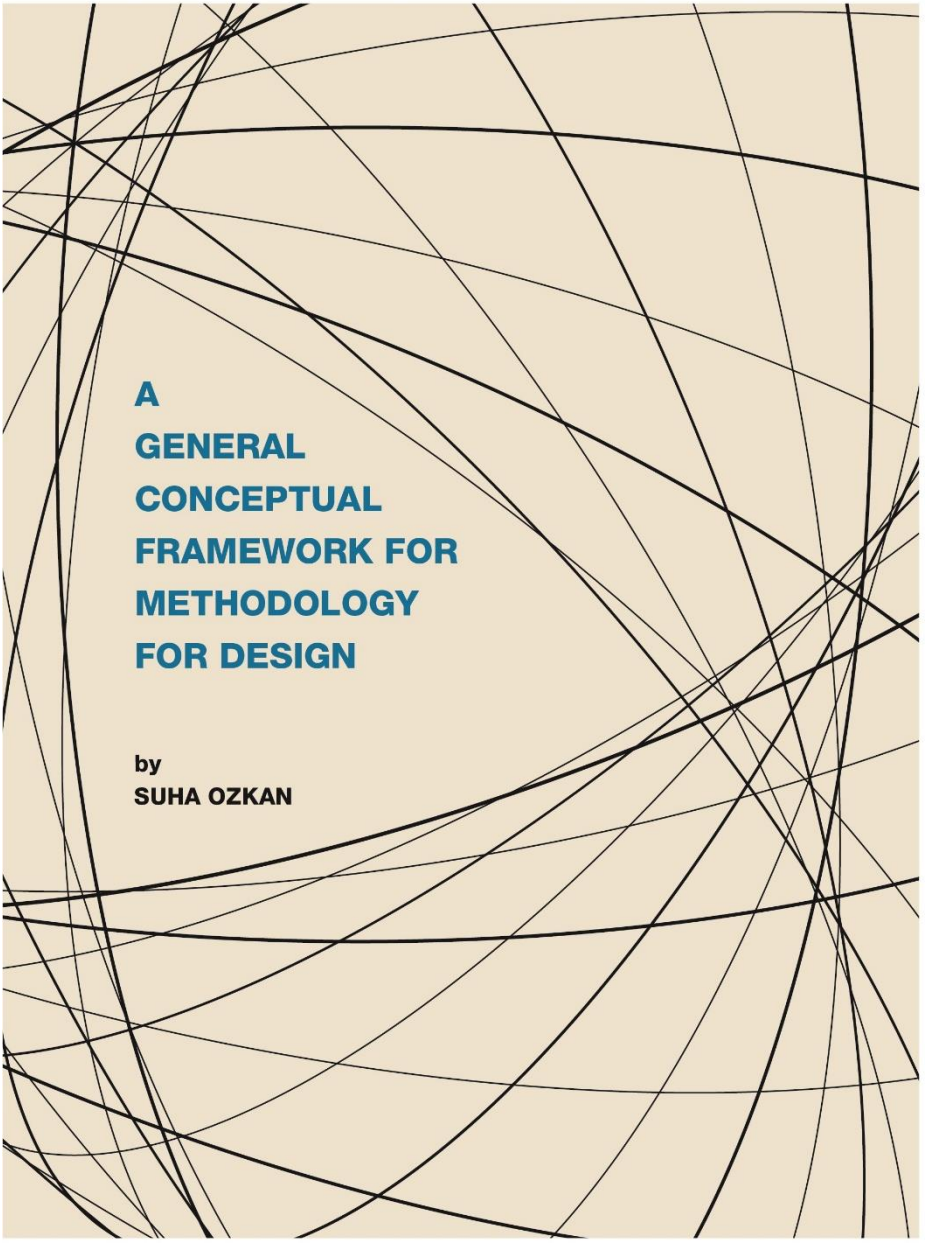
A
GENERAL
CONCEPTUAL
FRAMEWORK FOR
METHODOLOGY
FOR DESIGN
by
SUHA OZKAN

A General Conceptual Framework For Methodology For Design

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"According to Mesarović A set of proper statements which Has mastered, in well-ordered schools A set of transformation rules Which rules in turn have the rules to twist'em Deserves the name of general system.

All systems, it is now proposed Are either open or are closed. The closed have one-to-one relations Don't result in innovations. The open are disturbed, adaptive Or Heisenberg - observer captive."[1]

[1] 'Boulding, Kenneth E., Foundations for a General Systems Theory, in: Views on General Systems Theory, M.D. Mesarovic, ed., John Wiley & Sons, New York, 1964

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PART 1

THE GENERAL CONTEXT

Part one contains the disclosure of the general understanding of the phenomenon in which a general terminology is developed and a critical analysis is made. It deals with the context or a philosophical level and goes into detail wherever it seems to be needed.

CHAPTER 1, Coping with Environment briefly discusses the urgent necessity for the integration of the elements of 'environmental design' within their largest context. This brings forward the need for promoting the level of involvement from the individual to the societal level. In order to have a meaningful integration at that level a hypothetical definition for architectural is made. This covers the whole range of activities dealing with the adaptive, problem solving, satisfying and creative processes. This hypothetical definition is compared with the present state of the arhitectural design, within the parameters of professionalism. The notion of 'universe' is proposed for the comprehension of the totality under any cicumstance. This notion is not conceived as a mere cosmological entity but as an integfal totality, providing an access to cover all determining forces of any phenomenon.

CHAPTER 2, Universe, investigates the universe as patterns of relationships among its constituent elements for the stuctural analysis the concept of hierarchy is proposed and two different criteria, 'time-distance' and 'degree of complexity' are applied to demonstrate the process of breaking up a complex whole into its structural components. By doing so whole spectrum of exist-- ence is tried to be delineated. After hierarchy the concept of 'order' is taken as another central issue of complexity. Order in living and non-living matter are discussed in reference to the concept of entropy. Then, the contradiction between the goal of life and the goal of non-living matter are discussed as one of the greatest contradictions. Complementary to that the irreversible process of evolution is briefly indicated and the manenvironment dichotomy stated as an important point in the adaptive aspects of design.

CHAPTER 3, Energy, is taken as the most essential ingredient required for the maintenance and for the increase of the level of order. The known available categories of energy are discussed in the widest scope. This is done to cover the total spectrum of the energies, Symbolism is considered as the most fundamental abstract process making all sorts of energies available. It is briefly discussed here.

CHAPTER 4, Nature of the phenomenon, deals with the major characteristics of the 'man involving' processes. Here the four aspects are emphasized. It is stated that the man involving processes are complex, due to their structure which is made out of the ordering of highly complex patterns of matter-energy and information. They are indterminate due to their decision mechanism, therefore the governing rules for their cousses of action are probabilistic Such processes are irreversible owing to their memory, information pocessing capabilities. Finally, they take place in an (n) dimensional space, since they exist in a relative pattern to man's perception. The four basic are dealt with in their own philosophical context. Some historical reference is made wherever it is needed for better comprehension.

CHAPTER 1

COPING WITH ENVIRONMENT

ARCHITECTURAL DESIGN IN GENERAL

'The General Conceptual Framework for Methodology for Design' endeavours to construct a theoretical basis for the interacting elements of the man-society-environment totality. The word 'theoretical basis' implies the existence of a theory as the logical framework of reference. For the time being there is not an available theory to integrate the total interacting forces of such a complexity. This is partly due to the nature of the phenomenon and partly due to the unavailability of theoretical resources to facilitate such an integration. The aim of the present work is twofold. One is to make a level of integration as such, available; the othee is to provide access to the multi-disciplinary theoretical resources for their particular relevant inquiry. The validity of such an efford within the traditional scope of architecture may be questioned, but the sufficiency of traditional architectural discipline to cope with the problems of environment may be the counter question.

Before going any further, an understanding of the content of architecture and its fundamental activity design need to be developed. Architecture as an activity takes place in the scope of decision making activities covering the wide range between high level planning and elementary tool making activities. If we identify architecture with built form to demarcate it from the other similar activities, we see 'design' as the basic issue of such an involvement. The elaborate or precise definitions of design is not intended here.[2] Still one can basicly agree design as activity is a particular case of decision making. Architectural design in its abstract context is to relate the decisions as such, to man-environment relationships or to built form. Therfore, in this context the

[2] vide., Jones, J. Christopher, Design Methods, Seeds of Human Futures, John Wiley and Sons Inc., London, 1970, pp.3f

perfomance of architecture is the performance of a critical function of the social system. That is to adapt itself to its supra-system or its environment.

Architecture neither as an adaptive function nor as a creative process can be abstrcted from the society. In other words, the determinants of architectural design and the patterns of built form, are acting on such entities from a higher level in the hierarchy. That higher level in the case of architecture is the society. So, besides the macroenvironmental givens and constraints, and particular contribution of architecture as discipline almost all of the rest of the determinants are at the social level.

Until recently, architectural design has been considered as an abstracted activity based on its normative rules and values, which are sustained by tradition. Due to both negligange and ignorance of architects about the real determinants of the built environment, the fundamental function of architecture has been carried out by certain other institutions of the social system. As a consequence of this, the contribution of architects to the man-made environment became a small fraction of what actually should have been made. In today's industrial societies architects are only given an extremely limited field to perform their function, which is a vital one as far as the adaptation of the system to its environment is concerned. The major source of discontent among the architects now, is the ineffectiveness of their marginal decisions about the perceptual qualities of the environment. The insufficient contribution of architects to tire man-environment totality was both because of having no communicative basis with the other fields of scientific inquiry and the inexpertise of architects to perform their critical role within the system, in reference to the system's dynamics.

Although the pratical validity of the broad definitions of architecture can be questioned, architectural design in its broader context is defined as the complete set of decisions about the formation of the physical man-made environment. The communication and the implementation of these decisions: are considered as supplementary activities tequired to facilitate them. The boundaries defining the limits of responsibility of such an involvement are mostly circumscribed in terms of the scale of the undertaken decisions. The practical limits of decisive responsibility of architectural design range between the smallest shelter and largest building complexes. This definition of architectural design in terms of the scale of the work only includes the institutionalized criteria of differentiation of labour in technocratical societies where such a professionally diversified activity exists to cope with the problems of environment. The scalar boundaries for architectural design responsibility are the direct outcome of institutionalization in societies. In the industrialized societies architecture is

recognized within the parameters of professionalism. In the non-industrialized ones it either exists as an imitation of industrial societies professionalism or does not appear at all as recognized and differentiated mode of decision making for structuring the built environment.

In present societies, although, there is a highly complex set of institutions constituting highly complex organizational patterns, there is not an identified institutional or otherwise, involvement to cope with the problems of environment in their entirety. The vital problems of adaptation are in most cases dealt with by the politicians in a very fragmented way, directly related to their own short term interests. It is apparent that they do not possess the required expertise to cope with the problems of such a complex nature. As a consequence of this the environmental decisions given at a high political level are quite far from being sufficient. The increase in the population and in the variety of means of communication, together with changes in the modes of production urges the necessity of a higher level of responsibility for the problems of environmental adaptation. The high level decisions, their physical implications, immediate problem solving activities, and the repercussions of all have to be integrated.

Architectural design as a more integral activity is named "environmental design". This is a process of decision making about the totality of adaptive precautions taken against the natural context and the provision of spaces to shelter social interactions as well as the contributions of new and better experiences of environment. This consideration is of course a hypothetical one since there exists no professional recognition for the acceptance of the validity of such a broad definition. Meanwhile a highly restricted professional definition of architecture has turned out to be obsolete and insuffucient due to the misconsideration of problems of environment.

This limited professional architectural activity, partly due to the inappropriateness of architects to undertake extremely complex and multidimensional situations requiring immediate practical solutions, and partly due to the existence of many other specialized occupations within the boundary of the above definition, has never been able to bring a comprehensive level of integration of total forces acting upon any environmental design problem.

The present growth of the body of knowledge about the natural context and the availability of various methods and techniques to comprehend the social context and also about highly developed means of implementation of decision, urgently require the establishment of an integrated level of environmental decision making.

In order to construct the conceptual framework into which the total variables determining environmental structuring can be fed, it is needed to consider the scope of architecture in its most capacious context. The trifold aspects delineated above can be taken as such. To start dealing with architecture first as an activity, then as a process of decision making, and finally dealing with interacting responses from society towards architectural elements, and vice-versa, it is necessary to have a general understanding of the context in which architecture lies. This context can best be comprehended by the method of integration. When the integration done in the form of levels of hierarchy, micro and macro variables of any situation can be traced in relation to the other levels of that hierarchy. The placement of any situation wiithin the continiuty of an hierarcy provides the conceptual tools for the delineation of macro and micro determinants of a situation. · It also helps not to abstract an phenomena from the context of influence.

As the beginning of exploration of the macro variables, it will be appropriate to trace the structure of the whole being a subset of the universe. By doing so it is not meant that the determination of the macro variables of any problem situation simply lies on the universal level, but such an integration increases the comprehensiveness of the totality, where the interacting elements become more tangible. The availability of different approaches for the taxonomy of the levels of formation of the universe and the uncohesiveness of these classifications increases the complexity of our task, especially when the ordering of the universe includes mind and through which trancendental systems. In such cases the argument becomes rather metaphysical less objective; meanwhile the subjective and emotional content may increase. It is also important to comprehend universe not only as a cosmological concept but also as a logical entity. That is the understanding of the known totality. So universe in this context becomes the highest integrative level where every entity can be its subsequent parts.

Fuller, mentioning the importance of the comprehension of the problems of mankind at a universal level, says: "If we could start with universe we would automatically avoid leaving out any strategically critical variables."[3]

[3] Fuller, R. Buckminster, Operating Manual for Spaceship Earth, Southern Illinois Univ. Pr., Feffer & Simon Inc. London, 1969, p.60

CHAPTER 2

UNIVERSE

DEFINITIONS

Universe in simpler terms can be defined as the totality of all existing things around and within man, composed of both known and unknown, tangible and intangible elements. These elements are perceivable or conceivable thinkable or emotional, physical or metaphysical.[4]

It is quite clear that the conceptof integration on the universal level taken on its own can neither establish the desired level of comprehensiveness nor provide an operational ease, because the universe itself is unknown and indeterminate and contains many other conceptual and metaphysical attributes. It is also due to the fact that its constituent elements themselves are of a very high degree of complexity. Still, defining the universe as the known utmost context of human beings and their environment, bring a clear range of relationship patterns within which a conceptual or even operational allocation of the variables of any situation can be done inconsideration with its both macro and micro determinants. The concept of universe gains a paticular content as it is broken into its substructural elements, in accordance with the observer's interests. Conceiving the universe as the highest level in the hierarchy, although it is unknown still sets the upper limit of human concern, and lays the whole spectrum of possible elements of any phenomenon interacting to constitute a whole.

[4] Fuller, R. Buckmister, Utopia or Oblivion, The Prospect for Humantity,
Allen Lane, The Penguin Pr. London, 1970, where he defines the universe in a rather richer and more personalized way: "Universe: Non instaneity. Non simultaneity. Physical or metaphysical regeneration. Irreversibility of evolution. Irreversibility of metaphysical comprehension of physical... Universe is the aggregate of all humanities all-time, consciously apprehended and communicated experiences. vide., Ch.8,

HIERARCHY IN THE UNIVERSE

For the comprehension, then for the operation of the total context of any phenomenon it is not the statement or definition of the universe that provides the aimed richness in approach; but the method of analysis in the form of decomposition of the elements of any phenomenon. The concept of hierarchy of systems is the most helpful in facilitating such an analysis.

"A system subdivides universe into all the universe outside the system (macrocosm) and all the rest of the universe which is inside the system (microcosm) with the exception of the minor fraction which contitutes the system itself."[5] This reveals the hierarchic structure of the universe. "By hierarchy… it is meant a system that is composed of interrelated subsystems, each of the latter being, in turn hierarchic in structure we reach some lowest level of elementary subsystem."[6] This elementary subsystem cannot be defined and determined, because any matter-energy or information composition in the micro extreme is also uknown, as far as the elements composing the known elementary subsystem are concerned.

Hierarchy is not an absolute material object, but a notion rel the way one investigates. It is a classification regarding the structure of the phenomenon the observer focuses on, hence any hierarchical taxonomy requires a common applicable criterion valid throughout all the levels of any phenomenon. To investigate the hierarchical structure of the universe, and to disclose the total spectrum of problem situations, it will be appropriate to propose two criteria applicable to all levels of the universe.

