

A SCI-FI EPISODE OF 'URBAN METAMORPHOSIS'

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Abstract— It is intended to glance at urban change from a totally different perspective whereby modernist planning is conceived as a technological-interventionist attitude towards an organic host. It is argued that city is evolving as a hybrid (of technology and natural organisms), and that it is significant to convert existing information on cities into new technological format. Therefore, the parallels between the concepts of 'body-machine complex' and 'contemporary city' are discussed on the basis of their common transformation processes. A scientific study of architecture and urbanism is advocated towards an understanding of cultural transmission encoded in urban transformation. An alternative process, leading to linguistic abstraction of urban form, is proposed as an analytical approach so as to enable coming to terms with dynamic mechanisms currently acting upon cities and transforming them into hybrid entities (i.e. an organic machine or a mechanical organism). Statistical approaches are interpreted within the scientific framework of urban studies for purposes of pattern recognition, with cross-references to linguistics, music, and science-fiction and new technologies. It is concluded that scientific innovation should not only increase technology but also promote a symbiosis of nature, history, culture, technology, economy and society, and that of nature and technology in the city.

PROLOGUE

One of the major science-fictional notions is gradually becoming a 'science-fact'; that is 'a machine-like city with its android-like inhabitants'. An untimely emergence of *modernism* in the last century (and its revival with much more friendly garments in the late 1990s) may clearly be an innuendo for a sci-fi phase of urban transformation in the new era. Yet, instead of fearing or blaming what is about to come, professionals in the field of built-environment should (and easily could) turn it into an indisputable opportunity for comprehending some uncontrollable dynamics of ever-transforming city. One way of approaching the issue is to put the evolution of humanity and its material culture into historical perspective in parallel to the developments in science-fiction, and to see the gradual increase in the use of technology as an inseparable component of our own bodies and our environment for the betterment of both. It is argued that city is a *hybrid* structure just like our society in which

machines and organisms are in a *dynamic* and *symbiotic* relationship. The main questions are; *how* this hybrid emerges (or is devised) in regard to the relations among its components, and *how* science can enhance our understanding of it (and ourselves). The paper attempts to tackle these issues with the following sets of ideas which help to construct the argument;

- Modern science offers us a new metaphor for analysing city and its evolution in the course of larger timescales; an *automated-city* (as a self-organising and intelligent system) capable of planning, renewing and improving itself and its growth. Furthermore, scientific studies of human thought and artificial intelligence opens new frontiers regarding the interaction between humans, machines and city gradually merging into a single entity.

- City has always been a hybrid structure (i.e. developing from an *organic-machine* towards a *mechanical-organism*) from its very early beginnings (accelerating after 19th century developments). The relation between *organic* and *mechanic* features is gradually gaining more importance to explain city and its design. Thus, today, *cybernetics* may present new frontiers to understand and manipulate it with the aid of developments in 'computation and automation in design'.

- Most of the crucial complications of the organisms (of the city) have long been diagnosed with the aid of technology, and treated by mechanical means or by technological implantations.

- Such a re-reading of the history of urban morphology would help conversion of existing knowledge on cities into new medium of information storage and processing.

Within above-defined approach, it is argued that modernist conception of city (its principles of democracy, ecology, universal welfare rather than its early devastating exploitation and misinterpretation) seem to resuscitate itself to give us a second chance for apprehending its humane ideals and using environment-friendly technologies to improve the quality of life on earth. Hence, the argument is built through following stages throughout the paper;

- The concepts of modern development and progress, particularly after industrialisation, seem to have been built into a scientific metaphor (at the service of production); city as a 'hybrid structure', that is to say physical manifestation of 'body-machine complex' in built environment.

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- There are parallel mechanisms and processes (particularly regarding *transformation*) between 'city' (i.e. *a physical component*) and what is called 'body-machine complex' (i.e. *its sociological counterpart*).

- The very same metaphor exhibits a unique opportunity to unite *natural* with *artificial*, and the *old* with the *new* (ultimate problematics for architecture in the city).

- Science enables human thinking to simplify complexity of city-building into various sub-problems and sub-components, and to *represent* them with various symbols and codes (i.e. *abstraction*). Also, there is a strong evidence of a code uniting diverse components of a hybrid, and there are various types of underlying codes in different aspects of human life and endeavour.

- In most *hybrid transformations*, it seems possible to observe some kind of systematic recurrence and a symbiotic relationship between components in the course of time.

- First, unearthing, and then *statistical approximation* of these recursive codes (through *recombination* and *juxtaposition* of existing patterns) seem to underlie material evolution in history.

Finally, new technologies and the new information format enable us to conceive our environment in a new perspective so that we can understand human thought; design of our environment as its reflection, and then we can simulate, manipulate and improve it towards a better future.

I. INTRODUCTION: A NEW METAPHOR IN URBAN-ARCHITECTURE

The paper argues *body-machine complex* as a conceptual model to describe the physical transformation of urban environment. The paper attempts to place the issue within the context of scientific study of architecture and urbanism. It is endeavoured to illustrate the parallel mechanisms and processes of transformation between body-machine complex and contemporary city.

Regarding the dilemma between "new" and "old" in historic town centres, this paper attempts to derive some principles for urban renewal with regard to constant features (hybrid characteristics) of urban transformation using cross-references to other disciplines, allied arts, sciences and other aspects of culture. This is also an urban-architectural search for parallels with other spheres of human activity to deviate from 'status quo' representing the current state of urban renewal. There have always been analogies with other disciplines, as sources of inspiration in the study and practice of art and architecture. Because artists like scientists, depend on the same sense of unification, so as to see patterns that connect apparently disparate phenomena. In this study, other disciplines are also examined to understand the concept of change in a similar manner because the need for a broad

analysis is important to enable placing a subject like "transformation in architecture" into its broadest context [1].

