrity and continuity. A hierarchy of components can be used for spatial recombination tasks using the vocabulary of spatial components which are characterized and defined for each type of urban spaces. This development has to take into account the changes that have taken place in quantum mechanics, information technology, and spatial perception especially in relation to the concept of abstract movement. In future, architecture and urbanism has to be adapting to an "electronically induced ethereal space" rather than electronically generating an architecture constructed from genetic codes that will allow it to conform to the existing environment. "Genetic space" is an extension to a new "cosmic conception of reason" that will evolve because of this changing awareness of space-time. Genetic space differs from the interactive formulation of images that is already generally understood as cyberspace, and that while it is also predicated on the known logic of evolutionary systems, it is "entry-level modeling of a possible world that is still in its embryonic state (Steele, 2001).

SPACE

Combination, Re-combination, Abstractions and Relationships
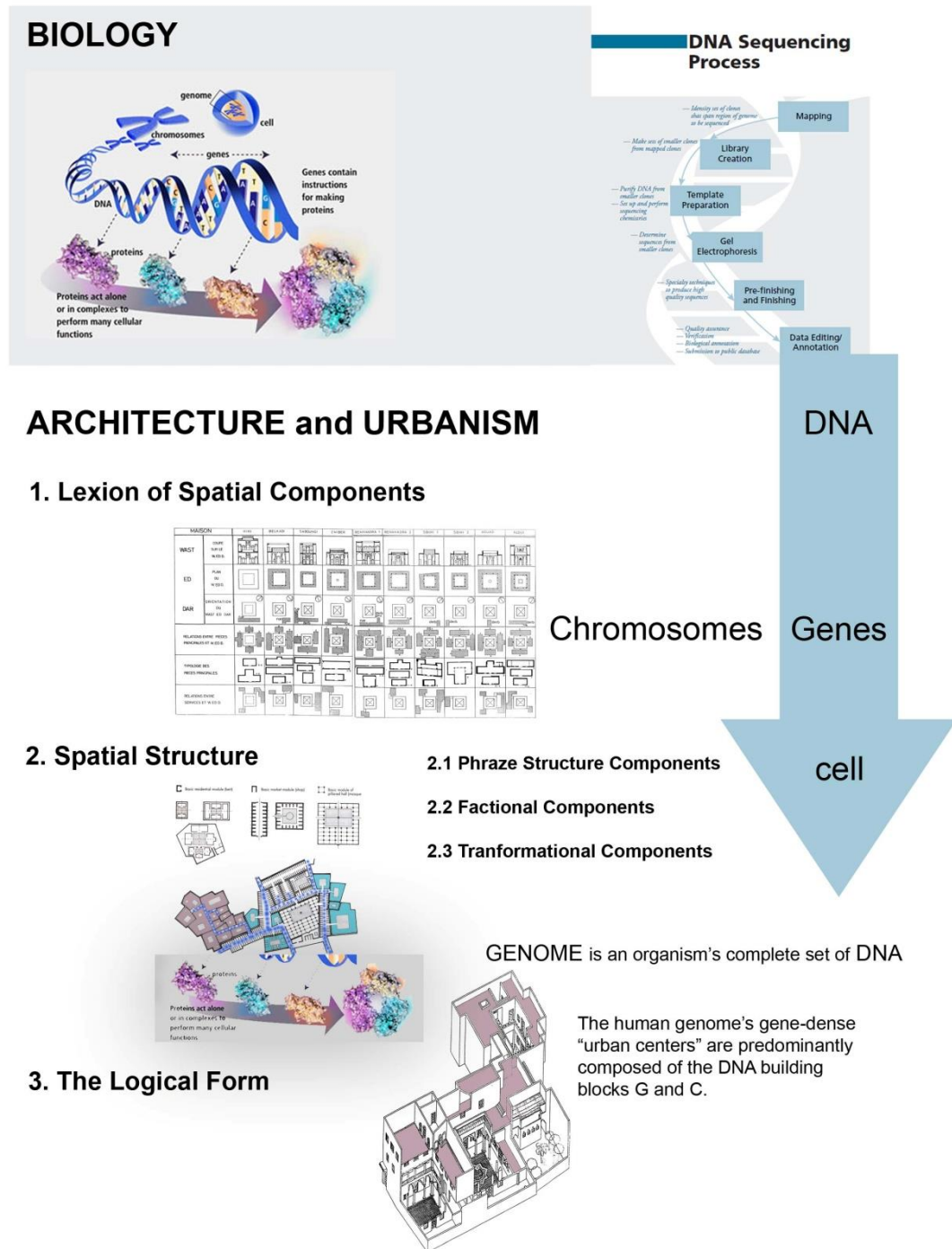

Fig.4 Abstractness in a hierarchy of functions can be helpful in urban reformations.