TIME-DISTANCE CRITERION

The first is the relative one-dimensional criterion: Distance, or in a more objective sense the time-distance criterion, Shapley's "Classification of Materials" lays out the largest known scale in physical terms. The hierarchy of the universe is composed of fourteen subsequent levels each higher one being an aggregate of the elements of the lower:

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[5] Fuller, R.Buckminster, Operating Manual for Spaceship Earth, op.cit., p.64 5Simon, Herbert A., Sciences of the Artificial, MIT Pr. Massachusetts and London, 1969, p.87

[6] Shapley, Harlow, OP Stars and Man, Boston: Beacon Pr., 1958, USA, Stapley's classification is puposely abridged by ommission of subclassifications, in such a comprehensive level of discussion the astronomic details seem to be superious. vide, also: Wilson, Donna, Forms of Hierarchy, General Systems Yearbook, Vol. XIV, 1969, pub. G.S.Soc. pp.3-15

TABLE 1

+9 ....

+8. The Universe: Space-Time Complex

+7. Metagalaxy

+6. Galaxy Aggregations

+5. Galaxies

+4. Stellar Clusters

+3. Stars and Star Families

+2. Satelitic Systems,

+1. Meteoric Associations ./..

0. Colloidal and Crystalic Aggregates

-1.Mollecular Systems

-2. Molecules

-3. Atoms

-4.Corpuscles, Fundamental Particles

-5....

The two levels in the extremes are unknown to man. In this classification the levels are numbered relation to man being in the level '0'. The elements of the universe marked with '+' sign are the componential elements of man's environment, those with '-' sign are the elements of his own composition. This sort of hierarchy reveals the endlessness of inner and outer space as far as human beings can conceive. The gigantic scale of this hierarchy does not give a substantial about the man-environment relationships but clarifies the cognition of the infinity of being.

DEGREE OF COMPLEXITY CRITERION

The second criterion for classification is not as concretely objective as the previous one, it provides chances for personalization within the classification. The basic criterion for the constitution of hierarchy is the degree of complexity.

The following table outlines the hierarchy of complexity, recognizing of biosphere as the most most complex level. After Miller:[7]

TABLE 2

+4.Biosphere

+3. Supra-National Societies

+2.Societies +1.Groups of Organisms, Organizations

0. Organisms

-1.Organs

-2. Tissues

-3. Cells

-4. Viruses

-5. Molecules

-6. Atoms

-7. Elementary Particles

-8....

In this classification of system levels, the transitions: From the level -5 to the levels -4 and -3 where the life emerged and from the level #1 to +4 where the life has spread all around the crust of the planet are worth investigation. The classification of subsystems of the universe can be done according to many other personalized sub-criteria, while the concept of complexity is kept a the basis.

Boulding's[8] levels in General Systems Theory contain slightly different terminology, but there is not a drastic distinction in the theme between Boulding's and Miller's classification, with the exception of the levels i, ii, iii, ix.

[7] The classification is extracted from Miller, James G., Living Systems: Basic Concepts, Behavioral Science, Vol. 10. No.3, July 1965, Michigan, USA, pp. 212-213, and organized as atable, higher level than biosphere omitted, so not considered as being more complex than the biosphere or human organism, et al.

[8] Boulding, Kenneth, General Systems Theory - The Skeloton of Science, Management Science, Vol.2, pp. 202-205, 1956

TABLE 3

ix. Trancendental Systems

viii. Social Organization Level

vii. Human Level, Self consciousness, Symbols

vi. Animal Level, Increased mobility, Teleological,

Behavioral self awareness

v. Genetic Societal Level, Plants

iv. Self Maintaining Structure, Open system

iii. Control Mechanism

ii. Clockworks

i. Frameworks

The "trancendental systems" constituting the univers composed of both physical and psychological phenomena defined differently according to different interests; like "cosmic spheres"[9] and in a more metaphysical sense like' de Chardin's 'noosphere' defined as being "the collective psychic or spiritual environment, corresponding to the 'biosphere' standing for the totality of living organisns on the Earth."[10]

Bennet in his "Dramatic Universe"[11] presents the corresponding elements of his philosophy in a completely different order, meanwhile the more objective part of the taxonomy (exepters) is rather similar to that of Miller's with a slight difference in macro levels:

TABLE 4[12]

	Category	Exepters
12.	Autocracy	The Universe

[9] Sheather, G.D., North and Central Lakes Region, A General Systems Theory Analysis, ACE Research Report, No.7, p.8, Athens, 1969

[10] Copman, Victor,, Apostoles of Integration, Systematics, Vol.2, No.1, June 1964, pp. 72-79, Kigston--u-Thames

[11] Bennet, J.G., The Dramatic Universe, Hodder and Stoughton, 4 Vol.s, London, 1961-1966

[12] ibid., Vol.II, Foundations of Moral Philosophy, p.17

11.	Domination	Galaxies
10.	Creativity	Suns
9.	Pattern	Planets
8.	Individuality	Selves
7.	Structure	Organisms
6.	Repetition	Cells
5,	Potentiality	Viruses
4.	Subsistence	Thinghood
3.	Relatedness	Particles
2.	Polarity	Corpuscles
1.	Wholeness	Hyle

Bennet's classification is also based on the increasing degree of complexity. The relative complexity of the levels higher than octad (eighth level) seem not to be valid in comparison to the degree of complexity of the lower level which are suppossed to be less complex in hierarchy. This classification is an intermix of the two criteria for investigating the hierarchy of the universe. The enrichment achieved' through the personalization of the criteria is quite apparent.

It is a known fact that all forces of the universe act upon man simultaneously. Within the scope of this work it is almost impossible to develop a model including the totality of such forces, nor is this end aimed at. The objective, being the construction of a causal or fuctional integrative conceptual framework, will be sufficiently satisfied if the biosphere is defined as the macro-environmental context. This context will be the most appropriate level to consider that is entails substantially enough forces which determine man-society phenomenon and the context in which it happens to exist. This is colloquially called the ecosystem and "in any description of an ecosystem it is desired that the characteristics of the whole be retained and made clear so far as possible. Reduction for the sake of simplification loses its point if the end is to delineate or demonstrate complexity."[13]

[13] McIntosh, Robert P., Ecosystems, Evolution and Relational Patterns of Living Organisms, American Scientist, Vol.51, p.247, USA, 1963

ORDER

The investigation of hierarchies in the universe and biosphere reveals that the each higher level is composed of the elements of the level below. What makes the the containing level higher is that it constitutes a series of combinary rules to bring the elements together to form another whole. This whole becomes something different; it is either higher in complexity or larger in scale than its constituent elements. This non-random arrangement of the parts is called order, and this property will be the measure of order in any phenomenon.[14] Order itself is a measure of complexity in any phenomenon; but still in almost all classifications of complexities-including those above- the measure of order is mixed with the relative magnitude of the perceptible characteristics of the successive levels.

ORDER IN NON-LIVING MATTER

For the better comprehensive investigation of order as an abstract notion, the distinction between living and non-living matter has to be made. When we consider the universe in terms of time-distance classification, it can easily be seen that the tendancy in the non-living universe is to establish a more stable state by breaking the order among the elements of each higher level and degrading that level into the relatively more stable state of the level below. The process of degradation, as it takes place, releases the inherent internal energy binding the elements together.

The concept of entropy is the most appropriate one to explain this process. The Second Law of Thermodynamics states that the tendancy of heat is towards being distributed equally all over the matter in which it is kept, inherent or produced. The analogous model of entropy in the systems context is made by the replacement of heatwith information or energy or both. In fact the notion of entropy has got entirely different content and remarkably has produced the terminology to cope with rather complex phenomena than thermodynamics. It is quite true that a property of aphysical phenomenon rarely holds valid for a non-physical one, in an anticipatory exploration like this this is subject to critisims and will be discussed later in detail.

The elements of the non-living universe seek an equilibria of acting inter and intra forces between their sub and supra systems and also among the internal

[14] Order, non-randomness, negentropy, (syntropy, antientropy), information, etc., will be discussed later in this work together with their dual characteristics.

forces of its structure. In certan levels of the subsystems of the universe this equilibrium seem to be established. The tendancy of development in such systems are again towards a more stable state of being but in relation to their supra systems. Examples of such cases can be observed in solar system or in a relatively simple atom. In the solar system all elements are connected to each other in an order explainable by the laws of physics. Although the solar systems seems to be maintaining its stable state, by transmiting energy the sun itself is increasing its entropy. The increase of entropy in a planet is obvious.

In the non-living universe the degradation of order releases the fixed energy for the constitvtion of that order, consequently the process of degradation is a source of energy. In the solar system the degradation of order in the sun releases vast amounts of energy, which is the ultimate source of energy for living beings, in the form heat and radiation.

ORDER IN LIVING MATTER

A revolution in the universe occured about 1.700 million years ago in the means of production and treatment of energy. Life enabled the living beings to process, store and regenerate the energy available in their environment. The emergence of life has been scientifically explained in terms of complex molecular aggregates as ATP, DNA,[15] etc., religiously or metaphysically it has been explained in various ways. It is still one of most challenging unknowns yet needs to be explained objectively. The evolution and spread of life and living matter took millions of years to produce the human being, the most complex living creature. Throughout this sequence of evolution the process of obtaining energy remained the same, the ultimate sources of energy being sun, and materials available on the crust of the Earth and incthe atmossphere.

The different mode of treatment of energy as the process-storage-regeneration, started a new development in the trend of change on the Earth. The existing progress towards the increase of entropy and maximization of stability rose from it; confronted with the tendancy of life towards the maximization or at least maintenance of order due to the increase in syntropy. The living beings constituted an increasing level of order and organization by being capable of producing variety of energies that they inputted from the environment. The emergence of mankind and mind achieved the latest known stage of this evolution. At this stage the level of organization, order and the degree of

[15] ATP: adenozine tri-phospate, DNA: deoxyribonucleic acid: C10, H14, N5 013 P3

complexity are the highest. The spread of life all over the crust of the Earth changed this surface into the Biosphere.

A CONTRADICTION

A continious process of transfering non-living matter into living matter and simpler living matters into more complex and organized living matters became the first contradictory development in the universe. This contradiction still goes on between the contradictory goals of the living and nonliving universe. Contradiction is inherent in the ever evolving process not in individual matter.[16] The process of life is basicly a continious increase in the level of order and the supply of energies to maintain this proces. The contradiction between the trend of maximization of syntropy of the living universe and the trend of maximization of entropy of the nonliving universe is one of the most basic aspects of being-environment relationships. That living matter is completely dependant on the non-living environment makes this contradiction one of its most important determining relationships. This contradiction is neither a competitive conflict nor an unresolveable antagonism, it is a vital aspect of the process existing from the very beginning till the end of any life cycle.[17]

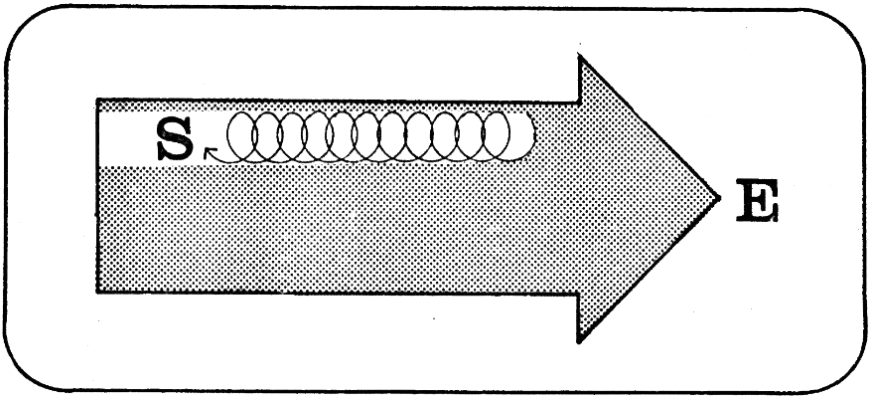


FIG. 1

[16] This statement requires further explanation, which is dealt more precisely and profoundly in Ch.8,

[17] vide. Fig.1, sketching the E.entropic vs. S. syntropic development; although their goals are contradictory, the non-living universe including the living, forming an environment and providing energies, the contradiction can be named as potential contradiction.

As a product of life the trnsformation of non-living matter into living matter and consequently the tranformation of living matter back into non-living matter in a different composition, is a perpetual cyclic process. Although this process seems to be a close periodical circuit it is not since there exist irreversible aspects of the development is inherent in the evolution.

Applicationof the notion "Entropy versus Syntropy" and the process of development in the "universal" level, reveals the trends of progress observed in universe.[18] For the convenience of conceptualization it will be more appropriate to take four basic levels to observe the directions of entropic change. The "outer circle, universe order increasing, decreasing or stationary? Unknown."[19] This is mainly due to the scope of our knowledge about this level, which lacks sufficient information.

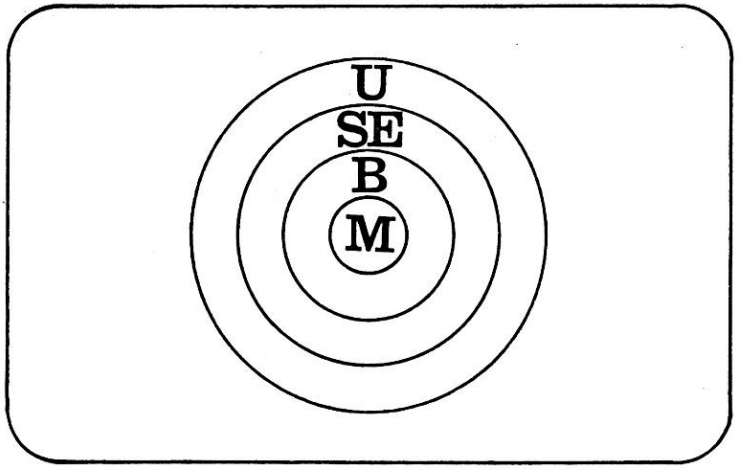


FIG. 2

The componential elements in the suprasystem have not yet been discovered to furnish the scientific explanation of the goals, tendancies and directions of development available. In the relative time and scale of interest there is sufficient knowledge about the second circle:" SE, sun-earth; order decreases in all measurable levels. If the Biosphere is included the situation is unknown.

[18] vide., Fig.2 reproduced from: Bennet, J.G., op.cit., Vol. IV ch. "Order against Disorder"
[19] ibid., p.19

In the third circle B, biosphere; order is at least stationary. If the Biosphere still evolving, order is increasing.

This again reveals the basic contradiction in the system, when in its supra-system (SE) the direction of the development is towards the increase of entropy, the released energy through the degradation in the level of order in the supra system is absorbed in one of its subsystems and converted into certain other kinds of order again; but when we consider theitotal amount of energy released by the sun and the amount of energy absorbed and fixed by the Biosphere, the fixed energy is negligible in comparison with the other. In the "Fourth circle, M, Man, Order is certainly increasing."[20] The incresing order in "man" and "Man-made environment" as an integral phenomenon requires a thorough investigation.[21]

THE HISTORICAL SEQUENCE

The Biosphere went through 4 000 million years of development to arrive at the present state of being. Each stage of progress was built upon the previous one, where it was contained or depended on. The preceeding stage of development both formed the closest environment of the emerging stage and supplied the necessary energies for sustaining it. At the present all of the these stages of development exist together, without the minor fraction of extinct life forms,- with a close interdependent interaction among these. The eight previous stages of development can be summarized as:[22]

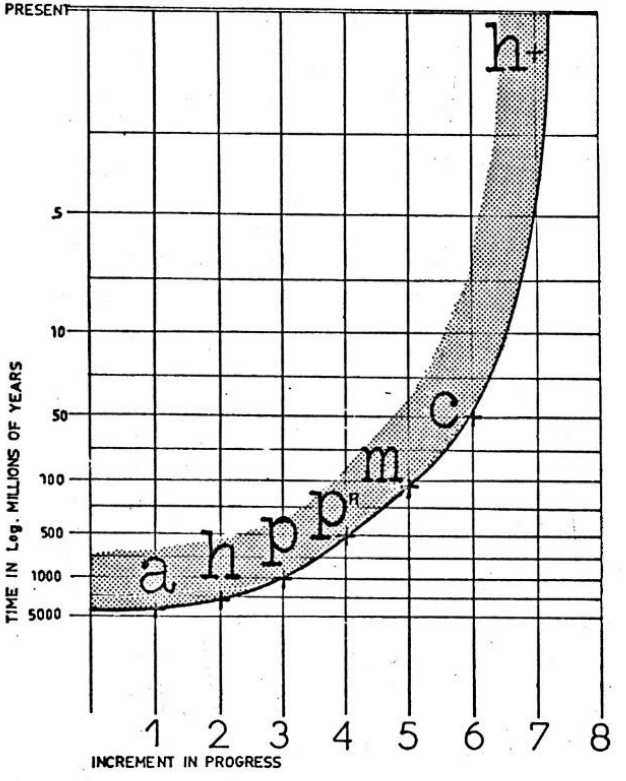
[20] ibid., p.19

[21] ibid., p. 20, following his four levels of classification Bennet says: "It seems from these considerations that the ratio orderdisorder is not constantly, decreasing in every relatively closed system as the secon Law of Thermodynamics would require, but varies according to the 'present moment' in which our attention is focused! supplementary to this fact it is the contradiction within the system producing a potential at the other level.