There are some limitations, however, with regard to the scope of this paper. Otherwise, further details of other disciplines would divert the direction of the study, and they could not be uncovered within the limits of an article. Hybridity, underlying linguistic codes and synthetic nature of each field constitute the main focus of the cross-disciplinary sections throughout the paper. Thus, these two keywords, namely *abstraction* and *transformation* will constitute the major themes later in this paper.

a. Multi-Disciplinary Nature of Urban Design; A Scientific Device for Encoding Cosmic & Cultural Laws

For uncovering the scientific nature of *hybrid-city* as a device for encoding cosmic and cultural knowledge, one has to examine the interaction between the processes of human thought and the computational aspects of urban design and renewal. Along this avenue, first of all, one has to approach to the concept of change with reference to multi-disciplinary studies examining diverse aspects of the universe. Because, the unexpected ways in which structure of the universe (i.e. its appearances and laws) imprints itself upon our thoughts, aesthetic preferences, general views about the nature of all phenomena [2] have to be understood for apprehending the essence of how human thought interprets and develops models or methods to analyse the components of the universe. In this way, the relationships between science and art might be illuminated helping us to become aware of how these imprinted knowledge inevitably influence the way humans fix their environment. It is also important to study (define and simulate) process of human thought so as to understand the two-way interaction between humans and machines. Particularly, the study (storage & usage of information) of expert behaviours is significant to understand how professionals in architectural field think and act in designing our environment. Although each expert field is different, the way information is organised, processes of thinking, problem solving and creativity seem to be common in all systems. Thus, scientific study of city should not be separated from the studies of human mind, and can only be understood within cross-disciplinary framework.

Multi-disciplinary framework brings the issue of *form* forward as the major medium of coding cultural information in our environment. Within Darwinian understanding of the inevitable process of change, adaptations remaining with us as transmogrified forms can be considered as the living evidence of the presence of the past. Moreover, development of humanity has proceeded far more rapidly with the transmission of this information through social interaction, language, images, symbols (i.e. mimetic processes) than coding this information in genes. Cultural transmission allows detailed information about the local environment to be passed on quickly, and is essential for survival in a rapidly changing environment. This transmission can take many

forms ranging from music, art and crafts to methods of science because cultural transmission is considered as an external dimension of human evolution. In that sense, the city itself and its design are quite significant in understanding interaction between humans and their artifacts (including machines and the city as the largest machine). Both form and content of that transmission could be decoded by analysing the transmogrified forms retrospectively. Urban space, when conceived within this framework, appears to be physical model of human thought; of expert behaviour, and a conceptual model of our tendency for a robotic future.

Today, it is fairly understood [3] that *human thought* is based on the way information is stored and used. Moreover, *creativity* is discovered to be a process of going beyond the routine in the use of knowledge and discovering new types of information. Thus, it can be conceived as a process of selective research; in other words, as processing of combinatorial possibilities, and producing new solutions out of unexpected situations that emerge during this process. Here, one can identify a strong *computational aspect* in creativity and design. This selective combinatorial process is mainly based on a *formal logic* and a *formal language* as a device with which problems are represented [4]. Linguistic logic and visual representations (which range from sketches, diagrams, tables, drawings and photos to 3D-models, videos and animations etc.) are quite essential in the field of design. Particularly, visual perception of different representations & media, and their simultaneous use throughout the process of discovering new information, constitute the basis of creativity in design. Additionally, one could comprehend, here, the large *knowledge-based framework*. Design is also an *iterative* process (though not along a pre-defined path) which shows parallels with *automation* process. Together with *computational, data-based & automation* characteristics, design establishes sound connections with new technologies and information systems (CAD, CAM, WWW, GIS, GPS etc. as *visual-computational* representations). The following points may be of particular interest for this study; i) how urban design might have exploited informatic and computational characteristics throughout history, and ii) how these features are reflected in current *hybridisation* process of contemporary city.

b. The Role of the Metaphor of Hybridity in Understanding and Modifying the Spatial Configuration of City

If one could review the history of city and of urban spatial configuration from such perspective, city would be conceived as an entity which has always been a hybrid structure even in its simplest forms at the very early ages of human settlement. It is possible to identify two interrelated inclinations which may have paved the way for hybridisation of human settlement areas in relation to their social structure. They may have led humans to exercise on science-fictional fantasies about city and its future social structure. Although the process

of hybridisation extends into sociological dimension of city, the paper will focus on its morphological ramifications in physical environment.

The first tendency is about the *material aspect* of hybridisation. Although architecture and spatial configuration in Pre-Antiquity and Mediaeval times were not in conflict with nature, the elements and devices of architectural context had started to be *processed* in one form or another, and this could be considered an early and perhaps, a primitive type of technological intervention into an organic (or natural) environment. Even though, materials were not totally artificial, the process itself was becoming that of 'manufacturing' or one of 'assembling'. Architectural components were crafted if not industrially produced. Economic motives behind the notion of settlement for an agrarian society necessitated a crafts-based production in the city and were reflected in its outlook.

There was another (and more *conceptual*) tendency towards hybridity throughout history. One could start to observe, even in Antiquity (and later revived with Reformation and afterwards with Enlightenment), human activity and thought being superimposed (through *geometry*) onto the nature (ranging from agricultural land to urban settlements). For example, the intersections between the iron-grid street pattern and the topography in Priene create a tension that gives the first indications of a *clash* between body and machine. Later, in Renaissance period for instance, one can see imposition of systematic order upon virgin lands as can be exemplified in settlements like Palmanova or other fortified town plans. Social motives behind this *abstraction of social order* is related to various matters such as; the definition of the cosmos at the time, technological and scientific discoveries, the increasing power of states or empires, the need for social control and for protection against hostile states etc.

These two concepts, *artificiality* and *geometric imposition*, would later be overemphasised in utopian projects (such as Friedman's proposal - see Figure.1- or Le Corbusier's Plan Voisin for Paris) because visionaries, like sci-fi pioneers, did manage to grasp the dynamics between social structure and the evolution of material culture. Thus, these two concepts seem to regulate the relation between the processes of *abstraction* and *transformation* of urban space towards a *sympiosis* between *technology* and *nature*.