It is obviously clear from the analysis of the morphology of urban spaces in Islamic cities that there is syntax for its spatial relations who exist in: *first*; the "lexicon" of spatial components (24 types), *second*; the spatial structure with its three main categories:-Phrase structure components, factional components, and transformational components, *third*; the logical form. Nanotechnology and computer modeling have helped genome engineers to determine the exact DNA sequence of 24 different organisms, the codes of life that will allow new organisms to be created (fig.4).

1.2 Form:

Where a cosmic order is visualized by means of spatial organization, characters are symbolized through *formal articulation*. Characters are more intangible than natural "things" and spatial relationships, and demand particular attention from the builder. In fact their concretization presupposes a language of symbolic forms (style). Such a language consists of basic elements which may be varied and combined in different ways. In other words it depends on systematic formal articulation (Norberg-Schulz, 1985).

Articulation means making precise a particular character, and this character, simple or complex determines every part of the building. Articulation determines how a building stands and rises, and how it receives light. The word stand denotes its relationship to the earth, and rise its relationship to the sky. Finally, it ought to be mentioned that material and colour may contribute decisively to characterization.

All things within the **cosmos** reflect the cosmic intelligence, but only man reflects it in an active sense. This microcosmic intelligence is the inner link which unites all things to the Universal Intellect, just as, from an ontological point of view; all things are related through their existence to Pure Being.

The concept of **time and form** as simultaneous continuities occupies no less a position of prominence. As with all creation, space contains both active and passive possibilities. It is in relation to the active aspect of space that the idea of time as motion occurs. Concurrently, the passive possibility is manifested in matter or form which is directly a product of this movement. The locus of time and form is space, which simultaneously manifests its active and passive aspects through motion. (fig. 5).

The word "space" was usually associated with Euclidian geometry, or was considered to be infinite, empty ether. The introduction of the concept of "social" space had to compete with the epistemological convention of space as a **mental place**, widely generalized into literary, ideological, psychoanalytic, or other variations that excluded a more uniformly humanistic point of view. Considering the relationship of the natural science to space, Lefebvre* rejects the "arrow of time" concept, preferring instead to subscribe to a cosmology based on a universe made up of a multiplicity of particular spaces that are the product of energy.

The concept of **motion** associated with the creation of **time and space.** Creation is renewed at every instant, and its apparent **'horizontal' continuity** is pierced by the **'Vertical Cause'** which integrates every moment of existence into its transcendent Origin."