[22] ibid., p. 120, vide., Fig. reproduced from ibid., p. 168, vide., also Hutcchinson, G.E., The Biosphere, Scientific American, Sept., 1970, Vol.223, No.3, p.46

TABLE 5

Stage	Characteristics	Starting date	Duration
1. Amorphous	The Precrystalline Earth	4000	1500
2. Azoik	Crust, Oceans, Silt, and Clays	2500	800
3. Hypozoic	Soil and Sexless Algae	1700	600
4. Proterozoic	Sexed Life	1100	500
5. Paleozoic	Plants and Invertebrates	600	370
6. Mezozoic	Vertebretes and Advanced Plants	230	170
7. Cainozoic	Mamals and Birds	60	58
8. Hyperzoic	Mind	1 ½	½



STAGES

a azoic
h hypozoic
pR proterozoic
p paleozoic
m mesozoic
c cainozoic
h hyperzoic

FIG.3

The most important aspect of the Biosphere (and life) is its capability to fixate the energy transmitted from the Sun in the form of radiation; that is fixed as organic compounds through the process of photosynthesis. Roughly two billion year old process of fixing energy of the Sun is still the basic source of energy for living beings. "Only about a tenth of one percent of the energy recieved fron the Sun by the Earth is fixed by photosyothesis." [23] The sequence of development from less complex organisms to more and more complex ones, is not only a historical process of evolution, but also the process of exchanging the fixed energy among the living matter. This is the most important aspect for the conceptualization of the Biosphere as an integrated system. According to the 'First Law of Thermodynamics' the amount of energy is constant in the universe and it neither increases nor decreases but transforms from one state of being to another. The steady state of the biosphere is called the 'ecological balance' which is sustained through the cycling of matter. energy as the basic characteristic of the system. These basic cycles within the Biosphere can be summarized as:

TABLE 6 [24]

Matter-Energy Cycles

1. The energy cycle
2. The water cycle
3. The oxygen cycle
4. The carbon cycle
5. The nitrogen cycle
6. Mineral cycles
7.....

Human beings depend on these cycles and on the fixation of energy in the organisms of a lower levels of complexity. This interdependence creates a highly complex network in the Biosphere as if it were a single organism. [25] This

[23] Woodwell, G.M., The Energy Cycle in the Biosphere, Sci. Amer., Sept. 1970, Vol.223, No.3, pp. 64-74

[24] vide., Scientific American, op.cit. For more concise and detailed in information.

[25] vide., Hawley, Amos H., Human Ecology, A Theory of Community Structure, The Ronald Pr. Co., New York, 1950, pp.33-65, Interrelatedness of Life, for further detailed information.

justifies the reason why it would be more complete if the Biospherevere taken as the supra-system for the problems of environment. Through such a conceptualization or even an operation an environmentalist would be able to feed all determining factors. and variables to the solutions for the problems of environment.

The problems of environment have first arose owing to the conflict between human beings' biological structure and their surrounding environment, then to envelope their social interactions and other productive activities.

NATURAL ENVIRONMENT

Whether it was man's ability to make tools in order to cope with the problems of environment, or whether it was the environment which caused man to produce means and ways to lessen the undesirable effects of the natural environment, is the ever existing man-environment dicotomy which needs not to be explained here. The conflict between the natural context and human beings as an apparent. fact is one of the main determining factors which produced a set of disciplined environmental pręcautions.

Any brief investigation of the Biosphere reveals that the animal and plant species are aggregated in the areas where the natural environment is sufficiently appropriate for their existence. This produces a large peculiar pattern of distribution of living beings on the surface of the planet, where there is an interrelated dependancy between the environment and the living species. The environment providing macro-determining elements for the species and the species within in a pattern of interrelationship among themselves create their micro-environmental pattern. These patterns of interaction of micro and macro organizations are definetely structured all over the Biosphere with strictly explainable functional relationships.

For human beings the situation is completely different. With slight adaptive differentiation in their biological structure, human beings can be seen at every single spot on the Earth provided that there are soil, water and vegetation to grow. This large scale spread of human beings all over the globe has been carried out by their capability of utilizing various kinds of energies to lessen the undesired effects of the natural environment. This activity of facilitating energies has been done through available mental and physical powers one being uniquely inherent in man and the other being provided by nature.

CHAPTER 3

ENERGY

DEFINITON

For any matter to ascend from a less orderly state of being to a more orderly state, energy is required. Energy is simply defined as "the ability to work" and covers a wide spectrum of qualities, ranging from metaphysical energies of mind to mechanical energies of matter. To bring any set of elements from more probable state of entropy to a less probable state of syntropy a series of energies are required appropriate to the specific situation and in an appropriate order and magnitude. [26]

CATEGORIES OF ENERGY

Any classification of energies must include both physical and metaphysical energies, since there are many types of energy which have not yet been explained by sciences but are still in themselves and their influences conspicuous. In order to avoid omission of such energies the following table includes the total range of known energies.

TABLE 7 [27]

The Twelve Qualities of Energy

Cosmic Energies	
E1. Trancendant Energy	Self-Sufficiency, Power,
E2. Unitive Energy	Unity of Being, Love

[26] Here "entropy" is taken synoninous to "disorder" and "syntropy" to that of "order", and by probable state, the events which are more likely to happen under the forces aiming at the increase or maintenance of entropy in a system is meant.

[27] Bennet, J.G., op.cit. Vol.II, p.233

E3. Creative Energy	Cosmic Polarity,
E4. Conscious Energy	Universal Experience,
Life Energies	
E5. Sensitive Energy	Awareness, Selective Attention,
E6. Automatic Energy	Reflexes, Associations,
E7. Vital Energy	Vitality, Reproduction,
E8. Constructive Energy	Catalysis, Autosynthesis,
Mechanical Energies	
E9. Plastic Energy	Mobility, Elasticity,
E10. Cohesive Energy	Aggregation, Agglutination,
E11. Directed Energy	Force-fields Radiation,
E12.Dispersed Energy	Random Motions, Heat,

Among these three main groupings of energy the non-living matter has only mechanical energies fixed by the level of organization of their structure. The living beings have both second and third categories of energy which are fixed, stored and regenerated, Due to the lack of cosmic energies of mind they undergo slow processes of change through which they increase their level of complexity. This process of change is mostly determined by the acting forces of environment and the suprasystem in which the are contained.

For mankind all three categories of energy are both inherent in their biological structure and available through mind. The key reason why man is in a continious process of change, and development, is the availability of all sources of energy by the cosmic energies of mind. The totality of this process is called civilization which is achieved by creating a large body of symbols that enable man to discover his environment and find new resources of energy to communicate to others in order to create new and better experiences of life. [28]

[28] vide., Bertalanffy, Ludwig von, The Tree of knowledge, in Sign, Image and Symbol, Kepes, G., ed., Studio Vista, London, 1966, p.275 Claims symbolism as being the ultimate source for the continious process of development of mankind, where he says: "Whatever the origin of symbolism, its consequences are enormous. The first consequence is obvious. Phylogenetic evolution, based on hereditary changes, is supplanted by history, based on the tradition of symbols. In the biological sphere, progress is possible only within an evolutionary time scale. For example, the societies of ants have remained unchanged for the past fifty million years. In contrast, human history has a time scale of generations, comprising almost all high cultures in a

SYMBOLISM

The process of symbolism started with language as abasic means of - communication. As the consciousnes of the being increased the corresponding set of symbols to communicate this awareness also went through a parallel progress. By means of symbols and communication, two bodies of information have been created and maintained all through the history of mankind. These are sciences-being the body of knowledge, together with the process that produces that body of knowledge, searching for the governing truths about the universe; arts-being the processes and products of expression of feelings, thoughts and sensual values. It has been these two basic categories of information which have enabled man to explore better sources of energy and exploit that energy for the benefit of humanity.

Due to the use of energies the level of order in mankind increased at an incredible pace. The biology of human beings has been evolving at a very slow rate foolowing the rules of development of nature. [29] The body of information, the sensual experiences and the thoughts have been evolving at a higher pitch, being directly related to the symbolic world.

Development in the symbolic world enabled progress in the artifactual processes, which facilitated man's communication to his kind and consequently, resulted in a development in the community structure. At any cross section of time and level there must be a continious supply of energy to the system in order to maintain its degree of complexity. This energy supply covers the wide spectrum of above-mentioned qualities of energy.

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span of five thousand yaars, and it may even be thought that cultural time has a logarithmic than an arithmetic scale, with the changes taking place at an ever increasing pace."

[29] vide., Fig.4, where three major axes of development are simply presented. (x) is the level of complexity axis, signifying the evolution in the biological structure of human beings. (y) is standing for the level of development in the sciences and technologyto facilitate the exploration and exploitation of nature and improve communication. (z) is the level of complexity due to community structure. Time is the sequence of this development, hence the total development and the total level of complexity of mankind at any cross section of time can be summarized symbolicly as being the intersection by a plane perpendicular to the revolving axis of the spiral. This can also be stated as a function the developments on these four interdependant axes, or symbolically:
D=f(xt, Yt, Zt,...)
Here (D) symbolizes the measure of development and complexity, which is at the same time a function of time

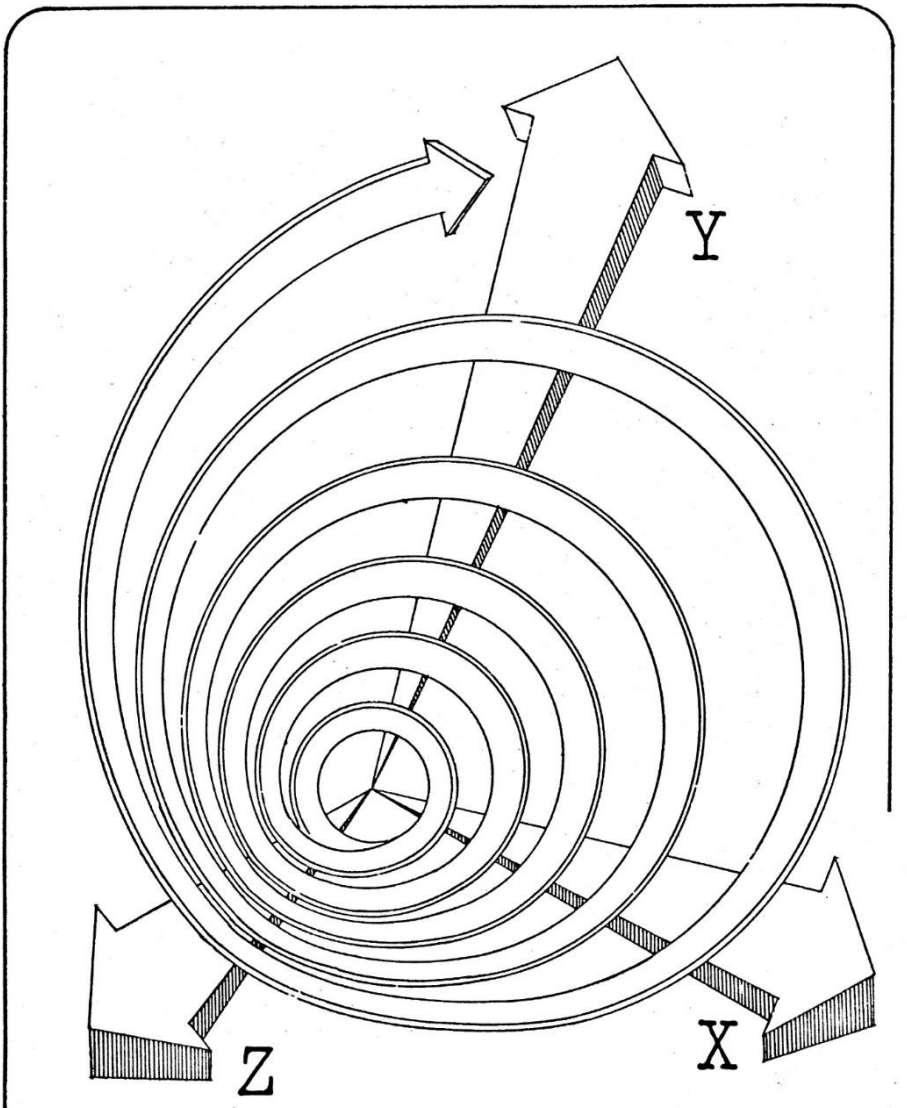

FIG 4

CHAPTER 4

NATURE OF THE PHENOMENON

ARGUMENT

Having defined society as the macro-determining set for the artifactual processes related to the environment, it is necessary to describe the major characteristics of the societal processes. Before going into that, a more precise argument on the scope of architecture may be helpful. Supplementary to the previous description of architectural activity, it can be said that, besides its main function 'adaptizing' it deals in detail with other kinds of activity, such as 'satisfising' and 'problem solving'. Abstracting any one of these aspects and claiming it to be the total scope of architecture, is completely insufficient. Since the concern is an integration of the largest set of acting determinants it needs to contain all these three. There is also an inevitable necessity to provide an integrative basis for the development likely to happen in the future.

Under the light of the hierarchy in the universe and energy, the most abstract definition of the environmental involvement can be formulated as: The process of utilization of the energies in order to increase the co'se'sus between the social system and its environment (supra-system). This definition includes the totality of adaptive aspects, and partially problem solving aspects but does not include properly satif ing aspects. Since, every action is a utilization of some sort of energy, it is general enough to contain them all. The involvement with environment takes place within the natural environment where the forces are more or less constant in their objective context, but they are completely variable depending on means and ways of coping with it. In other words the effects of the natural environment is relative to the availability of energies which are the direct product of science and technology.

Man involving processes processes are complex because the elements of the system are themselves extremely complex and multi-dimensional. Together with their interactions, these elements constitute a system of a higher degree of complexity. Such processes are also interminate since the basic component of the system is 'man', a complete system on his own. Man himself contains all

system characteristics as a biological and psychological entity and forms societies as his supra-system in the hierarchy. Any system having its subsystems with complete and and more or less independent decision mechanisms (man), has in its subsystems the complete freedom of making feedbacks at every single cross-section of time. Consequently, the courses of action of the subsystems and then those of the system itself do not lend themselves to deterministic rules. Therefore, they are unpredictible. [30]

The third aspect of man-involving phenomena is the irreversibility of the process, in the context of the progression of time. Any social system does never repeat itself, basically due to its information processing capabilities and also due to the feedbacks made through the memory of that processed information. [31] Fourthly as with everything in the universe which is real, it takes place in space and it reflects itself in space. For the conceptualization of the man-involving phenomena and its relation with the problems of environment, it is necessary to have a closer look at these aspects of social processes so that the nature of the phenomenon can be better comprehended.

COMPLEXITY

Complexity is the degree of diversity or differentiation of the dissimilar elements, together with the combinary rules and relationships among them, bringing together the elements to constitute a whole. [32] In most cases, complexity is a function of order, but they must n ver be confused however, because "complexity and order are two independent features of an observed system." [33]

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[30] The concepts "indeterminacy" and "unpredictability are taken here within ultimate philosophical context, meaning hundred per cent determined or predicted, meanwhile it is quite clear that every existing thing can be determined with some error or discrepancy.

[31] This process of information is a very general term meaning every single element occuring in a decision process has repercussive influ encences upon following sets of decisions and states of being.

[32] In this definition the concepts "elements" and "Wholes" have to be taken in levels where each whole being an element of a higher level of organization and successively each element being a relative supra system for its lower levels. A higher level of organization does not have to be a more complex one as previously discussed in Ch.2

[33] Pringle, J.W.S., On Parallel Between Learning and Evolution, in Modern Systems Research for the Behavioural Scientist, Aldine, Pub. Co., Chicago, 1969, ed. by Buckley, W., followin this continiues: "...Order, which is negative entropy, may increase without increase in complexity; and complexity might increase without change of entropy. An example will clarify this point.

Investigation of the "order of the universe" [34] reveals a requirement for two different scales to delineate the governing order.

In any phenomenon the degree of complexity is completely relative to the observer's interests. Between the indefinetely large spectrum of inner and outer infinity of the universe, one can locate any phenomenon in consideration with its macro and micro determinants. There is no absolute scale to measure and locate degrees of complexities in an objective sense, but in most cases complexities are coceived and graded according to determinants of the complexity as a concept or as a relative categorization. The determining aspect of the level of complexity of any phenomenon can be summarized as follows:

ELEMENTS

The number of element contained in a whole as the interacting constituents determine the level of complexity of the whole. Besides the number, the number of differentiated, diversified and dissimilar elements compose a more complex whole than identical elements, because different elements require different patterns of functioning. Dissimilar functionning also necessitates dissimilar internal processes, causing an increase in the level of complexity.