Following the above-defined stages, there had been a serious leap towards a robotic-city (particularly with 19th century industrialisation and with the impact of modernism in the early 20th century), because the entire society was conceived as a huge production-plant. So became its physical environment, particularly with Le Corbusier's motto "house (city) is a machine to live in". Here, Plan Voisin emerges as a new technological implant into the *heart* of Paris. Together with the injection of new building typologies, new technologies into urban fabric, this hybridisation process

seem to have accelerated since the second half of the 20th century. As we are more used to technology, implants start to strip off their organic gears and their *hi-tech* essence begin to surface out of the skin of the organisms (Figure 1).

However, urban historians appear to have rejected to study and conceive city in this manner particularly after 1980s as they conceived this development as an ill mannered occurrence or a sci-fi fantasy. Therefore, such polarised scholarship may have so far prevented us from accessing technological means for understanding ourselves and our environment better. Today at the beginning of the new era, a new paradigm emerges with the wide-spread use of environmental technologies, offering us a new opportunity to internalise technological component (based on mechanical, electronic and computational characteristics of the systems in both human body and humane environment) and come to terms with science-fiction. Therefore, following sections of this paper display mechanical and computational aspects of other human activities as well as those of city and its form.

II. BODY-MACHINE COMPLEX AS A MODEL OF URBAN TRANSFORMATION

In order for one to examine hybridity in urban space, one should look further into the relation between *body* and *machine* for understanding city's morphology in a sociological framework. One should start with an historical overview of sci-fictional view about life in the city; continue with the current state of the sci-fictional projections towards future of city and its architecture. Sci-fi notion of body-machine complex would then make sense as a conceptual model to describe urban transformation. The questions posed by urban renewal (i.e. a hybridisation device for city and as an intermediate discipline reconciling new and old) are twofold, and therefore it is of particular interest, in this section, to see i) *how* reconciliation of opposites, ii) *how* modifications through time, are achieved. In the formation of sociological phenomena, both 'existence of opposites' and 'need for change in time' accompany the concept of *conflict*. Around 1908 Simmel [5] introduced, into social sciences, the 'separation of *form* and *content*' in explaining conflicting social phenomena. Although his ideas have been criticised regarding many aspects of society, it seems to be a very promising way of explaining especially certain social institutions which have geometric and spatial dimension such as urban environment and architecture. He defines form as the mode of interaction among the components through which the content attains a social reality. In that sense, separation between form and content becomes an *instrument of analysis* to access the totality of matters through their components. Apparently, Simmel's emphasis is not on the abstracted character of the forms from specific social realities but rather on the process of abstracting. Thus, content is not ruled out. Simmel's *formal sociology* and related methodologies should be considered quite illuminating in the

reconciliation of opposites and in revelation of essences as a basis of transformation in time. From this point of view "body-machine complex" is worth examining.

a. A Metaphor Derived; A Man-Environment Hybrid and its Body-Machine Architecture

Here, one may establish links between *architecture* and *body-machine complex* (and their metamorphosis throughout ages). This relationship constitutes a crucial point especially when existing urban settlements or historic built contexts are considered as host organisms into which technological components are implanted by means of interventions of urban renewal activity. This should not only be considered as simplistic and reductivist resemblance, or crude analogy, or a metaphor. On the contrary, body-machine complex seems to be one of the major issues behind crisis of modernism. For instance, Metabolists, Archigram and Frei Otto addressed the issue of integration between *organic* and *mechanical* in architecture. Furthermore, urban theory which considers city as an organism raises similar ethical questions about urban transformation with those raised for the gradual transformation of human body into versions of body-machine complex (i.e. androids, cyborgs, etc.). Therefore, it is of particular importance, for this study, to understand the dynamics of transformation posed by *body-machine complex* for the purpose of deriving principles towards *urban transformation* (Figure 1). These are, in fact, two different yet complementary dimensions of body-machine metaphor to understand human evolution, growing from individual body to social body and its largest artifact, city. In Friedman's proposal for Paris, urban change has been projected as a superimposition of organic-machine forming a hybrid. It is possible to see some kind of layering with which the field of urban archeology is concerned in a historical perspective. As mentioned above, hi-tech face is gradually surfacing in this layering process and revealing the essence of body-machine complex in our daily environment. For the objectives of this paper, the relationship between body and machine is examined in terms of extension of human consciousness to total world environment [6]. The tendency towards a robotic future seems to have completed a *mechanistic phase*, and have been going through an *electronic phase*. The concept is of particular interest because of the following: i) It is a

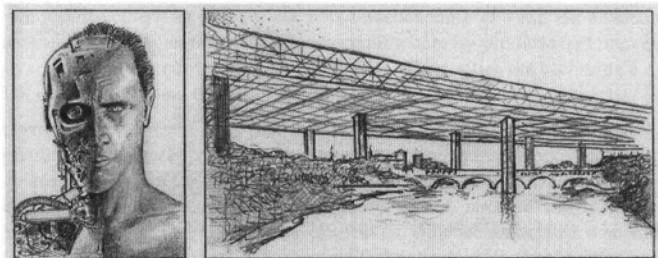


Fig. 1. *Terminator* and *Yona Friedman's Paris Proposal* represent two different dimensions of the *Body-Machine Complex* as a model to understand transformation

product of modern society (i.e. characterised by industrial production and market economy), and integrates opposite registers of *nature* and *technology*. ii) It is based on 'unnaturalness of nature' and 'naturalness of artificial' (i.e. machine-likeness of persons and personification of machines) as the common ground between opposites. iii) It is realised on the basis of statistics which serves to make statistically valid persons for the consumer society. These are the abstract principles on the basis of which one can interpret ongoing urban transformation. Seltzer (1992) [7] describes - referring to 1900s' literature - body-machine complex as a product of *industrial* and *consumer societies*. He explains the chain of events which have been converting individual (biological) body into a collective (social) body in order to co-ordinate body and machine within a system of regulation and mass production [8].