The accompanying realization is that the "real" time there is an important difference between direction, past, and future. This difference is dictated by the second law of thermodynamics, which predict that in any closed system entropy (the measure of disorder in that system) increases with time, which implies direction. The direction has been designated by physicists as "the arrow of time". The "arrow of time", asides from entropic progression, also includes a psychological direction, in which we perceive that time passes, and a cosmological direction, in which the universe has been expanding.
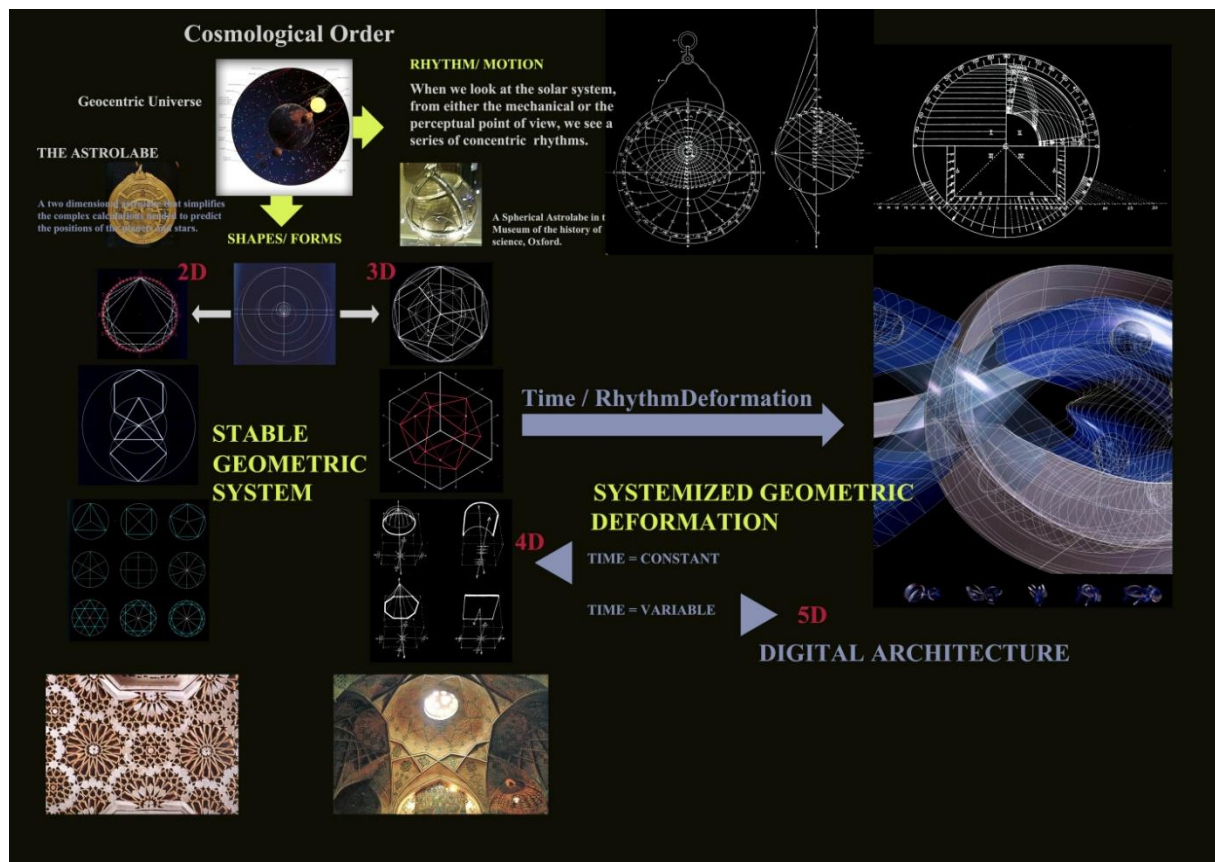
Fig.5 Form results from the delimitation of structured space. Numbers are the units of this spatial definition, and geometry expresses the "personality" of these numbers. Through the use of numbers and geometry, as mathematical expressions, the creation of shapes recalls the Archetypes. Mathematics, then, is viewed as the language of the Intellect, leading from the sensible to the intelligible world. Mathematics is an abstraction with respect to the senses, even though concretes in its Archetypical self. These abstractions from the intelligible world serve as a basic guide to the eternal and concrete essences that reside in the Divine Order.

In an evolutionary model of design, form emergence is considered to be the result of an evolutionary process. Form generation is derived from an internal genetic coding that replaces *traditional interaction* with the form itself. There also exists a significant body of theory dealing with problems of emergence and the behavior of complex systems as related to evolutionary models. Genetic algorithms have become a major tool in various research areas. John Holland is the founder of the domain of genetic algorithms. These are parallel computational representations of the processes of variation, recombination and selection on the basis of fitness underlying most processes of evolution and adaptation (Holland, 1992). Genetic algorithms were first employed in a problem-solving and optimization context in which stated criteria and goals were defined and controlled by a fitness function. In this type of automatic generative process there was no interactive consideration. However, in design the provision of interactivity and the formulation and the type of interaction of a certain generative mechanism are essential (fig. 6).