RELATIONSHIPS

The relationships being the combinary linkages among the elements, depend largely on the elements, since different elements require different relationships to interact functionally to constitute a whole. The degree of diversity and differentiation of relationships among elements of any phenomenon is another determining factor for the ordering of levels of complexity. [35]

When a crystal of common salt grows regularly, to twice its previous size, its entropy decreases; that it has increased its order. But its complexity is the same; ..."

[34] vide., Ch.2

[35] vide., Fig.5, where increase in the level of complexityof a hypothetical whole consisting of four elements and six interrelationships is diagramatically presented: Fig.5a, An increase in the order but not so much increase in the level of complexity; four identical elements come together to compose a whole with six identical relationships. Fig.5b, Increase in the level of complexity due to dissimilar elements, but identical combinary relationships. Fig.5c, Elements are identical but the relationships are dissimilar, since the "whole" is mostly determined by the relationships it is considered as being more complex, Fig.5b, The most complex state of being with four elements and six relationships, all being dissimilar.

CHANGE

As time proceeds any complex phenomenon changes its structure as a consequence of its internal changes, either at the level of elements and their relationships or on the level of the supra-system. The frequency or period of this change depends mainly upon the characteristics of the phenomenon and also on the increase in the level of complexity; in most cases complexity and change depend on each other when one increases, the other follows. [36]

As it is stated in the preceeding paragraphs, the concept of complexity and the measure of that complexity, are completely relative to the interests of the observer, but this never means that one cannot arrive at objective decisions on the degree of complexity. The objectivity in approach is mostly determined by the demarcation of the phenomenon and the definition of the interests. To clarify this, it will be appropriate to investigate the internal and external complexity of any phenomenon.

INTERNAL AND EXTERNAL COMPLEXITIES

In order to define the internal and external complexity of any phenomenon it is not possible to set up absolute boundaries for distinguishing the internal from the external. This can only be done only in relation to the relavant interests of an observer who will impose his conjectural criteria to differentiate. Any set of elements can be extremely complex internally but relatively simple externally, and vice versa. The level at which internal is differentiated from external is in most cases the level at which the complexity (or size) increases for one level. The lower levels of systems (or componential elements) aggregate to constitute a system of higher level. Internal complexity of any whole is the total degree of complexity observed within the pre-set boundaries of differentiation.

The internal complexity of any phenomenon does not always contribute to the total level of complexity of the whole. i.e., when elements of a certain degree of complexity interact to compose another whole of a higher order this higher order may or may not be of a higher level of complexity.

At the set boundaries the relationships can be defined simply as "inputs" and "outputs" in context to the investigated element or subsystem. [37]

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[36] vide., This Ch. Art.4.4.ff

[37] This is a simplified version of the "Black Box" concept in cybernetics, for further info., vide., Ashby, W, Ross, An Introduction to Cybernetics, Chapman & Hall Ltd. London, 1961, Ch.6,

Usually, it may not be appropriate for the observer's concerns to deal with the internal complexities, and also these internal complexities can be far more complex and beyond the reach of comprehension of the observer, in such an approach the observer does not get involved in the internal complexities, but deals with inputs and outputs of the investigated system. Negligance of the internal complexities, by focusing on the effects of that complexity avoids the diffusion of interest due to over-detailed analysis.

STRUCTURE OF COMPLEXITY

In the previous taxonomy of the universe it is apparent that any phenomenon can be fitted into that spectrum without beig abstracted from its relational state of being. This not only due to the structure of complexity but also due to the function of the hierarchical classification which facilitated such a large spectrum complex phenomena. "Complexity frequently takes the form of hierarchy, and that hierarchic systems have some commom properties that are independent of their specific content." [38] These properties are either the properties constituting the bondage or the properties which are focused for the sake of analysis. Hierarchical comprehension is mostly useful to delineate the structure of the complexity in levels, but, due to the complex interrelationship network between the levels, the structure keeps its comlexity, which can be called comprehensible complexity. This is eased by the hierarchy of the structure. In respect relationship patterns, (component linkages), Simon claims, that the linkages constituting the internel complexity are stronger than that of external complexity.

> ... Intra-component linkages are generally stronger than intercomponent linkages. This fact has the effect of seperating the high frequency dynamics of a hierarcy -involving the internal structure of the components from the low frequency dynamics. Involving interaction among components. [39]

The decomposition of the elements of a complexity and the delineation of the structural pattern of the linkages become quite complex methodoligical problem requiring consistent handling if one is not to end up with over-

pp.86113; and Beer, Stafford, Cybernetics and Management, The English Universities Pr., London, 1959, pp.293-298

[38] Simon, Herbert A., op.cit. p.87

[39] ibid., p. 106

simplifications.[40] Another way of operating a complex phenomenon, other than hierarchical decomposition is modelling. In modelling certain set of relevant aspects of the complexity are dealt with in abstraction, and then synthesized to facilitate operations in the whole. The synthesis of an abstract representation of the phenomenon is relevant in accordance with the observer's (designeris) concerns.

It should be kept in mind that, "the nature of a human group is complex and multi-variete. There is wide variety in its qualitative features. It has complicated relationships between the various levels which range from the physical to psychological." [41] Man-involving processes have the utmost degree of complexity when compared to other complex things in the universe. Environmentalist having man as their fundamental subject should develop appropriate methods to cope with such complexity. The methodological handling of complex phenomena will be dealt with later in this work. [42]

INDETERMINACY

The concept of indeterminacy is another characteristic of the man-involving phenomena. Indeterminacy of any phenomenon directly affects the degree of complexity of that phenomenon A situation becomes more indeterminate as the future stages of its being becomes less predictible.

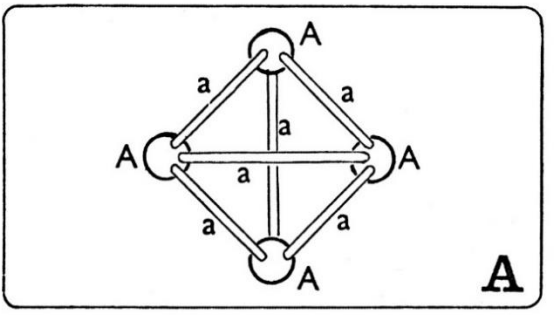
METAPHYSICAL DETERMINISM

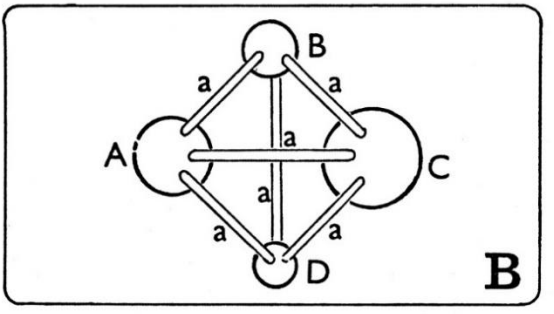
Determinism as a concept is inherent in the philosophy of most ancient religions. The God is defined as the determining power for the future state of being of every single being. The religious interpretation of the future is philosophically in the same framework as that of the past Every event as it took place, is explained as if it happened in the same pattern determined previously by the God. The fatalist belief in the future is known as metaphysical determinism. From ancient Greek mythology onwards there appeared thousands of myths, stories, etc., centered around the main theme of predetermined courses of events, where the fate could never be changed.

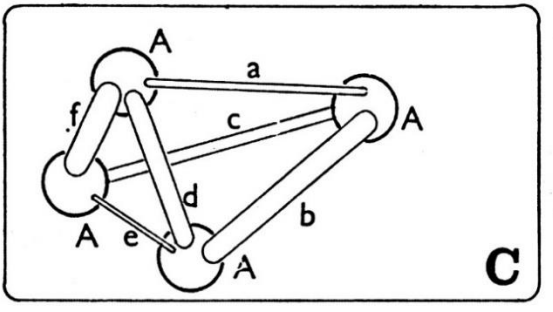
[40] vide. Ch.8
[41] Hodgson, Anthony M., The Solution of Technical Problems by Groups, A System Model of a Task Group, Systematics, Vol.2, No.1 pp.8f June, 1964, Kingston-u-Thames
[42] in Ch,8

Metapysical determinism avoided unrest and anxiety about the future, and created a common attitude: towards the future within the framework of beliefs.

The irreversible nature of time, as a nonperiodic progression in the sequence of time, made the metaphysical interpretation of the events irrefutable, so metaphysical determinism became an unexplainable belief rather than a theory.







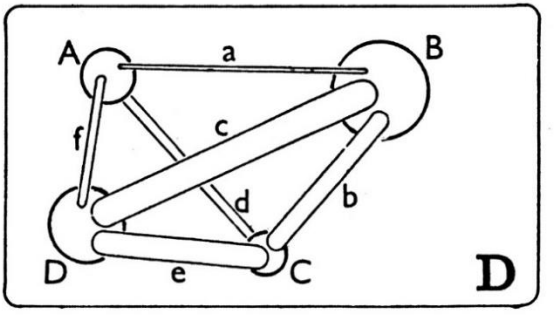


FIG.5

PHYSICAL DETERMINISM

When Newton synthesized the theories of Kepler and Galileo, and stated his theory of motion and attraction of masses, he generated the victorious deterministic interpretation of the universe, but this interpretation having a sound theoretical basis was entirely different from matephysical determinism. The endeavour was to facilitate a scientific explanation of the ill-explained facts of the past, as Galileo stated: "The book of nature is written in mathematical language" [43] and the scientists' duty was to find it out.

After Galileo, the French mathematian Laplace, "has summarized in his famous smile a super human intelligence that could observe position and momentum of every atom and could solve all mathematical equations; to this superhuman, 'the future like past would be present', and he would be able to state precisely the minute details of every occurance, be it thousands of years ahead or behind us." [44] Laplacean Demon[45] became the new interpretation of metaphysical theories which were enriched and stabilized with the introduction of mathematical theories and opened a new era in determinism called physical determinism.

> This physical determinism was the most general outcome of Newtonian physics. It is intrinsically different from fate; it is blind, -not planning; it does not favor or hate man; it is a determinsm not in terms of future aims but of past facts, but of a physical law. But it is a strict exceptionless as the determinsm of fate. It makes the physical world comparable to a wound clock that goes automatically through its stages.[46]

Physical determinism has been valid for the systems whose governing laws are simplistic, and their path of occurence periodic; such systems can be named as deterministic systems, viz. solar system. Still, the parameters of determinacy depends mostly on the range and precision the of observer's interests. Sometimes even the most deterministic processes cannot be categorized as deterministic, for the interests of certain other level. The enthusiasm of post Newtonian scientists, who discovered the basic order of the universe, became a profound deterministic belief. [47] After the turn of the last century, Einstein's

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[43] Reichenbach, Hans, The Rise of Scientific Philosophy, University of California Pr. Los Angeles, 1968, pp. 103f

[44] ibid., p. 106

[45] Superhuman Intelligence, or Superman

[46] ibid., p.106

[47] The discoveries done through Newtonian discipline caused this belief. e.g. The slight discrepancies with the predictions of Newtonian theory, about the sition of the planet Uranus,

theory surpassed Newtons with a superior explanation of the nature of matter and the universe. This opened another door to determinism in a richer and more profound context. "The growing scientific knowledge about the universe will someday completely remove the cloud of indeterminacy." This belief became the common positive argument, backed by the common trend in the sciences.

The materialist, deterministic argument is also quite a positive gesture as far as its confidence in science is concerned. Materialistic determinism acts from the composition of all existing thing, and states the as axiom everything is made out of matter. So, when we know matter itself sufficiently we can determine everything made out of it.[48] Simply in the words of a physical determinist; "with all our common sense, we arranged things not according to their nature, but merely accoding to our ignorance," [49]

PHYSICAL INDETERMINISM

When the accurate theorizations of Einstein opened a new era for determinism, in the micro level of involvement of nuclear physics, the probabilistic rules governing the movement of particles were defined as quantum theory by Planck and this was followed by the formulation done by Heisenberg. In reality a much earlier probabilistic interpretation of the particles had been made by Gibbs. Quantum theory added proof to the scepticism concerning determinism that emerged in the nineteenth century initiated by Peirce.[50] At the beginning of the twenteenth century, scientists were virtually divided two groups. When certain great scientists such as Planck, Schrodinger and Einstein hesitated to abondon determinism, a highly sophisticated discussion in philosophy of science, mainly centering on classical physics[51] which had been classified as on of the most deterministic sciences.

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caused a challange to search; later Adams and Leverrier pointed out the assumtion of a new planet and calculated its position and foolowing this Galle discovered the planet Neptun.

[48] Pure materialistic determinism simply ignored the fact that "things" were consisted of not only matter but matter and energy, although the determination of matter is questionable, there are so many intangible qualitative categories of energy which are only conceiveable, i.e. cosmic and life eneryies; besides these there are still mechanical energies that are not suffi ciently explained, i. e. light.vide.Ch.3 Art.3.2.

[49] Popper, Karl R., Of Clouds and Clocks, Architectural Design, September, 1969, p.491 puts a counter argument in physical determinists' own words.

[50] vide. ibid. p.492, fn.6i and 7, about C.S. Peirce, 1892

[51] Born, M., (1955); Brillouin, L., (1956); Liapunov, (1907); Popper, K.R. (1950); Dear, F., (1960); Aopp,F., (1961); Contributed to the subject, for brief summary, vide. Hoering, Walter, Indeterminism in Classical Physics, Brit, J. Phil. Sci. Vol.20, pp. 247-255, Cambridge, 1969; and

If metaphysical determinism is disregarded a priori, phsical determinism can be taken to be valid for the deterministic arguments for man involving phenomena. This is because of being refuted for the complex physical sciences. Therefore, physical determinism as a courageous, positive, scientific gesture would prove to be irrelevant at the high degree of complexity found in man-environment relationships.[52]

SOCIAL INDETERMINISM

Society being composed of elements which are themselves of an entirely complex nature, possesses the characteristics of indeterministic phenomena. Every individual, as a biological entity, is a self-maintaining and self-sufficient system. Each individual is in direct relation with other beings and matter, and has a control and decision subsystem allowing individual feedbac and decision making at every fraction of time, hence, in spite of the governing probabilistc rules in their pure philosophical context, it courses of action of individual and social events become indeterminate or unpredictable. This not only valid for long term developments but also for short term actions. When the processes of learning and creativity are added in parallel to the increased complexity the process also gets indeterministic.

Even if we put extremely complex systems such as man and society aside; still no living being may be considered under the grouping of either simple or complex deterministic processes.[53]

HISTORICAL DETERMINISM

While the discussions on determinism in the physical sciences was developing, determinism in the historical context of social sciences emerged, mainly based

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Popper, Karl R., Indeterminism in Quantum Physics, Brit. I. Phil. Sci. Vol.1, pp. 117-133, 173-195, Edinburgh, 1950

[52] Here a question by Szent-Gyorgyi, A., Teaching and Expanding knowledge, Science, 146, 1964, pp. 1278f, may be wothwhile to mention: "(When I joined the Institute for Advanced Study in Princeton) ...I would learn something about living matters. But as soon as I revealed that in any living system there are more than two electrons, the physisist would not speak to me. With all their computers they could not say what the third electron might do. The remarkable thing is that it knows what to do."

[53] Beer, Stafford, op.cit. pp.12-19 in his arbitrary classification of systems puts four categories such as: Simple Deterministic, Complex Deterministic, Simple Probabilistic and Complex Probabilistic. There no living being is considered as deterministic.

on the definitive identity between predictability and determinism.[54] Historical determinism basicly claims that the analysis of previous stages of any social development provides a determinative scientific basis for the future stages which become predictible.[55] Due to the highly complex nature of social phenomena and their irreversible character, the word determine cannot be attributed for such probabilistic predictions. This does not mean that predictions ought to be avoided, but the parameters of the predictions are to be defined.

> "However, we contend that it is doubtful whether any predictions of social scientists are valid even statistically, except if they are limited in area and time. A social scientist may predict perhaps with fair expectation of accuracy how many television sets will be sold in New York during the next year. He cannot predict how many will be sold throuhout the world during the next century. The reason for this limitation is not only the complexity of factors determining this phenomenon, but also inmensurability of factors of human reflection." [56]

CONCLUSION

It can be stated that the idea of determinism having been questioned even for the physical sciences cannot be considered as a fundamental characteristic for an approach in social contexts. The social phenomana are indeterministic in the sense that the governing rules of social structure are probabilistic; the continious feedback mechanism produces an ever-lasting change which makes scientists unable to determine an absolute end for this continious change.

The approaches to social problems in related disciplines, i.e. enviromental activities, should take this basic characteristic (change) as an essential predicament to start with. Since the subject matter (society) does not have an absolute end, its relations with the environment cannot have one. The solutions to the problems of environment have to be directed to the aspects of the process

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[54] 0' Connor, D.I., Determinism and Predictability, Brit. J. Phil. Sci., vol.7, Edinburgh, 1957, p.310, says:"the concept of determinism can best be explained by agreeing to call an event determined if it is predictible in principle."