b. Historical Overview of the Concept of 'Body-Machine' in Modern Society

Having discussed physical dimension of the metaphor, it is appropriate to unveil its social aspect for placing the whole concept of 'body-machine hybridity' in the broader context of modernity. The body-machine complex has mainly stemmed from the need, during the nineteenth century, for the replacement of biological production with mechanical production as well as the need for extending human senses. It takes place in the intersection of efficient production and progressive development, occurring both as a by-product and a prerequisite for those intersecting entities. It was intended to replace *organic body* with *social body* of the organisation by means of establishing statistical standards and promoting them as the measure of individuality. It is a similar process with the transformation process of *medieval towns* (which exhibit strong organic characteristics) into *industrial cities*. This process (*modus operandi*) seems to have later manifested itself in the transformation of *market economy* (based on production) into *management economy* (based on programming, processing of information). The resulting collapse of distinction between *production* and *information processing* has been echoed in the collapse of the distinction between *life processes* and *machine processes*. Thus, the boundaries between animate and inanimate have started to blur. This confrontation of bodies and machines has been characterised in form of various representations - based on statistics - such as maps, diagrams, graphs, models, pictures. It was followed by the juxtaposition of bodies and these representations (particularly in arts) towards dissolving of man into artefacts (i.e. components of a production machine). As Foucault [9] implies, institutions like schools, prisons, armies have been serving to integrate natural body and disciplines of machine culture. On the other hand, fashion [10] was converting biological body into social body utilising media technologies to promote the addiction to pleasure of overcoming the body. An analogy might be established with

the promotion of object buildings equipped with the comforts of technology to improve the quality of life (only within the buildings) while ignoring the contextual approach and overcoming the limitations of organic town. Also, the significance of juxtaposition of representations both in human thinking process (particularly in design) and in social processes should be restated to emphasise the relation of body-machine to architecture. Current attempts to clone cells, and humans, produce cyborgs, manufacture androids looking like humans, increasing their standards and abilities, decreasing the deficiencies and limitations of human beings, adding virtual dimension to environment, appear to be other manifestations of the need to replace biological production of humans with an artificial system to increase the efficiency of industrial production.

One of the most important outcomes of this process was that total demolition of human body into a machine would possibly have caused hysteria and pathological fatigue. Thus, a *correlation* between organic and mechanical, their symbiosis, or a hybrid have been thought to be much more productive. In fact, the city in which we have been living have not been an exception in its formation. New concepts such as Edge City [11], Ladders [12], Fractal Cities [13] are rapidly emerging making planners' understanding of them simultaneously with their emergence almost impossible. They are becoming both by-products and prerequisites of the slight variations of the current socio-economic system. Thus, cities are becoming a symbiosis or hybrid of organic cores and technological implants.

c. Current State of Sci-Fi View in Arts & Humanities

Regarding the ethics of emergent forms of body-machine complex, a sound example is the variation of science-fiction movies. Most reflect the current opposing views about a robotist future with emphasis on the element of violence associated with robots (e.g. *Terminator* and *Robocop*) while some of them emphasise their helpful characteristics such as high performance with minimum maintenance, improved senses, strength and memory (e.g. C-3PO in *Star Wars*). Physical environment that constitutes the background for these movies, also reflects immediate outcomes of robotist life style. One may suggest that transformations seem to be inevitable so should its ethics. In fact, when the latest developments in other fields are also examined, an important fact we will face is that machines are beginning to resemble organisms and evolve with and towards us. As it is discussed previously, cyborgs and cybernetic organisms are typical of this trend. In addition to the fact that wide-spread use of machines by humans has reached a state whereby humans cannot live without machines (i.e. a variety of devices ranging from optical, mechanical, and electronic accessories of the body to watches, phones, databanks, computers, cars etc.), transplantation of micro chips or mechanical parts into different systems of the human body, which used to be fantasies of science fiction novelists, become quite usual

lately. The age of Homo-cyborgs is about to arrive and they spread as the technology solve immediate problems and promise to improve the quality of life. Jencks [14], too, claims that unlike modernist reductivism did, machines started to resemble our position of self organisation which characterise the organic life.

One might also suggest that our built environment should also be assumed as an organism into which we transplant new technology for improving the quality of the system of operation within this organism, considering these architectural interventions as a kind of surgery. And finally, injection of what used to be called 'alien' might now be acceptable in existing fabric, considering the changing ethics and developments in other fields. Thomas [15], on the other hand, conceives this sort of technomorphism as a strange hybrid - of building/body/machine - stating that 'emphaty, as the essence of architectural theory, is now recast as a recognition of media-oriented, commercial, violent global culture instead of ennobling the human condition'. Consequently, there is enough evidence to suggest that change is inevitable, unavoidable and so is its ethics. There is no reason for this generalisation about other aspects of life to be invalid for built environment. As a matter of fact, negative aspects of current and future state of metropolitan environments should be counterbalanced with a new and positive interpretation.

d. Robotic Future and Its Physical Environment

Although it is quite difficult to assess objectively what is right or wrong, one can not deny widespread use of robots, prosthetic organs, mechanical and electronic means improving impaired senses, neither can discard such manifestation in former chess champion Kasparov's defeat by *Deep Blue* in 1997. Curiously, McLuhan describes *robotism*, with particular reference to *video related technologies*, as a desirable form to reconcile opposites. In that sense, the current technological context based on media, computers and communication network is a stage in the transformation of man (who was not designed for living at the speed of light) by translation of his central nervous system into an electrical circuitry. Indeed cities have also transformed themselves into places accommodating things which they were not designed to live with such as industry, car, etc. If problematic of body-machine complex in parallel to the developments in urban transformation is invoked, one must give an account of studies on android production. They are designed to work without volition, to perform fast and automatically (as a perfect worker for the economic system based on maximum production) especially on hard and dangerous tasks for humans. Similarly, cities are planned to work efficiently, and thus, transformed accordingly via high speed motorways, high-rise commercial buildings, industrial zones and power plants. Equipped with the latest technologies, new building complexes - like androids - perform as the components of a high-efficiency urban network. Also, events like Robot