In genetic algorithms, the populations of alternative solutions in generative processes are seen as key components within evolutionary systems. In this approach, genetic form evolution is based on rules defining the '*genetic code*' for a large family of similar objects. Variations are achieved through processes of 'reproduction' through gene crossover and mutation.
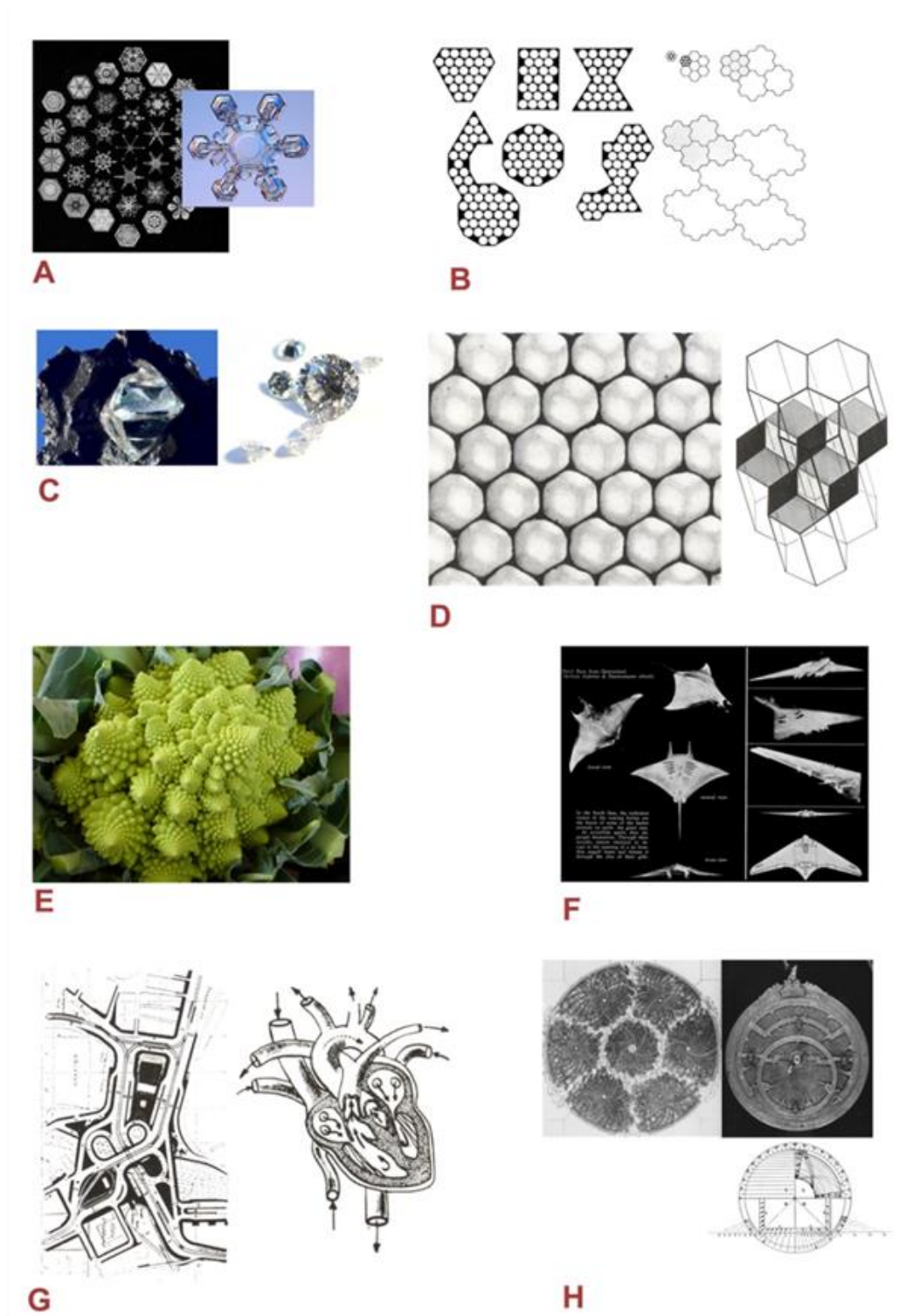
Fig.6 Form as a result of: A. chemical and physical interactions, **B.** a diagram of internal forces, **C.** a result of external forces, **D.** natural fitness and adaptation, **E.** natural growth and development, **F.** expression of external energy and speed, **G.** external and internal motion, **H.** expression of rhythm.