[55] This the method Popper calls'historicism' and criticises in Popper. Karl R., Poverty of Historicism, Routledge and Kegan Paul, London, 1969, he analyzes hictoricist doctrines as 'pro-naturalistic and ‘anti-naturalistic'

[56] Roshwald, M., The Case of Indeterminism: A Reply to Grunbaum, Brit. J. Phil. Sci., Vol.7, Edinburgh, 1957, p.242

rather than trying to establish close fits with the determined goals of static nature.

IRREVERSIBILITY

Similar to the concept of entropy the concept of irreversibility is first defined and conceptualized as a characteristic of thermodynamic processes, where heat always flows from a body of higher temperature to abody of comparatively lower temperature and his process cannot be be reversed, unless some energy is utilized to provide more heat to the other body.[57] Irreversibility in a more generalized sense means process can be played back in exactly the same way as it happened originally.

Newtonian Laws disclosing the governing order of the univers gave astronomers the chance of stating the periodic cycles of the planets, by means of which most of the events in astronomical context became more of less predictible due to their reversible nature. The meteorological events happening within a subset of the universe do not reveal a reversible characteristic.

> "In the first place, the meteorological is one involving a vast number of approximatelely equal particles, some of them very closely coupled to one another, while the astronomical system of the solar universe contains only a relatively small number of particles greatly diverse in size and coupled with one another in a sufficiently loose way that the second order coupling effects do not change the general aspect of the picture we observe, and the very high order coupling effects are completely negligible."[58]

The degree of complexity of any system is one of the most important determinants of irreversibility, but whether a system is complex or simple it is irreversible in relation to the progression of time. Every event or processe takes place in a space-time context, covering the whole spectrum of being from the past to the future infinity. Some mechanical systems seem to be “reversible in short run,.. they are irreverible over great lengths of time, due to friction, wear, so on."[59] To be more precise in the definition of reversibility it is worthwhile to

[57] The thermodynamic irreversibility of heat flow seems quite clear but still its relevance discussed by Popper, Karl R., Irreversibility, or Entropy since 1905, Brit. J. Phil. Sci. Vol.7 pp.151-5, Ediburgh 1958, If a one way heat valve or membrane produced the truth of irreversibility will be refuted. (Şummary is mine 5.0,)

[58] Wiener, Norbert, Cybernetics, MIT Pr. Massachusets, 1969, p.32

[59] Cowan, Peter, On Irreversibility, Architectural Design, Sept, 1969, London, p.485

state that even mechanical processes are not reversible when they are considered in the short run. In the period when the system used to be reversible it did not have the same qualities in the very beginning and at the end, and also it was playing a part within an irreversible process even when reversing in cyclus.

It should be kept in mind that similar to the concept of determinism and complexity, irreversibility is also relative to the interests of the observer. When we consider the solar system, it may as well be regarded as a reversible process repeating itself in cycles of predeterminable periods; but still the process is irreversible within the context of the universe of galaxies, where the solar system may be on of the particles with close couplings among them, similar to the particles of a cloud. This point can be clarified with the sepplementary notionsof, orbit as the path of the process. "In classical mechanics the closed systems have quasi-periodic orbits, where as the open systems have at least some aperiodic orbits which extend to infinity."[60]

The mechanical processes are irreversible in the direction of increase of entropy, as in the thermodynamic processes.[61] The suject matter of this work being living beings and man , how are such processes irreversible? Man-Involving phenomena are also irrevrsible as a process in the direction of increase in syntropy. This is firstly the fuction of time, the interpretation of time has contributed much to the apprehension of the irreversible nature of man-involving processes. Wiener sumarizes the change in the notion of time:

> "Transition from a Newtonian, reversible time to a Gibbsian irrreversible time has had its philosophical echoes, Bergson emphasized the difference between the reversible time of physics, in which nothing new happens, and the irreversible time of evolution and biology, in which there is always something new." [62]

Charles Darwin when he explained the 'origin of species'also, consciously or unconsciously stated the arrow of time and evolution, in the biological sense, in which the level of organization always increased in living beings. Human beings, with their ability for learning and communication, increased their level of organization at a much higher rate, depending upon their sustained body of knowledge and the process which produces that knowledge. As a product of

[60] Grunbaun, A., and Hill, E.L., Irreversible Processes in Physical Theory, Nature, Vol.179, No.4573, London, June 1959, p.1296

[61] vide., Ch.2, Art.2.3.

[62] Wiener, Norbert, op.cit. p.38

continious disclosure of unknowns, creations, and evaluation, each stage of development consists of the elements of the previous stoge, plus the contributions made in the period between the past and the present state. The continious progression avoids the existence of revesible characteristics in a social process. "We are directed in time, and our relation to the future is different from our relation to the past. All our questions are conditioned by this asymmetry and all our answers to these questions are equally conditioned by it." [63] In this asymmetric irreversible progression of time every achievement of man is built upon the previous ones, where new combinary rules for the existing elements introduce different states of being as time proceeds.

In similar manner the determinist, historicist philosophies of Danielevsky, Spengler and Toynbee made succesive claims for the cyclic nature of human civilization, under different terminology but with quite similar arguments. This historicist theory asserts the existence of an order in the nature of civilizations, they reveal a periodical process in a reversible way as the history repeats itself, different in form but essentially similar in structure. The analogy with life, to prove the thesis, validates the proof within the non-precise parameters of the claimed analogy. This historicist - or as Sorokin names 'totalitarian macrosociology' theory has been substantially refuted by Sorokin with the explanation of the irreversible nature of social processes. These processes largely depend upon the interaction between the preceeding and succeeding civilizations, having a close information transformation from one to the other.[64]

Einstein's theoty of relativity brings a clearer framework to the interpretation of such processes in relation to the progression of time, where profound integration of physical and social processes achieved in their entire philosophical context. Although at the perceptual level certain elements in social processes may seem to be repeated at certain, definite or indefinite periods, but this is not a sufficient proof of their reversible nature. Since similar causes produce similar effects, the repeating elements are the effects of the inherent causes in the process. Even if the cyclic nature of social processes is assumed this could never take place in identical cycles, which may thus be defined as being irreversible in that case.

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[63] Wiener, Norbert, op.cit. p.33

[64] Sorokin, Pitirim A., Sociological Theories of Today, New York-Londen, Harper and Row, 1966, Ch.7 Recent "Totalitarian Macrosciologies, and Ch.8. Criticism of the Macrosociological Totalitarian Theories, pp. 177-240

Another aspect of the concept irreversibility is its dependence on the balance between a system and its environment. When a system is extensively effected or dominated by its environment, it is quite unlikely to be reversible. If the internal complexities for adaptability are also considered, the improbability of having a reversible system further increases. The dominance of the physical environment over living beings emphasizes the vital importance of the consideration of the irreversible nature of shelter-society and decision problems where whether physical or social no decision can be undone or be forgotten; decisions in the context of the physical environment have the peculiar manner of covering a considerably longer life span than most other things.

It is worth stating again that there is scientifically no ultimate end or repeating cycle of being other than infinity, where all sub-processes and their products become the elements of this eternal continuation of being. Without extending our concern to infinity, within the reasonable parameters of conjecture of social events the influence of every event on the predicted event includes even the predictions themselves, which emphasizes the irreversible nature of man-involving phenomena.

SPACE

The fourth characteristic of societal processes can be deduced from one of the basic axioms of any being, whether living or not. Axiomatization of relatedness of any being to space can only be formulated after agreeing on the concept of reality. The idea is to clarify the concept by avoiding a metaphysical bias for the time being. "The first is t assumption that only those things with location have reality... nothing is believed to exist unless it has a location... it is regarded as unscientific, bad philosophy, or logically absurd to postulate a controlling influence without location." [65]

Until the beginning of this century the definition of space was conceived within the limits of three coordinates of the physical space. Apparently it was no different from the qualities attributed to the definition of volume, In that definition one dimentional space being "line", two dimensional space being "area" and finally three dimentional space being "volume" have been the major physical sub-categorization of the constituents of the physical world.

[65] Kapp, Reginald O., Space, Brit. J. Phil. Sci. pp.1-15, Vol.10, Edinburgh, May 1959

After 1920's the "space-time-relativity" theory of Einstein opened the way for the conceptualization of space in four dimensional continuity as it has been discussed this contributed greatly to the comprehension of the irreversible nature of the process in the context of space as well. Einsteinian description of space brought new understanding of space. As Kapp says: "When attributing physical properties to space Einstein obliged us to replace the word 'container' by the word 'constituent. Space, we learned from him, is a constituent of the material universe and not its container." [66]

The four abstract dimensions of physical space are necessary but neither sufficient for the definition, nor for the expression, of space as it is perceived and comprehended by human beings. Due to the extremely complex nature of human perception, comprehension and imagination, there exist many more determining variables affecting the definition of any space. The space that we perceive is multi-dimen ional and these dimensions are constituted by the four dimensions of physical space plus the other dimensions of social, cultural, psychological, economic, etc., space. The differentiation of meanings of volume and space is: That volume has only the characterictics of the four dimensional physical entity whereas as ‘space’ conceptually covers all dimensions affecting on the perception and comprehension of volume. The curious thing is that space can exist without a referred volume, in other words every volume becomes a space when it is perceived but every space cannot be a volume. For the clarification of the terminology a similar differentiation in meaning can be made between 'surrounding' and 'environment' where in a large context surrounging can be taken synnonymous to volume, and environment to space with similar attributions.[67]

The designer's concern with space used to be defined as the reduction of the number of dimensions determining the concerned space until the basic three of four dimensions of the physical space attained. Apparently such a definition which excludes the sensual involvement with environment is insufficient even the case of disregarding the designer's responsibility to provide new or better experiences to the people, and dealing with only the adaptive aspects of design. The new technological innovations have not only encouraged participation in the experiences of the other dimensions of space (or environment) but have also opened new horizons the expectations from space where these new experiences

[66] Kapp, Reginald 0., op.cit. p.3

[67] The distinction between the concepts 'surrounding' and 'environment' has been previously done by Tillich, Paul, Environment and Individual, A Talk Given at Harvard University, 1957, (mimeograph)

became inescapable needs.[68] The boundaries set for environmental involvement in terms of these dimensions sometimes restricts the problem solver to the first three or four practical dimensions of the built environment; even in such a situation, the problem solver has to face the predicament that all activities (or dimensions) of society either determine the structure of physical space or reflect themselves in that structure.

As a conclusion of this discussion, it should be noted that whether architects are defined as problem solvers or men providing new and better experiences of life, their involvement is an involvement with space; such a conclusion may seem to be trivial in offering no operational ease, but still it constructs the largest common definitive set of rules for the problems of enviroment.[69]

[68] McLuhan, Marshal, The Emperor's Old Clothes, in The Man-made Object, G.Kepes, (ed.), Studio Vista, 1966, p.93, about multi-dimensional environment says: "In the electric age the provisions of science incorporate the nervous system. They become 'reponsive environments' or probes. With electric circoitry we cannot only program the entire environment responsively... we can include the learning process in the environment itself." the word "ant-environment" has been replaced by provisions (where actuall McLuhan means arts) in order to aviod contradiction in meaning in this text.

[69] The popular definition of environmental design: "to reduce the n dimensional complexity of space to the 3 or 4 dimensional physical space, and to define the n-4 unseen dimensions in terms of the basic 3, sometimes 4, as in planning." failed because of the confusion and inappropriateness of the language of the physical dimensions to define or describe n dimensional complexity, where always n being greater than 4.

PART 2

A SURVEY

In the second part the social relationship patterns are taken as the basic determinants of the structure of the social complexity. The level of technological development, availability of energies, menas of communication and relationships of production are taken as the elements of the same structure, and they are consideed as the framework for the comprehension of that structure.

CHAPTER 5, A Retrospect, is a concise and simplified survey into the stages of development of societal structure. The taxonomy differentiates four stages of development as succeeding states. These are agrarian, feudal, industrial and post-industrial SOCieties. For each of these sta es parallels are drawn between the social structure and man-made environment. This done on the basis of functional determinants. No detailed investigation is intended to be followed, therefore it is a mere co-relation pattern.

CHAPTER 6, A Prospect. a personalized conjecturing about the existing trends of developments under the given potentials of the present situation. It contains a set of global ideas on the future developments towards a common culture of the world that will be enabled by the means of communication revolution and more advanced modes of energies. It is a general and simple optimistic view one-dimen ional political, technocratical and cultural bias are intended to be avoided.

CHAPTER 5

A RETROSPECT

Before starting to investigate the process of design and its implications for the social structure, it will be beneficial to establish a framework in whichthe process of design is conceptualized as an activity determined by the social, economic, cultural, etc., forces of society, together with the values of that society, availability of natural resources and the level of development of technology of the society.

If we again refer back to the twofold definition of design, one being the problem solving aspect of design and the other the creation of new (or better) experiences of life, such a definition may form a basis for the past stages of design, and of architecture as a profession, can be investigated. For such a retrospect, it will be appropriate to divide the history into major stages of development. Although there cannot be a definite boundary between the stages, there is still a clear qualitative differentiation between these stages as far as the relationshops of production are concerned. Special attention is to be paid to the following taxonomy, not as a mere historical sequence but as the stages of development existing in present-day societies.

AGRARIAN SOCIETIES

Man's dependence on a piece of land as the basis of agricultural production is the basic criterion for the effferentiation of agrarian societies. The period of cultivation necessitated permanent or temporary settlements to take care of the process of cultivation. However, another type of ag arian societies does not settle. It deals with crafts and animal breeding which are also considered an agricultural means of production. The emergence of agrarian societies also begins the time when number of people interacted mostly on a production basis and one basis of belief to constitute the first societies. Sizes of groupings were mainly determined production and communication techniques.

In agrarian societies the means and ways of solving all kinds of problems developed through trial and error method and were maintained, by their

institutionalization, in the form of traditions and religions. It was also via such beliefs that the utmost respect for the natural environment developed and was sustained.

Owing to the low level of development of science and consequently of technology, availability of alternative courses of action to solve the problems of adaptation were limited; so were the sources of materials as a function of technology. In the total picture the limitations in terms of materials and energy were the basic predicaments which constituted the problems of environment. As a product of this, the problem situation consisted of a small number of varibles with very limited ways of logical combinatory rules among them. All the environmental precautions taken by such rural societies took a considerable period of time to attain a certain degree of refinement and functional or structural ease. At that time the same course of action, achieved through ages of trials and errors, repeated unless a drastic change occured in the macro-environmental or in socio-cultural structure.

Profession wise the adaptation problems did not require differentiation, each family was responsible for its own shelter problems. The homogeneity in the social structure reflected itself in the perceptual aspects of the physical environment, that turned out to be equally homogenous. Societies of such agrarian production relationships never needed, and likely will never need, seperate professional involvement for the handling of their shelter problems. This is because problem situations with such a lot of givens and very small number of variables to manipulate require solutions unique in character, and which are for a long period of validity. Design wise this has been proven to be true; namely it is still hard to discfdit African, huts, Mediterranean houses, or any other kind of original vernacular architectiral piece or planning decision.

FEUDAL SOCIETIES

The emergence of feudal societies can be taken as the effect of the surplus of production in the agricultural sector, where due to the new innovations, the communication pattern was changed and the amount of agricultural production determined the number of population and the size of the towns. This also consequently affected the cocupational differentiation. In feudal settlements the mode of production was entirely changed and for the first time in the history of mankind there existed no direct relation with agriculture and land, but complete dependence indirectly existed. In terms of economic relationships the self-sufficiency and independence of agrarian societies was displaced by the

economic dependence (marketing) on towns, then on feudal society. Extra monetary value was added to the actual value of agricultural products, which provided the e basis for the survival or town society, and towns became the places where differentiated activities took place.

Change in the relationships of production enabled certain groups of: people to deal with the production of artefacts and also encouraged the developments in the body of knowledge, then in the arts and in technology.

The feudal societies were the first places where building activity was handled by a specialized group of people, who were even further specialized according to the specific building components they dealt with. The building trade gained more diversity within itself due to the new activities which emerged because of the change in the relationships of production. Environmental problems also became more complex, where comparatively more forces dictated physical lay out. Towns with their supporting agricultural region were more or less self-sufficient, mainly because of defence problems; meanwhile intercity communication started to gain importance within some other kind of differentiation in a higher organizational level. The determining factors for the degree of complexity increased in number, but the energy and material resources remained quite unchanged. While architecture as a profession was getting its societal definition, due to traditional and functional control buildings were the sterotypes of each other. Buildings, designed and built by builders (not architects), started to gain importance other than their shelter and use functions, this was mainly due to the perceptual values and the meanings attributed to thephysical expressions. As time progressed the content of architecture became rather more than mere building activity by the introduction of new values and expressions of the arts. Additional elements as decoration made buildings more and more elaborate than what engineering required.