Olympics, *robot-ants* communicating among themselves, and *robo pets*, children's favourite, may form an alternative humanist view *vis-a-vis* the dominant conception about the association of robots with inhuman values. City promises to be no exception with the absorption of appropriate and humane (eco-friendly) technologies in its formation.

e. Turning the Metaphor into Scientific Method; Interpretation of Underlying Linguistic Patterns in Artificial Processes

Consequently, one other major argument is the following: Although the idea of transformation of human body into hybrids or cyborgs is frightening, the gradual structural transformation taking place in practice (in terms of prosthetic or electronic implantations) does not ethically sound so disturbing mainly because it has been concealed by its *form* (i.e. human form) to be communicable to the public (review Figure 1). One might establish parallels, here, with the transformation of urban environment. When its modern, hi-technology, and intelligent buildings are concealed behind some form of layering (historicist facades or ecological skins) the transformation is hardly likely to disturb society in a transitional phase. On the contrary, such interventions can be quite welcomed by the society because they will improve the standards of life. Returning back to the problem of transforming human body into cyborgs, essential problem seems to be the lack of a sense of history associated with androids and cyborgs, and the resulting schizophrenic situation of the transformed body caused by ruptures [16] in the *linear* and *linguistic sequence of time* (i.e. past, present, future). With regard to the analogy between body-machine complex and urban transformation, this linguistic sequence should be the point of concentration in transforming urban settings. One must emphasise here that this linear linguistic sequence poses not a visual but structural problem.

The crucial point here is that, combination and juxtaposition of underlying patterns of both machines and human body appear to be the basis of ongoing transformation. This gradual combination is achieved by identifying common underlying regularities within the linear and linguistic sequence of time (see section *Codes in Synthesis*). These patterns are reproduced in different forms and represented in machines. The integration relies on the basis of their juxtaposition as well as approximation of these patterns in the linear sequence of time. In this manner, sci-fi episode of urban transformation may develop not in the line of *Megapolis*, *Blade-Runner* or *Matrix* but may progress with science promoting a symbiosis of *human* and *machine*. This can be achieved by investigating the process of design and thinking in terms of computational systems, linguistic patterns and statistical features. Thus, mechanical and electronic phases of human evolution can be improved by transferring the results of such investigation into new technological medium

III. INTERPRETATION OF THE REGULATING 'CODE' WITHIN THE EVER-CHANGING FORM

At this stage, it might be appropriate to explore some of the fields which are relevant to architecture and urban design in terms of linguistic and sequential patterns which are accommodated in their transformation (and hybridisation). Disciplines such as mathematics, language, music and architecture exist in structured worlds that are represented (though not merely) by rules. Therefore, for instance, styles in architecture can be described as certain characteristic sequences of elements. Similarly, physical transformation in urban locations can also be defined as specific sequences of some design operations.

The reasons behind the importance attributed to distinguishing the sequences seem to lie deeper in the way humans interpret the natural or man-made milieu around them. Humans have always tried to reflect cosmic patterns (that both stimulate and constrain the evolution of environment), structured time and organised their lives by these cycles. Humans are equipped to sense, identify, classify and therefore explore patterns at the level of intricacy (delicately balanced between undiscoverable complexity and uninteresting simplicity). These regularities reside not in the events themselves but in the rules governing them. Therefore, humans can only witness the outcomes of the patterns not the laws which are based upon the existence of patterns. The assumption of common laws (regularities and simplicities) that are thought to link past, present and future has given rise to the development of science which lately started to explain, also, diversity, asymmetry and irregularity. Although patterns of nature might be undiscoverable by any living subset (e.g. human species) of these patterns, some regularity (no matter how complex they can be) must exist in the environment in order for these species to survive in a complex natural environment. Additionally, species must be able to store representations of environment, to carry out computations of growing complexity in order to evolve. Thus, it seems next to impossible to deny the role of statistics and its tools.

a. Deciphering the Code in the Formation of Hybrid-City

Indeed, statistics which constitutes a major instrument for the implantation of body-machine complex has been heavily involved with underlying pattern recognition. Simon's interpretation of human thinking process in design is also based on statistical and combinatorial features of formal representations of design problems. Furthermore, biological classification systems of the 19th century, which paved the way for scientific approach in architecture, were based on formal patterns and their creative re-combinations (e.g. *Urpflanze*). It seems that most of the modern science and production have been based on search for other underlying rhythms, patterns and units in nature. The concept of

phyllotaxis, for example, has been an important source of inspiration for many systems of proportion in architectural history and music. In addition, other features in mathematics and statistics, such as *quantality*, seem to cast light over many archaeological phenomena. The intention behind the efforts of struggling to find more plausible mechanisms which operate on certain mathematical principle, of course, is to define nature in terms of simplified laws so that man can predict, simulate, manipulate, dominate and eventually duplicate it. As discussed previously, one cannot fail to notice (especially with recent applications in medicine) that, for instance, a microchip, implanted by a surgical operation into a system in organism seems to be based on repeating the pattern of electrical currents in the nervous system and substituting a malfunctioning part of that organism. Nonetheless, urban planners must have lessons from such operations through comprehensive studies.

Biological Code

Developments of DNA and those in genetic engineering could also be analysed in terms of "code" [17]. The information flow between DNA and RNA seems to define a language, implies Eco. Modifying a language in this way and discovering new meanings inherent in its use may certainly raise questions about the role of its use in architecture both as metaphor and as method of analysis. As McLuhan suggests, all technology have linguistic structure. Internet, (a recent technological means in addition to car, TV, telephone, computer, etc.) in which all media is converted into "standard browser languages for electronic exchange", sets another such example. He compares languages with other technologies in that all are attempts to interpret and manipulate the world by the extension of human senses and body on the basis of a "resonating interval" (a pattern).