At their best, architectural forms represent the crystallization of a creative process and have a life and a "soul" of their own. They are not just accidental and superficial shapes, as is often consumed, but are potential carriers and conveyors of meaning capable of evoking strong resonance in man's spirit, soul and body. Through his visual and intellectual senses, the beholder is able to intuitively perceive essential qualities inherent in formal structures, such as wholeness, unity and truth. The sense of beauty that such experience can evolve is nothing but a reminder of a higher and ***timeless order*** in which human life is rooted (Bianca, 2000).

1.3 Energy:

Energy exists in six elements that are the fundamental conditions of matter- ***Motion (Time, Rhythm), Light (color), Sound, Wind, Temperatures, and Water.*** These elements are ***symbols*** of life- generating forces both passive and active. Use of the six elements in the artifacts of man is essential and provides profound points of reference for his ultimate reintegration. Each of these elements can be symbolized in space and in form.

The world of symbols, as revealed or innate signs of the creator, provides the common denominator that enables the architect to link the varied and at times contradictory architectural components into a harmonious totality. Symbols form an important chapter in the morphology of architectural components as reflections of archetypes manifested generically in "temporal forms", these forms are subsequently crystalized or frozen in time by man, creating conceptual fluidity for the earthly realization of archetypes.

In the hierarchy of spatial conception or definition, the city is a positive shape set within the basic coordinate system of space. Insofar as the cosmos is defined, so the city is defined, and so man is defined. All three scales are viewed separately and together as determined, persistent, complete, and perfect in their archetypical existence. The city, in its temporal existence, approaches its archetype by degrees; the significance of its conceptual achievement lies in its ability to provide that essential sense of an ordered place in the universe.

Within the cityscape surfaces are developed like the skin of the body which both hides and reveals the anatomical structure, like the skin of a pomegranate.

The richness of both appears only on the inside, where lie the delicate seeds of life and its true color. So too developed surfaces predominately relate to nodal spaces and man's field of vision. Within the three-dimensional mass of the city, the "lining" only occurs in the carved out, negative shapes of positive spaces and the projecting shapes of domes and minarets which serve as visual landmarks in space. This emphasis on the internal marks a centripetal movement toward the locus of the Spirit hidden inside architecture, man, or the creations of nature (fig. 7).

Natural or ***rhythmic order*** develops from man's unconscious integration of cosmic laws. Mountains, ravines, river beds, or contours of the land all serve as natural boundaries within which man creates systems that show distinct random, linear, or cluster tendencies. The forms and spaces of nature, inasmuch as they are divine creations and symbols, are more primordial and more universal than anything man creates.

Within the hierarchy of spatial definition, shapes are delimited by their surfaces. As such, surfaces can perform a twofold function. Physically, they can delimit shapes and thereby crystalize earthly cosmic spaces. Intellectually, they may, through the development of their transcendent qualities, guide the soul to higher planes of realization that lie beyond the created place of man. Combining the fluidity of nature with the geometric transfiguration of surfaces is the characteristic achievement of the harmonic technique.
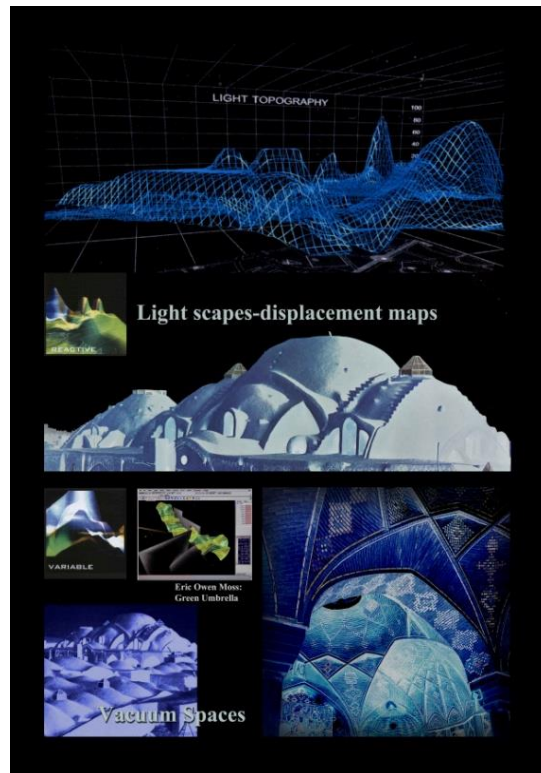
Fig.7 Natural or ***rhythmic order*** develops from man's unconscious
integration of cosmic laws