In the western world The Renaissance was the time when the ‘Architect’ as a recognized professional designing and communicating his ideas in the form of drawings and modeis, appeared. Since architects were almost always artists they were given the job ofincorporating the arts and building to provide nice environmental experiences. The developing perceptual language of physical environment turned out to be the architects professional concern, which was mostiy dictated by the existing values and the conditionment of society. Under these circumstances, the image of the feudal towns was also homogenous. The main reason for this homogeneity was the restrictions in terms of the availability of materials and energy, but still certain emphasis was put upon buildings of different use or ownership. Prominance attributed to meaning and

value, care about environment, and strugglefor the betterment of the quality of environment, were the most important contributions to the emerging architectural profession.

INDUSTRIAL SOCIETIES

The transition from pre-industrial societies to industrial societies is defined by the change in the mode of utilized energy for production. Use of inorganic energy instead of organic energy is the most peculiar criterion to differentiate industrial societies from feudal or agrarian societies. This progress in the mode of utilized energy, caused remarkable change in the relationships of production which became more specialized and more diverse, and apparently more complex. These relationships in order to keep production running required agglomerations of vast number of people in the vicinity of factories. Due to forced urbanization the structure of society changed both qualitatively and quantitatively. The urbanized population mostly worked in factories, services and in other related managerial services. In industrial societies the communication and means of transportation became the size determining forces, together with the other production determinants. Availabilty of a variety of choice in methods of production, modes life and leisure made the large cities more attractive, in spite of the consequential drawbacks growth of urbanization continued. Everything was produced in large quantities and distributed to more people, and in the later stages mass production, mass media and mass transportation became the most spoken words of such cultures.

Problems of environment became more complex with their multi-dimentional aspects and vast number of determining variables. Parellei to the devements in the body of knowledge, human consciousnes about environment increased. The progress in technology made various newly innovated materials available and advancement in the branches of engineering eabled higher densities in the centers of agglomeration. Old elaborated techniques and values of architecture turned out to be obsolets, a new refinement and simplicity was aimed at by the architects especially after the turn of the century. The seeds of this movement of refinement are developed in the field of the arts, where usually the changing values of the sensual world are introduced. The aesthetic values of the industrial societies developed parallel to those of mass production.

The movement was a drastic change cowards purity and a more abstract state of being, the past was interpreted a the huge source for abstractions and the present was the abstractions themselves. Architects all over the continent of

Europe the and USA were striving to construct relevant architecture for the new way of life and its physical image, they were not working within the context of society, but within the boundaries of archhitectural professionalism that had been set in the very emergence of the profession during Renaissance.[70]

Their limitation were identical with those of the closed boundaries of their professional involvement, that were mostly concerned with the perceptual qualities of the environment. Each one of these twentieth century architects generalized problems according to his own egocentric perceptual environment; consequently every one of them dealt with the problem in a disjointed framework that ended up with personalization of the problems of environment, this time in a different context of presence.

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[70] The endeavour was to create the new image through the means of the new achievements of the society both technologically and philosophically. First manifestations after the monumental but fragmented contributions of the nineteenth century came from P. Behrens: "Architecture is not an art but a human necessity" and L. Sullivan: "Form follows function", just about the turn of the century. These became the key statements of the new architecture of the coming century. The following generation after Sullivan, Behrens, etc., developed the changing concepts of architectural design and attained the purification of architectural hardware from the superfluities. F.L. Wright, Le Courbusier, M. van der Rohe, W. Gropious, A.Aalto, T.van Doesburg, G. Rietweld, A. Gaudi, R. Neutra, etc., can be named among the fundamental creators of this generation. Each one contributed by emhasizing certain aspects but as a whole, the total image of the built world changed due to the spread of such interpretations of space defining systems.
Influence of contemporary art movements like cubism, contructivism, purism, de stijl, futurism, etc., is quite important as the source of new abstract concepts and inspirations, and artists like P. Mondrian, P.Picasso, G. Braque, K.Malevitch, M. Nagy, etc., became the important abstract contributors to the movement.
The newly emerging profession, with new ideas on the organization of the whole with consideration with changing life style and its implications, directly influenced the architects, namely: E. Howard, T. Garnier, 0. Wagner, P. Geddes, A. Soria y Mata, H.P. Berlage, Eliel Saarinen
As time proceeded no drastic change in the mode of production occured in the western world, hence, newly innovated architectural definitions and concepts were gone underwent further sophistication by the third generation of the architects of the modern world. L.Kahn, Eero Saarinen, K. Tange, J.Utzon, A. Jacobsen, R.B.Bakema, G.Candilis, M. Breuer, J.L. Sert, A. van Eyck, P. Rudolph, H. Scharoun, A&P.Smithson, P. Rudolph, and so many others can be mentioned among the contributers. Certain dimensions of social phenomena were intended to be fed into the process of architectural design, but still the predicament was to arrive at the results within the professional discipline of arhitecture. This intitutionalization, limited the awareness about the actual determinants of the problems rather than their reflections onto the built environment.
The influence of planning as a different level of decision making is important, this helped the enlargement of the scale of the architectural involvement.

While on one side the technical and artistic language of environmental design was developing, on the other side the macro level decisions about the problems of environment were put down. The high level of organizational development started to restrict the solutions of environmental problems. A bureaucratic control mechanism was established in order to obtain a sort of image, predetermined to fit urban areas. These decisions were mostly given within the rough limits of empirical facts about urban life and trivial experiences of needs. Among the planning decisions only those stating absolute physical order were put into practice, just because they were perceptually orderly. Tha consequences of such planning implemetations were the petrification of the urban ares. Planning practises like these have even been favoured by the societies that could not succeed in surpassing the feudal relationships of production.

Under the extreme restrictions of planning proposals in the urban areas where the vast percentage of buildings are erected, architectural activity although seemed to be dealing with larger scale problems, became obsolete as a problem solving activity because of the constraints put forward in higher levels of decision making. The solutions of environmental problems of such a nature did not require the intellectual and artistic sophistication of architects; especially in societies where the whole mechanism is manipulated for the maximization of profit. The sad result of this development is that even in the most developed countries the percentage of the built volume erected without any consent or cosultation of architects is much higher than the architect designed buildings.

POST-INDUSTRIAL SOCIETIES

The fourth category of classification of societies according to their technological developments and mode of production is that of postindustrial societies although the percentage of population benefiting from the advantages of the post-industrial mode of production is a minor fraction of the global population. Nevertheless, it can be conjectured that the future of development is most likely to be the post-industrial mode of production. In the post-industrial societies of the present time we see a rather different picture than we anticipated. The positive side of the picture is again related to the high degree of development.

The sources of energy such as nuclear and electrical started to dominate almost all fields, and highly developed machinery contributed much to the progress of the organizational pattern. The negative side consists of the nostalgia caused by

the threatening future of natural resources that have been over-exploited for the sake of industrial productions, and also the future of the ecological balance which is about to be destroyed by pollution in every sense.

The vast developments of industry have not contribut greatly to the change in building technology, nor to the consequent image of the built enviroment. The conservative trends in building technology with slight manipulations for refinement and detailing maintained the existing state, where the perceptualcharacter of the post industrial built environment did not happen to be different from that of industrial societies. In the hid and late sixties architectural movements started to search for the image and the life style of the post-industrial society,[71] but still access to the vast scientific and technological developments were not available for building purposes of a gigantic scale. It

[71] The movements emerged intrid-sixties were in the same parallel with some other contemporary social and technological events, i.e., Pop, Space Explorations, Electronic Revolution, Beatles, etc. The architects of the western world participated in the change in their societies. The search was for was to design according to the way of life and building technology, implied or provided by post-industrial state of being and mode of production. Probably the first group movement on the subject emerged in London, i.e. Archigram, composed of P. Cook, D. Crompton, D. Greene, R. Herron, W. Chalk, M. Webb. Quite different from the architects of the industrial societies, Archigram and its repercussions proposed changes not only in terms of the image and the perceptual environment, but also in terms of the engineeringof the hardware and the personalized, social implications of completely determined and designed environment. The elements such as: change in time, large scale machine-like precise building, choice living multi-linear geometry, fragmentedly go back to: R.B.Fuller, C. Wachsmann, F.Otto, C.price, Y.Friedman, P.Soleri, I. Schein, etc., who developed material to be interpreted. The manifested architecture for the post-industrial societies was mobile, flexible, changing but precise and determined, as it was formulated by groups like Archigram, Metabolists, Ner, etc. As the movement spread around fed itself back through the consideration of the unsatisfactory effects of the commitments of post industrial society, that facilitated the change from determined hardware oriented designs, to more casual, relaxed software. Factory like physical images became objects in the landscape. Non-polluting energy sources as electricity etc. Were proposed., and a green revolution is aimed instead of totally man-made environment, viz. D. Greene, Log-Plug, Lawun. One of the most important contributions of the post-industrial architectural movements, is their consideration of a changing way of life, and their incorporation of the current reactions to the rigid, irresponsive, petrified environment. The geometrical richness in the designed form and redefinition of aesthetical values are conspicious.
Besides all positive aspects, the way such movements deal with the problems of social change in terms of architectural images is insufficient. The promotion of the level of decision making is inescapeably required, since all the determining decisions are still not given in terms of architecture or planning. The architectural movements have to be integrated at a level where most of the tangible variables of the built environment can be fed into the process. Some search for the solution on a political level, as the meaningful level of decision making for environmental and societal processes, i.e. Arse, Utopie, etc. Some try to establish integrative scientific frameworks for decisive activities through the theorization of the process of design.

will really be irrelevent to state that the advancement of technology is not going to spread to the fields of environmental design; actually at the present time these ideas are at an experimental stage.[72]

[72] vide., Cook, Peter, Experimental Architecture, Studio Vista, London, 1970,

CHAPTER 6

A PROSPECT

In the preceeding retrospect a brief outline was made of the development of the modes of production, as a function of which the change in the relationships of production was discussed. Frequently the parallels between the relations of production and environmental structure were delineated. Though the progress from agrarian societies of ancient times, to the post industrial societies of the present developed world, occured as successive steps in the sequence of history, now at any cross section of time these stages of development can be observed simultaneously all over the globe. This pattern of the distribution of relationships of production complicates the problems of environment as a total function of development, especially when they are dealt with at a global level.

There is a continious change the biosphere, a change not only in terms of biological evolution, but also in terms of man's dominance over the nature and his unending attempts to exploit it. The consequences of the irresponsible exploitation of nature threatened the environment-being inter-relationships which have vital importance for the survival of mankind and the other connected forms of life. Trial-and-error on a gigantic scale has been experienced and it has become clear that while obtaining the required energies, effects of the utilized process upon the environment need to be taken into consideration. Delicate ecological balance must be maintained in order to keep the steady state of manenvironment interrelationships. This feedback facilitated through the consequences of the over-industrial exploitation of nature will form the seeds of the future stages of development. The advanced modes of energy have the made earth shrink in time-distance.[73] The new mas communications media obliged people not to be indifferent to the problems, feelings and findings

[73] vide., fig.6, reproduced from McHale, J., The Ecological context, Energy and Materials, WDSD 1965-75, Phase II, Document 6, world Resuoces Inventory, Southern Illinois University, 1967, p.54, The relative size of the Earth according to time-distance citerion, dictated by the mode of transportation.
A. 15 AD- 1840AD, The best average speed of horse drawn coaches on land and sailing ships at sea was approximately 10 mph.
B. 1840-1930, Steam locomotives averaged 65 mph. while steamships averaged 36 mph.
C. 1950's Propeller aircraft averaged 300-400 mph.
D. 1960's Jet passenger aircraft averaged 500-700 mph.

of their kind. The cross-breeding of the cultural inheritence between East and West has never been so strong throughout the history of civilization. The exploitation orientated relationshops between developed and non-developed states, are subject to decline due to an increse in consciousness and to change in values of humanism. The growing trend is that in the future the economic relationships among nations will be based upon mutual economic and cultural interest rather than upon single sided exploitation.

Scientific development reached an extremely advanced stage and a vast number of new sources and types of energies were innovated. These energies are both qualitatively and quantitatively advanced and powerful, and as a product of these, human beings and societies are under continious change. The change is reflected in the arts, philosophy and artifacts Extra-sensual involvement with environment and completely different experiencs of life became possible as an effect of this progress.[74]

The growth in the body of knowledge has reached an enourmous degree. To become productive in any fields of science requires an absolute specialization, which at the same time causes a tendancy towards ignorance or a narrow view of societal structure by scientists and technocrats.[75] This, apparently ends up with their disregarding the social and psychological implications of their achievements. Misuse of these scientific achievements by political powers sometimes causes accusation to made at scientists and their contributions to scientic developments. Presently, human civilization will arrive at a critical point where a set of macro-scale decisions are to be given in order to avoid the undesired consequences of technology. The ease in communication and transportation, the availability of choices for alternative ways of life,

[74] Copman, Victor, op.cit. p.74, in his talk on 0.L. Reiser's book: "The Integration of Human Knowledge" says: "For Reiser the Earth is an organism at embryonic stage, with a great composite mind beginning to dawn. Radio, television, long distance transport, etc. are its developing organs. He is a strong advocate of "Project Prometheus", communication sattelites that would encircle the Eatrh transmitting information that would build a universal culture. He even looks forward eventually "radiation belts of thought" utilising extra sensory perception."

[75] Fuller, R. Buckminster, Utopia or Oblivion, op.cit. pp.347f, explains the incomprehension of scientific evolution by society: "..the physical omnisucces of all humanity is frustrated by the fact that scientific evolution -by which it could be accomplished- is almost entirely invisible and its integrated significances are too difficult for total and effective comprehension by society, One reason for latter frustration is that the language of science has been up to now almost exclisively mathematical -ice, nonconceptual. A second reason is that scientists altogether cunstitute less than one percent of world population, their thoughs are popularly unknown. The third reason is that most scientists operate exclusively on a subjective basis -as pure scientists. They also operate nonconceptually. Most of the objective technologists -or applied scientists- are specialists and are unaware of comprehensively integrated significance, to society, of the tasks they perform.

automation, increase in leisure time and chances for different experiences of environment have been the positive provisions of this technological development. Meanwhile the irresponsible exploitation of natural resources, the pollution of air, earth and water by refuse materials and the consequent threatening of the ecological balance of the biosphere have been the negative aspects of this progress. In any case, the irreversible nature of the process indicates that this process can never be reversed to avoid the undesired effects. The commitments done until any present state of being are the constituent givens for the succeeding ones, -as our givens were the commitments of the preceeding generation. The direction of development must change and it is quite likely that it will in this decade.

Any living system has at least one goal which is to sustain its existence within its environment. Societies need to make necessary feedbacks (adaptive) and keep their environment relatively more appropriately in context to their biological being. This fact is one of the system characteristics of society. In order to maintain that constant relationship. pattern with the environment, there have to be operating componential elements in the system that perform the role of a "thermostat" in that system.

The use of word thermostat implies the existence of some sort of a "homeostasis" or "steady state" in the system. Since the natural environment produced living beings by forming a suitable context for them, this steady state is inherent in the system. Meanwhile there is a continious interaction between the system and the environment, so when the system changes consequently the environment changes and vice versa; hence this steady state can be claimed to be a "dynamic steady state"[76] In the process of continious change, the parameters of adaptability of man cover quite a large spectrum and they change as the environment changes.[77] The institutions are the elements in social organization functioning that maintain the steady state, in most cases they operate on an actioreaction model, apparently they deal with the manipulation of the system under the givens of that situation. Until the present day, architecture has been defined as an institutionalized technocratic involvement whose boundaries are identical to those of building. Under such limitations architecture has never been defined asa responsible involvement (or institution) for the totality of environmental activities; so architects have been bound to deal with the problems in terms of the limited theory of design available. This

[76] This is also called "heterostasis" or "kinetic steady state", the subject will further be discussed with change, dialectics, etc.,

[77] vide. Dubos, Rene, Man Adapting,

is composed of the normative discipline of arts and insufficiently fed developments of sciences. Inefficiency of such a theory was conspicuous and revealed itself especially when changes in industrial societies created far more complex problem: situations which were beyond the reach of architects to solve. The appearance of complex problems required a more objective and sound process of decision making; subsequently after the late fifties a new subject entered the field of architecture: Design Methods.

The endeavour to theorize the environmental involvement disclosed two major aspects of the situation as the process of decision making in physical environment. The theory attained a high degree of technical sophistication, this was due to the assistance of the available techniques developed for certain other fields of sciences and technology. The subordination of physical environmental decisions, by other superiour decision factors of the society generated the other aspect of the environmental involvement. This can be named as a higher level responsibility for the totality of adaptation problems. In the existing reality it may seem that there are neither technical nor professional tools confirmed by the architectural profession, to claim such a general responsibility as an organization, but still:

> The architects and planners, particularly the planners, though rated as specialists, have a little wider focus than do the other professions. Also as human beings they often battle the narrow views of specialists -in particular, their patrons the politicians, and the financial and other legal, but no longer comprehensively effective, heirs to the great pirates-now only ghostly-prerogatives.[78]

The general and political orientation among architects is mainly due to the discontent caused by the non-solution aspects of the building orientated design processes and the social value of such processes.