Linguistic Code

Language has been an ideal model for understanding cultural activity and production. Literature itself can be described in terms of form and content. Lukacs introduces into the literature the theoretical pair, *form* and *life*, which function as the bearers of coherence. *Form* gives order and structure to the experience of *life*; unifies diverse elements of life into a meaningful structure. For example [18], Calvino's novels exhibit strong family resemblance with regard to form and structure. Lukacs [19] interprets form as a concept which every anti-thesis become a necessity, equal, complete, and fuse into each other. He suggests, according to Bernstein [20], only when elements of *form* and *life* are separated, secret second meaning in the text could be interpreted. As cultural form and social content are assumed to be different expressions of the same organic unity in traditional society, crisis of a culture is defined as the contradiction of form (as ideology) and content (social reality). This point needs the utmost emphasis from the viewpoint of urban transformation

because if these contradictions can be identified, then ruptures in the socio-cultural traditions could be identified more clearly towards their rehabilitation.

Musical Code

Consequently, it seems more likely to find closer relationships between architecture and its allied arts with regard to underlying orders. Therefore, one may tend to return to arts especially for the purpose of underlying regularities, particularly in terms of *form* and *formal relationships*. Music constitutes one of the first subjects to be examined from this viewpoint. There are several issues to be raised in this section. The first emphasis will be on architecture-music analogy, to establish them as two different types of cultural transmission from one generation to the next; in addition to parallel researches in psychology on the common mechanisms human mind perceives both music and architecture. Secondly, pattern in music and its relation to meaning will be analysed as a form of cultural transmission of knowledge. Finally, music - language relationship will be stressed to understand further complexities in both music and urban environment.

Igor Stravinsky describes 'the function of music' as 'to structure the flow of time' and defines music as 'the art of permutation of time'. One might easily derive from this statement that music is inevitably based on the *recognition* and *reproduction* of patterns. Regarding the origins of music, one must understand the importance of prenatal conditioning of human foetus to the rhythms; of the mother and the inner beat of the human heart itself. Moreover, division of the musical phrases (based on intervals of human breathing cycle) also proves close association of music with inner patterns of the body. Patterns of music, which span a vast range of sounds and frequencies, are encoded in a musical score. People respond to those rhythms without necessarily learning its rules and deep structure consciously. Thus, harmony, visually or acoustically perceived, may become a guarantee of aesthetic delight, and an encoded form of cultural transmission. This may form the common point between music and architecture.

In understanding of patterns inherent in different types of music, statistics (which lie at the very heart of body-machine complex) seems to play a major role. Voss & Clarke [21] defined certain statistical features to characterise the forms of different types of noises; they analyse many ranges of loudness variation with frequency, and discovered that types of noises that could stimulate mind's pattern seeking mechanisms, are aesthetically pleasing. What listeners (from a diversity of cultures and musical traditions) chose as the most interesting type of musical compositions among others are named *pink noise* and are moderately correlated at all time scales. Nevertheless, one should neither regard these observations and associated speculations as totally reductionist nor give to the argument greater weight than it

deserves for no better reason than that it is seductively incomprehensible. Yet again, from the perspective of architecture-music analogy, it sheds light on which range pattern recognition should be investigated in urban design.

Having uncovered the pattern based nature of music; one must be able to recognise the relationship between language and music. Obviously, Darwin [22] was among the first who attempted to formulate this relationship conceiving music as the primitive precursor of language. No matter what the historical sequence (*music* and *language*) might have been, universality of both skills (musical intuition and language ability) is of utmost importance from the viewpoint of human's genetic ability for programming either linguistic or sound patterns [23]. It is of interest whether this ability is reflected in the built environment.

Codes in Synthesis

Re-mix versions of old musical pieces or combinations of different styles (hybrid pieces), enables us to derive principles for architecture. In these experiments, juxtaposition of two (or sometimes more) tunes, melodies, styles, on the basis of their common rhythms - or their certain fractions - seem to act as a further source of musical richness and flavour. The composers of later pieces seem to understand and interpret the expressions, codes and patterns in previous compositions and restate them in new combinations utilising their conflict for improving musical quality. In a quite similar way, architects who have built into historically accumulated contexts, such as Piazza San Marco [24], Arles, Lucca, seem to have conceived their own work in terms of these juxtapositions. Recent applications in architecture (such as Foster's library in Nimes, Sackler Galleries in London, Döllgast's Alta Pinakotek)[25] can also be interpreted as the use of latest technologies for blending into the harmony created by existing context on the basis of rhythm, sequence and proportions.

In formalist musical philosophy, music is assumed to be a set of all possible applications that are composed of; i) a set of musical building blocks (notes, intervals etc.), and ii) a set of rules for combining them to produce phrases, melodies and so on. Christopher Longuet-Higgins [26] attempted to isolate essential structural features (timing structures) embodied in Classical Western compositions, and programmed a computer to compose and perform according to the same principles. In order to test the success of this operation, one must notice the importance of *isolating structural features* especially in adapting similar principles to urban design. As Knight [27] quoted, Johnson (1997) draws attention to Experiments in Musical Intelligence (EMI), a computer program - by D.Cope - which analyses musical compositions in a particular style and then generates new compositions in the same style. The basic idea behind these works is, first, the analysis of input music by segmenting and deconstructing given compositions into musical fragments; then identification of patterns and

meaningful combinations that are characteristic of the particular style; later cataloguing these segments by function in a lexicon; finally, recombining segments from the lexicon in correct but new arrangements, while recreating variations of the identified patterns. In that sense, these properties of EMI may show common characteristics with the *formal grammar* methodology in design.

Though, his method fails to capture what distinguishes the *raison d'être* of music it seems hard to discard the importance of encoding underlying rules, identifying patterns and testing new generated designs when controlled by knowledgeable user or perceptual expertise to relate formal aspects to program, context, experience and symbolism. In design, *segments* could be replaced by *shapes*, *lexicon* with *vocabulary*, *musical* with *spatial* and *deconstruction* by *decomposition* in a way that will allow manipulation of variables and multiple interpretations of architectural data. Similarly, a town should be conceived as symphony of buildings. In that sense, studying its underlying canons may constitute a first step for a well-combined intervention theory. However, one should take into account that architectonic symphony of the town, in this era, has to include vast amount of instruments, plural rhythms, as well as many individual improvisations.