3. STRATEGIES FOR SUSTAINABLE IDEOLOGIES:

3.1 DESIGN METHODOLOGY
Rather than viewing design as a *top-down*, linear, and goal-oriented procedure, we need to understand underlying rules and principles of universal systems, which produce structural order and material organization of high *complexity, efficiency, and beauty*. Our own research investigates how parametrically controlled systems can be applied to architectural design in order to achieve more responsive and adaptive modeling techniques. The accompanying technological and media developments, the foundations of architectural education appear to be in need of a make-over *from the bottom-up.*

The combination of *interactivity*, *transformability* and *parametrically* controlled perturbations that generate discrete structural variations within design formation processes is an emerging characteristic *phenomenon* of digital design. Parametric systems are becoming cornerstone in the more complex performative digital environment; the body of the theoretical concepts related to parametric formations includes adaptability and change, continuity, proximity and connectivity (Brandon, 2008).

Cosmology serve as a store of experience, available for use in similar situations in future designs. Histories are also a rich source of material for learning. Previous stored cases can be used as a basis for **abstraction** or analogy, while cases with common similarities may help synthesize generalized knowledge (Bianca, 2000).

3.2. LANGUAGE OF SUSTAINABILE ARCHITECTURE AND URBANISM:

A language is a system. One cannot study a language by studying the syntactical elements and their meaning one by one. The most interesting phenomena happen because of relationships, similarities and differences between words. The relationships, similarities and differences between words arise because of the ease and frequency of replication and change, enriched with processes of resolving ambiguity, learning and teaching. Similar system aspects exist in **biology** (but until recently there was not much design freedom in biology) and in architecture (although the replication takes more effort in architecture). This integration is externalized in the architecture and urban environment, presenting simultaneous movement systems, such as the bazaar, which create a continuous flow of harmonious spatial experiences based on number and geometry.

Architecture, like all forms of human endeavor, must move forward, but architects must also find a way of doing this that enables people to read and use their buildings in their ordinary lives. People should not be seen as being conservative deliberately in order to obstruct architects, but rather as responding perfectly reasonably and sensibly given their implicit knowledge of the language of space, form and energy (fig . 8).

If architects understand and learn to speak this human language of space their work can become externally meaningful whatever visual style is applied to it in order to help make it internally readable. Of course our experience is generally integrative rather than analytical, and we are not normally conscious of identifying the extent to which formal and symbolic modes of perception comprise that experience. The symbol of the Cosmic Spiral is a central theme in our research. Why is there such a consistent system of natural symbols in the world? Is the world inherently symbolic?

Most familiar computational algorithms are symbolic. Rules are given using text, numbers or symbols. Output is also textual, or text that is translated into something visual. In contrast, shape grammar rules and computations are spatial. Shape grammars are visual, spatial algorithms for creating, or computing, and understanding designs. Simply they are a visual implementation of computational design.

Languages are created by transforming the spatial relations underlying grammars for existing languages. In other words, a known style is first analyzed by inferring a grammar for it, the rules of the grammar are transformed, and then the transformed rules become the basis for a new grammar and style (fig. 8).
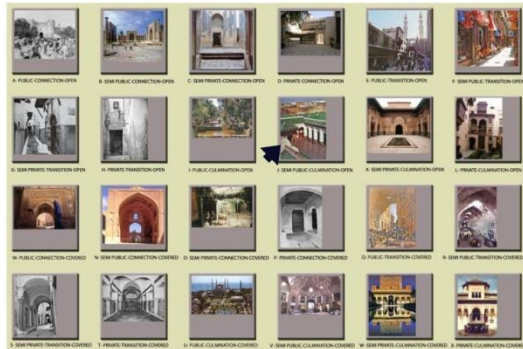
There is no better way to learn about styles or languages of designs (at least compositionally) than by either studying shape grammars already written for languages or by writing grammars oneself. Good analytic grammars are both parsimonious and descriptive. They are eye-openers, revealing simplicity or regularities behind designs seemingly complex or random.

When the language is used to express the actual circumstances, what is general is related to what is local and temporal. General are the basic facts of **topology**, **morphology** and **typology**. Local and temporal are the given environment and the actual building task. Language as such is timeless and placeless, although it contains the original "memories" of mankind (Norberg-Schulz, 1985).