Though these are surely the main causes for promoting the level of decision making, to achieve greater effectiveness in the process of and implementation, still these new yheories can only be complementary to the influences of hypothetico-deductive theories, aiming at the unity of sciences. The general theories constructed mainly after the Second World War are towards the unified operations and conceptualizations of multi-variete disciplines. These theories together with their subtheories are to be dealt with in general later on in this work.[79]

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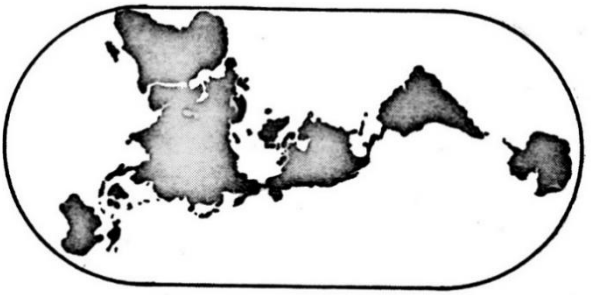
[78] Fuller, R. Buckminster, Operating Manual for Spaceship Earth, op.cit. p.59

[79] vide., Ch.7; Art.7.5. and 7.6.



15 AD - 1840 AD

A

1650-1930

B

1950's

C

1960's

D

PRINTED IN ENGLAND.

PART 3

A THEORY

This part deals with an exploration into the fields of theorization of design. The structure of theoretical discipline available theories and the fundamental aspects of the theory of design are discussed.

CHAPTER 7, Towards a Theory of Design, criticises the sufficiency of the existing normative theory of design, and investigates the requirements for a scientific theory as a logical structuring. Hypothetico-deductive inference is proposed both for the existence of a theoretical consistence and to provide access to the other specialized theories. GST is proposed as the basis for causal-functional integration. Systems in general are accepted as a a logical decomposition process. A brief survey into this field is also made. Supplementary to the known classical theories other available recent theories are decribed to be utilized for their particular relevant application.

CHAPTER 8, The Framework, is a search for a more detailed analysis of the aspects of the theory of design in reference to the nature of the phenomenon. The theoretical implications of the previously discussed characteristics are disclosed. While operating with a complex phenomenon the symbolic process needs to be handled in such a way that has to be devoid of oversimplifications. This implies the necessity of a functional integration as the lowest acceptable basis for simplification. The irreversible aspects of the phenomenon necessitate the consideration of adaptive processes together with the elements of change. Here a quite detailed search into 'change' is made. It has been concluded that no design process is to be oriented towards a predetermined concrete goal but towards an ever-lasting process of continious change. The indeterminate aspects of man-involving complexity requires an important need of sound logical discipline in prediction which has to be multi-diretional, in order to be valid in accordance with the nature of the complexity.

CHAPTER 9, Design Methods for Theory of Design is quite specialized within the context of this work. A critical retrospective view into the field of methodology of design aims at tracing the particular relevance of this field. Most of the contributions are evaluated in reference to the discriminating general framework of this work. The disjointed and piecemealian approches are severely criticised. This retrospect covers the last eight years, or so.

CHAPTER 7

TOWARDS A THEORY OF DESIGN

BACKGROUND

Architectural design emerged within a premeval activity of adaptive precautions as a professional activity, by the introduction of inherent or created values and meanings of the culture of the society. The attributed meanings and values provided enrichment of the experiences of the physical surroundings and consequently contributed to the vocabulary of the profession itself. Besides the traditionally inherited values and meanings, new ones have been created in the fields of fine arts. As a product of this the theoretical interaction between the arts and architecture has been a strong one; it has also caused architecture to considered as abranch of arts. The normative theory of arts has always dominated architectural theoty; in arts the relevant values are developed and the abstract level andgeneralizations are maintained. Hence, a theory of architecture as a qualitative involvement with space could never have gotten away from being a normative field of knowledge subject to changes parallel to the social cultural changes and changes in the economic structure of the society.

In the past the arhitectural design process aimed at artifactual beauty, the appreciation of which has been determined by the level of conditionment of that culture i. e. by its inherited traditional values and other cultural influences which act together on aesthetics. The decisions given on an esthetical basis have been extremely complex as far as the concurrent forces acting upon them are concerned. The thought process mainly composed of spatial symbolizations takes place in a complete cycle of Perception-Evaluation (or Comprehension)-and Expression.[80] At every stage it has direct relation with the symbolic world. The final products (as expressive elements) are usually evaluated on a basically aesthetical basis with some emhasis on their functional and logical

[80] vide., Fig. 7, Symbolizingcyclic process of P-CE-E, intersections of the helical curve with poc, e axses, a cycle is completed after three intersections. The helical progress is indicated by Δ's that is to be interpreted as the increase in environmental elements which again constitute (P) perceptual elements and subject to the process of (CE) comprehension and evaluation and so on...

characteristics and psychological implications. The beauty orientated design approaches are far from being a sound basis for the procreation of a subsequent theory for design, but the normative processes are in still action as the existing basis for design theory. Through continious criticisms and redefinitions the normative approaches reached towards a level of saturation which may well be an over-personalization or a chaotic state of tastes or more optimistically extreme richness, mainly caused by expression orientated interests.[81]

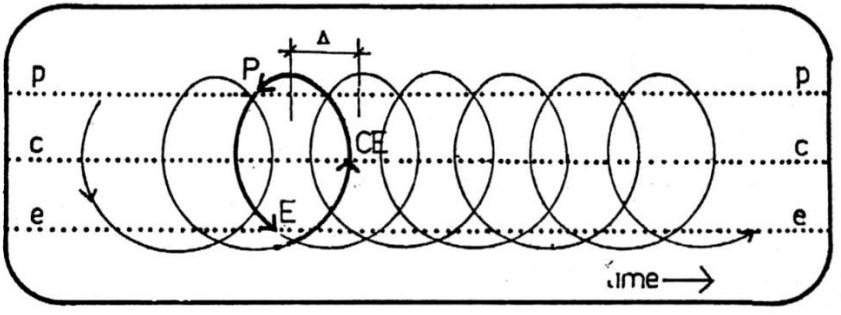


FIG.7

MAKING OF A THEORY

In order to achieve a valid theory on any subject there have to be a set of basic axioms to start with and an orderly multiplication of these axioms. As the multiplicity of axioms is attained by the logical combinatory rules among them, the theoretical applicable complexity increases in the form of theorems, and parallel to that the content of the theorems get larger. For the construction of the basis of a theory, a set of basic facts and logical relations are required. These are axioms, postulates and definitions, to explain the internal structure of theorems. A theory then grows on such a basis, provided that there are no

[81] Efforts towards theorization of design in the late fifties, in such a chaotic situation, with an endeavour to provide a clarity and to introduce social dimensions to the phenomenon. In 1958 in a lecture at the World's Fair, Brussels, Maldonado, Tomas, New Developments in Industry and the Training of Designers, Architect's Yearbook 9, Dannatt, T., (ed) Elek Books Ltd., London 1960, p. 176, utterly claimed against "aesthetica). Prostitution" and "neo academisism" concerning neo academisism, he says: “neo-acedemisism is a right wing aesthetisism, an aesthetic for but few people, 'rare flowers': styling is a left wing aesthetisism, an aesthetic for many people, 'wild flowers'. The me tphor is doubtless plesing, but I hold that the new tasks of the designer will have nothing to do with artistic horticulture, be it from the left or from the right.

internal logical contradictions, within the theory. Mathematics being the purest form of representation of the logical relations based on definitions, axioms, etc., gives a good example of such a development of theory with consistency of growth. e.g. Euclidean geometry; depending on the existence of one and only one parallel line to a given line through a given point. Meanwhile Non-Euclidean geometry, discovered by Bolyai, disregards this axiom; but still, "each non-Euclidean geometry is free from internal contradictions; it is a consistent system in the same sense that Euclid's geometry is consistent."[82]

A similar structure of growth of theory can also be observed in any language, where words convey meanings and come together to form sentences in order to describe messages; they also give content to new words and concepts in the form of definitions. In symbolic order letters, syllables, words, phrases, sentences, pharagraphs and whole ideas are successively brought together with logical combinary rules to express feelings and thoughts. The total product is language ingredient of human communication.

For the construction of a theory on any subject, a structure of relationships among the componential parts is required for the existence of theoretical consistency. In the sciences the basic axiomatic language is that of mathematics, describing the utmost abstract relationships among the elements; and these relationships are utilized by almost all sciences. For specific concerns of specific sciences new contents and meanings are attributed to the mathematical basis by means of further qualifications, e.g., Physics, chemistry, etc. The discussion of mathematical theory discloses the basic aspects of internal consistency of theories when a theory is based on assumptions rather than facts which may or may not reveal a consistent structural pattern.

When the subject matter of a theory gets more complex, especially in cases of classification of the theory takes place between "descriptive" and "normative" sciences;[83] the basic axioms assumed to constitute the theorems become

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[82] Reichenbach, Hans, op.cit. p. 126, non-Euclidean geometries then deve loped by Lobachovski, Gauss and Rieman in mid-nineteenth century.

[83] Searles, Herbert L., Logic and Scientific Method, The Ronald pr. co.p.205 New York, 1956, classified sciences in the following order:

I. Formal and Abstract Sciences, e.g., Mathematics, Logic,
II. Concrete or Descriptive Sciences
    a. Physical Sci. Physics, Chemistry,
    b. Life Sci. Biology, Zoology,
    c. Psycho-physical Sci. Psychology, Psycho-physics,
    d. Social Sci. Sociology, Ethnology, History,
III. Normative Sciences, Aesthetics, Ethics,

anticipated facts, where the validity of these facts is tested to be confirmed. The substantially refuted logical method of inductive inference can not be accepted as a sound basis of inquiry for highly complex, irreversible and indeterministic problemsituations of environmental design.[84] In such cases integrations under the discipline of hypothetico-deductive theories are more appropriate than inductive deterministic theories whose validity even for physical sciences, is dubious.[85]

HYPOTHETICO-DEDUCTIVE INFERENCE

It is quite clear that a simple fact oriented, objective scientific framework will be very limited to uncover the multifold problems of human society. The phenomena of environment and its relevant theory as previously stated, contains a vast number of variables to determine any single solution or situation. These variables are extremely diversified in their basic characteristics. They cannot be comprehended within a simple framework of generalization, but more sophisticated, abstract and process oriented general principles are helpful to construct the relevant theory of environmental intervention.

The theory of design can best be constructed with a basic scientific integration on an objective basis, where the totality of the interacting forces and variables can be comprehended and the basic integration of such elements can also be achieved. The imposition of softer facts and values of society and theirenrichment with personalization of the problem situations, can simply be fitted into that framework through which applicabity of the theory can be attained. The high degree of complexity of man involving problem situations, and the wide spectrum of influencing factors upon them, implies that the theory,

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[84] In philosophy of science, validity of "inductive" and "deductive" inferences has reached a highly sophisticated level. It has become clear that the development of theories, by introduction of new hypotheses, theorems and proofs, has never been done by piling up particular, singularistic observations then bringing them together in order to constitute the generalized theory-as luced inductive theory of inference claims. But, hypotheses heva been developed through the process of cojectured facts, formulated in the form of hypotheses to be tested by further observation and experimentation to obtain proofs. So in scieritific theorization we have our preceding anticipatory theories to facilitate particular involvements for proof. vide., Popper, Karl R., Logic of Scientific Discovery, Hutchinson, London, 1968, and Popper, Karl R., Conjectures and Refutations, Routledge and Kegan Paul, London, 1969

[85] Reichenbach, Hans, op.cit., p. 104, "The simple generalization performed in the inductive inference by enumeration appeared a poor instrument if compared with the power of the hypthetico-deductive method."

composed of basic axioms, should cover the totality of the phenomenon rather then gain specific content and relevance as one goes down in the governing hierarchy. Since, as natural aspect of any phenomenon no one can claim the existence of any absolute truth, then in the theory of design can not be a search for absolutely valid truths. The emerging content of the theory of design can be composed of deductions from generalized principles whose validity is to be accepted as true until they are falsified. In more precise terms this is named as the "verisimilitude"[86] of the theory, so the validity of a theory ceases when the falsifying anti-theory succeeds. Proposed theory for design is to be open to the dynamic theoretical changes caused by continious falsifications.

INTEGRATIONS

The application of the deductive method for the constitution of the theory of design requires integration and establishment of basic governing principles. Integrations are to be composed of the elements of society and its multivariete activities, including social interactions and adaptive processes. Integration, is a method of demarcation of the concerned entity (problem situation) from the rest of the complexity. This should be done in such a way that almost all concurrent critical forces can be included within the demarcated entity. Hence, integration has a great operational importance, while it still provides ease for further conceptualization,

Integrations in social processes can be done in various ways. Sorokin[87] asserts four categorical levels to intergrate social phenomena. His method of integration is also valid for some other lower degree complexities, and these categories are necessary to conceptualize the basic relationship pattern of any

[86] vide., Popper, Karl R., Conjectures and Refutations, op.cit., p.198, verisimilitude, truthlikeliness

[87] vide., Sorokin, Pitirim, Causal-Functional and Logico-Meaningful Integ ration, in Demerathi III, N.J., Peterson, R.A., (eds) System Change and Conflict, Free Pr. New York, 1967, pp.99-113, categorizes the levels of integration as: "A.Spatial or Mechanical Adjecency, (Congeries)" which is the aggregation of related or unrelated elements within a certain physical boundary. "B.Indirect Association Through a Common External Factor" where an element of the supra system reflects itself of determines the formation of certain elements that may or may not have internal interaction. "C. Causal-Functional Integration" is the method of integration structured around the internal factors which consist of "the tangible, noticeable, testifiable, direct interdependence of the variables or parts upon one another and upon whole system." "D.Logico-Meaningful Integration" is one allowing further conceptualization of the system by emphasizing certain factors, cont. attributing meanings, values and qualifications, Richest and intellectually more appropriate including both tangible and intangible variables.

complexity. For the integration of environmental phenomena the causal-functional level of integration will be sufficiently appropriate, but still futher conceptualization and enrichment the logico-meaningful level of integration may well be required. Integrations should deal with both physical and symbolic universes. An integration devoid of one becomes quite simplified due to the consistence of elements but this simplification cannot hold true for problems of the environment where the perception-evaluation-expression cycle always occurs at the symbolic level.

As Bertalanffy says: "Natural science has to do with physical entities in time and space, ... , social science has to do with human beings and their self created universe of culture."[88] The environmental involvement where the sembolic world of culture and the physical world of nature happen to be together. The theory of environmental involvement must gain access to the available immense body of knowledge on sciences and technologies therefrom, it should also provide the vocabulary to conceptualize the processes with their philosophical implications, thus enabling continious internal feedback within the theory.

The methodological aspects of integrative approaches willbe dealt with later, together with the inclusion of the other related subject, in a process of handling of complex problem stiations. This will mainly be composed of the discussion of integration as amethod of delineating sub-comlexities within a structural hierarchy.[89]

SYSTEMS DEVELOPMENT

In order to facilitate the concept of the integration of social phenomena with the problems of environment, a theoretical discipline having the previously dicussed characteristics is to be constituted. The deductive theory enabling integration of society and its artifactual inclusions must cover the totality of interactions of the concurrent forces that determine the structure of the phenomenon, together with the relationships with its environment (or supra system). This theory has also to contain sufficient vocabulary (or series of concepts) to capacitate the further conceptualization of subject matter.

[88] Bertalanffy, Ludwig von, General System Theory, Foundations, Development, Applications, George Braziller, New York, 1968, p.197
[89] vide., Ch.8

Functionalism[90] is one of the most important approaches in the social sciences, and is aimed at the comprehension of structural relationships among the elements that are either influencing the formation or directly determining social phenomena. By means of functionalism in social sciences a more precise and more objective view into the subject is developed. The functionalist integrations of society can directly contribute to the integrations the attheory of design level, especially to the aspects of design controlled by the forces of social "inter" and "intra" actions.

Although the regeneration and formulation of the functionalist approach to social theory goes back to Merton, Nagel, Weber and Parsons in the 1940's and 50's, the sound scientific basis for functionalism is esteblished by the manifestation of General System Theory, by von Bertalanffy [91] in 1950 and the developments done by Rapopart, Boulding, Meier, Miller, Ashby, et. al. in the subsequent years. A unifying general framework was made available through intercommunication of sciences in a hypothetico-deductive level.