Finally, one may understand music as a form of cultural transmission, and methods above as ways of revealing underlying information in music. Darwin considers this sort of transmitted knowledge vital for the survival of species in a continuously changing environment. It is, therefore, assumed in this study that urban transformation may also encode such a knowledge culturally transmitted via urban-architectural traditions.

Codes in Arts & Humanities

At this stage, the concept of 'order' in arts should be stressed as an underlying regularity *per se*. A. Moles asserts; "There is no art without constraint (to obey rules) ... pure chance represents total liberty, and the word 'construct' means to revolt against chance. An art is defined by set of rules it follows. The role of aesthetics is to enumerate these rules and link them with universal rules of perception". It is quite important to comprehend underlying order in arts although one is reluctant to discover the source of pleasure or strength, as M. Minsky states, because it is feared that exposing the roots may cause art to lose its power.

The crucial point of emphasis is not whether or not there is an underlying regularity explaining all phenomena but should be our ability to describe seemingly irregular phenomena in terms of regularities. The more our computational ability and technology improve, the more we are able to achieve this. It should also focus on how we relate these regular descriptions to irregular dimensions of the phenomena. Simmel's formal sociology approach promotes to concentrate upon the formal interactions that underlie the subject matters of economy,

ethics, psychology and other aspects of sociology rather than to pretend to usurp all of them. "Simmel aims to write a grammar of social life", says Coser [28]. Thus, one may suggest that he established a framework on the basis of interactions among *i) form* (geometric properties of spatial dimension) of a phenomena, *ii) underlying patterns*, and *iii) grammatical* principles of language.

IV. CONCLUSION

The study has displayed hybrid structure of city in sci-fi perspective throughout history. Moreover, mechanical and computational features of cities have also been delineated in relation to other human activities and scientific disciplines. Thus, a new and noteworthy way of re-reading the transformation of urban environment has been put forward.

This paper, in spite of its obvious limitations, has endeavoured to derive certain principles with regard to the constant features of continuously transforming environment. Along this purpose, other seemingly unrelated disciplines and allied arts, with architecture and urban design, have been examined. The disciplines have been selected mainly from those which already addressed the issue of transformation as well as those indirectly attempt to promote profound changes in their ongoing evolution.

The results of these examinations illustrate, first of all, what might be regarded as the inevitability of change in the ethics of transformation as well as that of transformation itself. It is also indicated that any modification, natural or man-made, seems to be built upon some sort of recursive structures. These recursivities may appear in various forms ranging from rhythm, underlying units of measures, ratios and proportions to certain forms, patterns of transformations, or relationships. It may also be possible to find more implicit and conceptual references to time, order and change. On balance, these observations lead one to conclude that most of the transformation may seem to be based upon the systematic recurrence of some characteristic feature, pattern, order or relationships.

Consequently, urban transformation, with its two components; *organic host* and *technological implant*, appears to be an architectural dimension of body-machine complex. For the reconciliation of these opposing ends, *robotism* seems to become a required form as long as it is concealed within the layers of organic host (from ethical viewpoint). If urban evolution is assumed as another form of *encoded cultural transmission*, scientific methods [to analyse such a seemingly complex and irregular phenomena] should be developed taking into account how the implemented structure of the universe in our thoughts and aesthetic preferences influences these methods. The issues of 'reconciling the opposites' and 'modifying through time', which are posed by urban renewal, could be tackled by the separation of *form* and *content*. Revelation of the linguistic 'code' and elimination of ruptures in that code within a linear sequence of time are essential for

successful combination and juxtaposition of patterns that constitute this code. Thus, achievement of a required level of complexity in successful transformation seems to depend on the step-by-step approximation of a reliable pattern by means of complicated computations. The dynamics of body-machine complex, the concepts of pattern recognition and grammars may help to bring original solutions to the problem of transforming or renovating cities when defined as deeper structures. If science-fictional perspective is invoked, there are historical moments at which sudden crystallisation of a new information format (such as printing, photography, film, TV and recently computer, web and virtual environment) provides an impetus for new forms of social and cultural practice, and points out a new era of artistic inquiry as one of the consequences of new technologies for our visual culture (29) in which urban environment has an essential part. In a format where dynamically interacting information is encoded and analysed digitally, CAD modelling - associated with multimedia facilities - as analytical tools and GIS for surveying, control and planning purposes, altogether, herald the increasing use of approaches such as Space Syntax, Grammatical Analysis etc. As discussed above, while these systems provide a multiplicity of design representations and a new medium of information storage, they also provide a computational support human thinking in design field, particularly in the electronic phase of human evolution. Thus, our era seems to promise a breakpoint similar to when perspective, as a numerical model for constructing image, had influenced the perception and design of urban space in the 16th century. Before starting to analyse the impact of new algorithmic image construction in virtual environment on urban space, our environment and its historic evolution should be interpreted in terms of this new information format. Indeed, what is called New Science seems to address issues within the domain of architecture. Similarly, Friedman's concept of scientific architecture and urbanism also focuses on the primacy of rules, and Hillier's Space-Syntax combines pattern like qualities and social activities of the city. Thus, linguistic dimensions of city and grammatical structure of its spatial configuration has to be exploited for urban design to cope with frenzy in which humankind rehearses a leap from Homo-urbanis to Homo-cyborg, from "the Vitruvian Man" to "the Lawnmower Man" (Two illustrations in Figure 2 demonstrate the differences in relations between *geometry* and *body*, thus those in changing attitudes towards humans and machines). It would then be possible to change current transition from a humane phase of evolution to robotic stage and enhance this tendency with integration of sociology with technology. Although it is not possible to reverse the clock back to the 16th century scientific context where human was at the centre of universe, it is still possible to impose a paradigm shift from the 20th century science & technology (oriented for more production and consumption cycle) to a

state where human and environmental welfare is at the heart of all technological and scientific matters in the new era.