Morphology is concerned with the "how" of the built form. Topology is concerned with the spatial order. Typology, finally, is concerned with the manifestation of the modes of dwelling. Over the last decade, cultural identity and creative diversity have become…links past present and future (Bianca, 2000). All things within the cosmos reflect the cosmic intelligence, but only man reflects it in an active sense. This microcosmic intelligence is the inner link which unites all things to the Universal Intellect, just as, from an ontological point of view; all things are related through their existence to Pure Being.

LANGUAGE OF SPACE, FORM AND ENERGY

The analysis of the morhology of urban spaces in Islamic cities shows that there is a syntax for its spatial relations which exists in the "lexion" of its **24** spatial components.
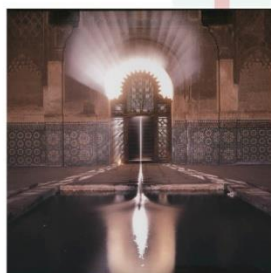
Nanotechnology and computer modeling have helped genome engineers to detrmine the exact DNA sequence of **24** different organisms.

Spatial Vocabulary

Symbolic Modes of Perception

Our Perceptual System allows for both iconic and symbolic representation

The language of space has regional dialects that comprise important features of local cultures

SPACE

SHAPE GRAMMAR

Shape Grammar Rules and Computations are Spatial
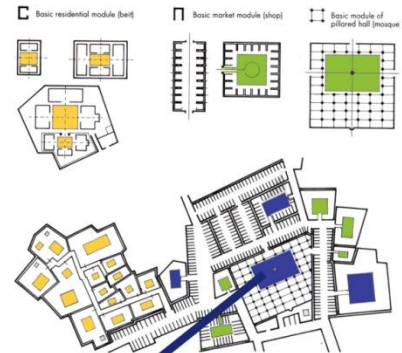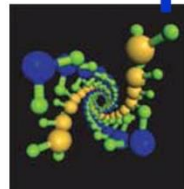
Spatial

Attributes

Relations

Identity

ENERGY   **Formal**
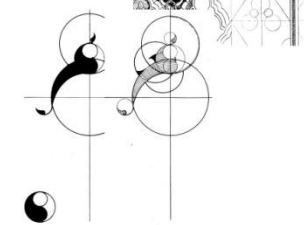
Analytic / Synthetic Grammars Describes Styles of Designs that are Diverse and Complex

Muqarnas

REALITY

Abstraction

FORM

Object atribute values, Object behaviour, Object identity → Relations → Synthesize

Knowledge

COMPOSITION

ASSEMBLY

DECOMPOSITION   COMPONENTS

Fig.8 Language of sustainable Architecture and Urbanism.

4. Conclusion

Actually meanings and balance are what makes our whole life sustainable; consequently it is not an easy task to have these values exist at a time. Balance is actually achieved when all aspects of design are optimized together, and that means that we are dealing with interactive parameters that correspond to all these aspects that starts with the "wholeness" of the design process and ends with every detailed artifact of that design.

Subjectively cosmological rules are based on balance and meaning, and physically we lose sustainability if we miss balance with nature, objectively, this is also true.

Meanings and values are timeless. Cosmic rules are also timeless, and are a unique source of learning design ideologies that contains diversity and adaptability and also has the facility of responsiveness/feedback.

4.1 General Findings and Outcomes

The future of architecture and urbanism depends on its transformation once again into cosmogenetic principles where synthesis is the pre-eminent outcome of a return to a second nature – transcendent concept of nature.

As we had mentioned in our introduction, there is an intelligence base in our DNA and a consciousness as well. "Consciousness" carries different baggage than "intelligence."

Sustainability means also that we need an intelligent urban fabric and Architecture that can afford time changes; in this regard sustainability is seeking time-less architecture and urbanism. In this regard, we could refer to one of the most tiny creatures; "ants" that live in hills that contain complex ventilation systems that remove carbon dioxide and bring in fresh air, and have the equivalent of hundreds of miles of sewers that drain the ant waste into special chambers to be recycled afterwards.

4.2 Recommendations:

To obtain sustainability we have to adopt, adapt, and cooperate with cosmic rules, and if these rules are deeply governing our design methodologies then we could achieve meaning and balance in our urban fabric.

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