EPILOGUE

To conclude, one could state that city has been, and increasingly becoming, a hybrid device; a mechanical organism. Modernism has turned this drift into an irreversible process since industrialisation. Such a device has been constituted by common patterns and recurrences on morphology and organism, and operation of technological systems. In today's new technological medium, new information format is utilised to understand and manipulate urban environment, to turn sci-fi fears into science-facts of human welfare. Having assumed city as a physical reflection of human thinking, scientific studies related to the disclosure of human mind would help re-interpretation of urban history and help plan further interventions into urban transformation. Finally, a little foresight and positive interpretation may be needed in a state where classical contradictions between traditional city, countryside and nature no longer exist. Cities of future may form a part of natural cycles by redefining the role of architecture for integrating technology into natural and urban - scapes. Only then architects may enforce devices of body-machine for a better architectural environment rather than being a slave of body-machine society

REFERENCES

- [1] Antoniadis, A.C., *Poetics of Architecture; Theory of Design*, Van Nostrand Reinhold: New York, and Collins, P., 1965. Changing Ideals in Modern Architecture, Faber & Faber: London, (1992).
- [2] Barrow, John D., *The Artful Universe*, Oxford University Press: New York, (1995), p.2.
- [3] Newell, A. & Simon, H., *Human Information Processing*, Prentice Hall: New Jersey. (1972).
- [4] Akin, O., *Psychology in Architectural Design*, Pion Ltd.: London, (1986).
- [5] Simmel, Georg, *Conflict and the Web of Group Affiliations* (tr. K.H. Wolff, R. Bendix) Free Press: Illinois, {(1908) 1955}.
- [6] McLuhan, M. & Powers, B.R., *Global Village; Transformations in World Life and Media in the 21st Century*, Oxford UP: New York, (1989).
- [7] Seltzer, M., *Bodies and Machines*, Routledge: New York, (1992).
- [8] *Op.cit.*, p.95.
- [9] Foucault, M., *Discipline and Punishment: The Birth of the Prison* (Tr. A. Sheridan) Allen Lane: London, {(1975) 1977}.
- [10] Veblen, T., *The Theory of the Leisure Class; An Economic Study of Institutions*, New American Library: New York. (1912).
- [11] Gareau, J., *Edge City; Life on A New Frontier*, Anchor: New York, (1991).
- [12] Pope, A., *Ladders*, Princeton Architectural Press: Princeton, (1997).
- [13] Batty, M. & Longley, P., *Fractal City; A Geometry of Form and Function*, Academic Press: New York, (1994).
- [14] Jencks, C., *The Architecture of A Jumping Universe*, Academy Editions: London, (1995), p.159-169.
- [15] Thomas, B., "Culture, Merchandise, or Just Light Entertainment? New Architecture at the Era", *Journal of Architectural Education*, Vol.50, N.4, (1997), p.254-264.
- [16] Lacan, J., *Ecrits; A Selection* (Tr. A. Sheridan), Tavistock: London, {(1966) 1977}.
- [17] Eco, U., *A Theory of Semiotics*, Indiana UP: Bloomington, (1976).
- [18] The idea of family resemblance in terms of form and structure is used for other examples in Lodge, D., *After Bakhtin; Essays on Fiction and Criticism*, Routledge: London, (1990), p.116-24.

- [19] Lukacs, G., *Soul and Form*, (Tr. A. Bostock) Merlin Press: London, (1971), p.22.
- [20] Bernstein, J.M., *The Philosophy of Novel; Lukacs, Marxism and Dialectics of Form*, The Harvester Press: Sussex, (1984), p.54.
- [21] Voss, Richard V. & Clarke, J., "1/f Noise in Music & Speech", *Nature*, V.258, p.317-8; Voss, Richard V. & Clarke, J., 1975. "1/f Noise in Music; Music from 1/f Noise ", *Journal of the Acoustical Society of America*, V.63, (1975), p.258-63.
- [22] Darwin, C., *The Expression of the Emotion in Man and Animals*, Murray: London, (1872).
- [23] Barrow, *op.cit.*
- [24] Çetin, M., 'Principles of Urban Transformation; A Grammatical Interpretation of Two Urban Squares'. *Proceedings of ISUF'99: Sixth International Seminar on Urban Form (Transformations of Urban Form; From Interpretations to Methodologies in Practice)*, Florence: Alinea Editrice, 23-26 July 1999, pp.FM2.7-10.
- [25] Byard, P.S., *Architecture of Additions*, W.W. Norton & Company: London, (1998).
- [26] Longuet-Higgins, C., The Perception of Music, *Interdisciplinary Science Review*, V.3, (1978), p.148-56.
- [27] Knight, T.W., "Shape Grammars", *Environment & Planning B: Planning and Design*, 25th Anniversary Issue, (1998), p.86-91.
- [28] Coser, Lewis A., *Makers of Modern Social Science; Georg Simmel*. Prentice Hall Inc. : New Jersey, (1965), p.14.
- [29] Mitchell, W.J., *Reconfigured Eye; Visual Truth in the Post-Photographic*

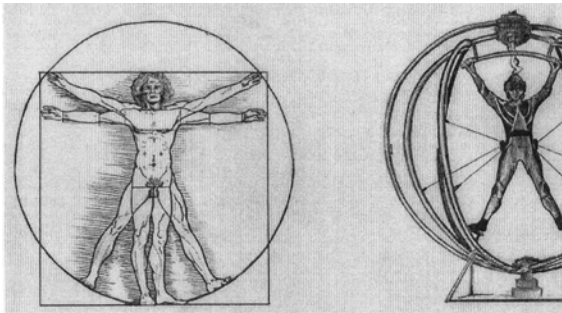


Fig. 1. From "the Vitruvian Man" to "the Lawnmower Man"
Era, MIT Press: Mass., (1994), p.20

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