One of the major couses for the innovation of General Systems Theory was the need for the "unity of sciences", especially shortly after 1940's due to the profound and concentrated specialization in almost all fields of sciences and great the developments achieved, but it became the basic requirement to contribute, in other words contributions are preceded by specialization. The increase in specialization required further specialization which consequently ended up with the fragmentation of individual efforts. The non-existence of lateral connections among the sciences and in pure technological involvement resulted in repetition of the previously attained scientific achievements and the same theories being postulated by different scientists unaware of knowing each other's doings. Besides the unnecessary rei terance of findings, due to discommunication, scientists could not develop social responsibility for their doings, and they also became unaware of the consequences of the implementation of their findings or even misuse of them. The integrating theory (General Syatems Theory) is basically constituted of the structural similarities among the scientific theories. Isomorphy of the theoretical aspects made the basis of General Systems Theory more reliable and non-trivial than a foundation based upon mere analogies.

[90] vide., Demerath III, N.J., Peterson, R.A. System, Change and Conflict, A Reader on Contemporary Sociological Theory and the Debate over Funtionalism, op.cit.

[91] Bertalanffy, Ludwig von, An Outline of General System Theory, Brit. J. Phil. Sci. Vol.1, pp.134-172, 1950, Edinburgh, 1951

"System", as a concept goes far back in history, of course without refering to the specificname and terminology.

> "As a natural history, we may trace it back to Leibniz, to Nicholas of Cusa, …, to mystic medicine of Paracelsus to Vico's and Ibn-Khaldun's vision of history as sequence of cultural entities or "systems", to the dialectic of Marx and Hegel.[92]

System, as a conscious method of logical thinking and organization of thoughts goesback only to the 1930's. Although the social and economic theories of Marx and Engels were based on the concept of systemic integration; still it was only aimed at the comprehension of determining forces of social structure and unification of disjointed approaches to the social phenomena.

Within the scope of this work, no technical sophistication of General System or any other theory, is needed. The level "General Conceptual". Framework" requires a comprehensive deductive level where the concern being "A Theory for Environmental Problems" can be fitted in as a subsequent theory. In a general conceptual level it will be a rather excessive effort to construct such a general theory; this may as well form a subject to an entirely different work. The conceptualization of the multidimentional environmental problems will be chaotic without the previously mentioned integrations. In this case it will be wiser to investigate the in vaulable "Hypothetico-Deductive" theories, and their subtheories as their tools, and then trace the valid and invalid aspects of those as far as the "Theory of Design" is concerned.

In the constitution (or even in the selection) of any theory there lies the fundamental dicotomy of "content" and "meaning".[93] A very general theory containing everything consequently contains so little that it can also be considered as a theory without content, on the other hand a higly specialized theory within the strict framework of that specialization lacks the conceptualization of the theory,[94] which may as well be regarded as a theory without meaning. For the theory of environmental design a rich conteptual vocabulary for creativity and comprehension, and precise objective theory for

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[92] Bertalanffy, L. von, General System Theory, op.cit. p.11

[93] vide., Boulding, K. op.citp.197, where he discusses content vs meaning "It (mathemetics) studies all thinkable relationships abstracted fron any concrete situation or body of emprical knowledge.... Nevertheless because it contains all theories it contains none; it is the language of a theory, but does not give us content."

[94] vide., fn, 14 this Ch.

avoidance of irresponsibility and for relevence is required.[95] This can also be stated as the requirement of an optimal degree of generality; that is an existing trend among architects without theoretical awareness. It is impossible for them to be indifferent to the large scale problems of humantiy and also the developments in the body of knowledge (sciences).

OTHER THEORIES

Before going into the details of the conceptual terminology of the General Systems Theory, it will be helpful to investigate the impotent available theories which have mostly been developed for cetain other fields, but contain some conceptual elements other than their specific context for which they have been established and developed. These theories have great relevance for certain particular problem situations, almost all them are modern theories developed after second World War. Many of them were generated under very specific cicumstances, where a new theory was required to cope with different problem situations.

SYSTEMS ENGINEERING

Developed to cope with highly complex problems of heterogenous nature, basically depends on concept of systems and the decomposition of the elements of a system in order to sort out the constituent elements and the interactions among them. Systems engineering is relavant for most complex problem situations and is utilized for scientific planning, design, management and for construction of man-machine systems. Among many contributors C.W.Churchman,[96] A.D.Hall,[97] H.H. Goode and R.E.Machol should be cited.

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[95] Boulding, K., op.cit. "It is the contention of General System Theorists that (this) optimum generality is not always reached by the particular sciences. The objective of General Systems Theory then can be set out with varying degrees of ambition and confidence. At a low level of ambition but with a high degree of confidence it aims to point out similarities in the theoretical constructions of different disciplines, where these exist, and to develop theoretical models having applicability to at least two different fields of study. At a higher level of ambition, but with perhaps a lower degree of confidence it hopes to develop something like a 'spectrum' of theories -a system of systems which may perform the function of a gestalt in theoretical construction." p.198

[96] Churchman, C. West, The Systems Approach, Dell Publishing Co. Inc. N.Y. 1968

[97] Hall, Arthur D., A Methodology for Systems Engineering, Van Nostrand, New York, 1963

CYBERNETICS

Cybernetics is the theoretical basis for goal seeking, self-controlling and self-maintaining mechanisms, with concepts of feedbeck, control and circular causal trains to provide and sustain such mechanisms. Basically the relationships between system and environment are handled as transfer of information. Mainly aims at the description of formal structure of regulatory mechanism, while the actual mechanism may be unknown. N. Wiener,[98] R.Ashby, S. Beer,[99] G.Pask,[100] can be named as founders and contributers.

INFORMATION THEORY

Basicly constructed upon the isomorphic axioms derived from negative entropy concept of thermodynamics. Describes information as a measurable quantity being the main ingredient of organization, and develops principles of transmission of information. Initiated by C.Shannon and W. Weaver,[101] and developed by Qastler. In a closed feedbac mechanism info decrease and turn into noise. The basic axiom, the relationship (or isomorphy) with thermodynamic laws, still remains the unresolved problem.[102]

OPERATIONS RESEARCH

Control of management of existing man-machine system. The conceptual tools, techniques and method are defined in terms of operations, and in order to achive predetermined objective of the control mechanism (or ma nagement), these operations are manipulated towards the optimization between controlable and uncontrollable variables. R.L.Ackhoff, C.W.Churchman, E.L. Arnoff are among the basic contributers.[103] Operations research uses linear programming and game theory as subsequent techniques.

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[98] Wiener, Norbert, Cybernetics, op.cit. Ashby, W.R. Introduction to Cyb, opcit.

[99] Beer, Stafford, Cybernetics and Management, op.cit.

[100] Pask, Gordon, An Approach to Cybernetics, Hutchinson, London, 1968

[101] Shannon, Claude, and Weaver, Warron, The Mathematical Theory of Communication, Urbana, University of Illinois Pr. 1949

[102] Gilbert, E.N. Information Theory After 18 Years, Science, 152, 1966,

[103] Churchman, C.W., R.L.Ackhoff, Arnoff, E.L., Introduction to Operations Research, John Wiley and Sons, New York, 1957

Churchman, C.W., Prediction and Optimal Decision, Englewood Cliffs, N.J. Prentice Hall, 1961

Ackhoff, Russel L., Scientific Method, Optimizing Applied Research Decisions, John Wiley and Sons, Inc. New York, 1967

HUMAN ENGINEERING (ERGONOMICS)

The abilities, physiological limitations and variabilities of human beings are the basic concern of human engineering. The conclusions produced by human engineering determines the parameters of any man-involving phenomenon physically, as constraints and resources. Human engineering is developed in many fields of industrial and engineering design and its tools are antropometrics, biomechanics, engineering psychology, human factor and the other related disciplines.

GAME THEORY

Based on the supposedly rational behaviour of players under a given circumstantial problem situation which is to be preferably the closest analogue of the real problem. Players play under the fundamental predicament of maximum gain and minimum loss. Aim of the game is the disclosu ting trends under antagonistic forces. Application of game theory becomes more valid when the statistical data and variabilities of the real problem situation are fed into the analogue, Game theory was generated by J. Von Neuman and O. Morgenstern;[104] R.D.Luce, H.Raiffa[105] contributed.

DECISION THEORY

A mathematically symbolized theory, concerned with the choices among the availble alternatives. The situations are where the courses of action are determined through a series of decisions, the required objective framework is brought forward by decision theory. Contributors are many among those H.Chernoff,[106] W.Churchman, D.Davidsons,[107] can be cited here. Decision theory utilizes many of the theories mentioned in this chapter.

Goode, H.H., and Machol, R.E., System Engineering, Mc Graw Hill, N.Y.1957

[104] Neuman, J. von, and Morgenstern, 0., Theory of Games and Economic Behaviour, Princeton Univ. Pr. Princeton, 1947

[105] Luce, R.D., and Raiffa, H., Games and Decisions, John Wiley and Sons Inc. New York, 1957

[106] Chernoff, H., Moses, L.E., Elementary Decision Theory, John Wiley and Sons: Inc. New York, 1959 Churchman, W., Prediction and Optimal Dec.op.cit.

[107] Davidson, D., Suppes, P., and Siegel, S., Decision-making, An Experimental Approach, Stanford University Pr. Staniord, 1957

NETWORK THEORY

Concerned with the relationships among the elements of a system that basically form a structural network. Network theory gains extreme importance in social systems where the relationships become activities organized in a highly complex network. Network theory uses Critical Path Method, PERT, as its techniques.[108]

GRAPH THEORY

The structural or topological properties of systems in most cases need to be studied, more than che quantitative relations. Graph Theory elaborates these decisions especially in a topological space or in relational mathematics. It is qualitatively rather rich and inspring for problems of design. Application of graph theory has been used in biology by: N.Rachevski and N. Rosen; in architecture (in planning scale) by C. Alexander.[109]

GRAND THEORY

A functionalist sociological theory, developed exclusively for sociology has a little relevance for certain other fields. The most important aspect of grand theory is that it investigates the syntactic relations among the elements and ignores the semantic implications of the elements themselves.[110]

FACTOR ANALYSIS

Factor analysis aims at the investigation of the factors of multi-variable problem situations by isolating them from the real context of the phenomena. It is widely practised in psychology.

There is a vast interaction and cross-fertilization among all these theories, under such interactive cicumstances it is almost impossible to organize them in a hierarchical form of importance and relevance. All of them have both general and specific contexts to be considered. Meanwhile there are plenty of other

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[108] Battersby, Albert, Network Analysis, for planning and Schduling, MacMillan and Co. itd. London, 1970

[109] Alexander, Christopher, The Determination of Components for an Indian Village, in Jones, C., and Thornley, D., (eds) Design Methods Conference, Pergamon Pr.Oxford, 1963, pp.83-114

[110] Mills, C. Wright, Grand Theory, in Demerath III, N.J., and Peterson, R.A., op.cit.pp.171-183

theoris, methods and techniques applicable to specific problem situations; viz. Queuing Theory, Linear Programming, Location Theory, Simulation, etc. There are also method-technique-tool relationships among them, e.g. General System Theory uses Systems Engineering, Operations Research and Human Engineering among its tools. The abovementioned theories are the ones available to any problem solver or organizer for more objective exploration of man-involving phenomana. It should be definitely stated that everyone of these theories was introduced and developed with a specific purpose in the mind of the initiators, hence, they all have very specific contexts being relevant to particular situations and are helpful to similar problems in structure and irrelevant, or non-applicable, to many other problem situations. The aim of this work is to avoid such technical limitations, therefore it is not intebded to select a methodology and then to manipulate the problems of environment, with the provided means of that technique. Apparently such an approach would be limited by the boundaries of the technique and the concerned conceptual vocabulary. Meanwhile no pre-set framework would satisfy the requirement of infinite definitions of conceptual elements, such a framework even if available would be devoid of theoretical consistency.

In the following chapters the conceptual elements and a set of definitions of General Systems Theory are accepted as the deductive conceptual tools. Also, the structuring provided by that theory is agreed upon as the basic structure; but the theory is still both criticised and fed by certain other theories and views wherever it appears to be necessary to generate such a theoretical interrelationship, certain notions and attainments of Political Economy, Dialectics and Philosophy of Science are utilized.

CHAPTER 8

THE FRAMEWORK

Asit has been discussed previously, any social phenomenon has four basic characteristics, to be taken into consideration when dealing with anything related to it. Aspects such as ‘complexity’ and ‘indeterminacy’ are the characteristics of the structure, ‘irreversibility’ of the continiuty and chance in time, while ‘space’ is of the externalized relationships and of a multi-dimensional conceptualization of any state of being. In this chapter, the methodological significances of these aspects will be discussed. By doing so, it is hoped to achieve furher conceptualization of the context and the determinants of the man-made environment. The aim this of work is to comprehend the environmental decisions within the context of the totality of interacting forces upon them. Decisions as such, can never be properly set without making integrations on the social level. The first aspect of social processes described in the previous categorization,[111] is their high degree of complexity.

The total range of problem situations was categorized by Weaver[112] as: "Problems of simplicity,..., problems of disorganized complexity,... and problems of organized complexity,..." As far as the complexity in social processes are concerned it would be illogical to claim the existence of disorganized or chaotic complexity, since, by definition, in order to constitute a social whole there have to be a set of combinatory organizational rules to bring the elements together to interact.

ORGANIZATION

The complex problem situations of social processes apparently become those of organization.[113] Hence, at any degree of complexity of any problem situation,

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[111] vide, Ch.4

[112] Weaver, Warren, Science and Complexity, American Scientist, Vol.36, Autumn 1948, Pub. The Society of the Sigma xi, Inc., New Haven, 1948, pp.536-544, Cf. Beer, S., op.cit, in Ch.2

[113] There is a formal identity between the concepts ‘order’ and ‘organition’. Order has been previously discussed in: Ch.2, Art.2.3.2. Most of the peculiarities of order apply to those of

in social phenomena, there is a comprehensible order that enables the observer to analyze its structure objectively. Before going into the details of this analysis a further survey of the concept of organization is required.

Organization in a broader sense can be defined as the pattern of communication among the elements of a system which brings them together to constitute the system. The term organization includes the vast spectrum of negentropic elements in a system. In other words organization as a concept is an aggregate of the notions as negentropy, less-probability, syntropy, order,...etc. Organizational aspects of a social system gain an utmost importance especially when one intends to sort its structure out. The degree of organizational complexity is another aspect to be understood, but here it will not be dealt with in detail. "The organization of a system is simple if the system is a serial or an additive complex of components, each of which is understood", it is considered relatively complex otherwise.

Basically organizations can be grouped under the following types, each of which exists in any social system, mostly in the form of the intitutioc which constitute the system:

"i. Elementary organization,

ii. Sorting operating organization,

iii. Simple goal maintaining organization,

iv. Feedback sorting operating organization,

v. Servomechanistic organization

vi. Automatic goal changing organization,

vii. Consciously learning organization."[114]

DECOMPOSITION OF COMPLEXITY

The comprehension and the operational structuring of any social complexity proceeds by the application of a basic discipline, and then by the sorting out of the structure within the framework of that discipline. From the previously discussed points of view GST can be taken as the basic integrative discipline

organization. Here in the context of social process it will be appropriate to refer only to organization in order to avoid confusion in meaning.

[114] Ozkan, Suha, Notes on the Methodology for Design, Unpub. paper submitted to METU, Ankara, 1970, p.10

for such an operation. It not only provides a logical -therefore internal- consistency but also offers a large set of abstract notions for further conceptualization. As it has been pointed out in the preceeding chapters, hierarchy in complexity is the main point to start with. If we go back to the hierarchical ordering of the universe, we see that any complexity can be fitted into a specific place, in consideration of its external relationship and internal structuring. The conceptual framework of the taxonomy then may also become that of the analysis. "Analysis is an attempt to understand a complexity by examining its constituent parts. The parts being simpler they are supposedly. more amenable to understanding."[115]

In the words of Simon: "Hierarchic systems are... often nearly decomposable."[116] Comprehension of a complex phenomenon as a system, and decompositon in the form of subsystems, sub-subsystems, etc. as constituent parts of that complexity, brings forward a non-negligible operational ease, meanwhile avoiding the oversimplification of the phenomenon in the form of fruitless metaphors.

The pattern of decomposition of a complexity in the form of sets and subsets devoid of lateral interaction among the elements of the same level, is called a "tree like hierarchy."[117] In other words in tree like hierarchies no two subsets of the same level contain the same element(s). There are no interaction among the elements of subsets of the same level. In such hierarchies constituent elements of the complexity are ordered in the form of sets and subsets, in accordance with a pre-set criterion. In such decompositions the main consideration is to form the aggregation of elements into a set. This type of decomposition also presumes an identical relationship pattern among the elements which is the basis substantiating the analysis.

In the architectural context Alexander applied tree like hierarchical decomposition for "The Determination of components of an Indian Village." His application was not in terms of the comprehension of the complexity but in terms of decision making. His decision tree was based on 141 random elements structured in the form of a tree like hierarchy. The inappropriatenes of such a

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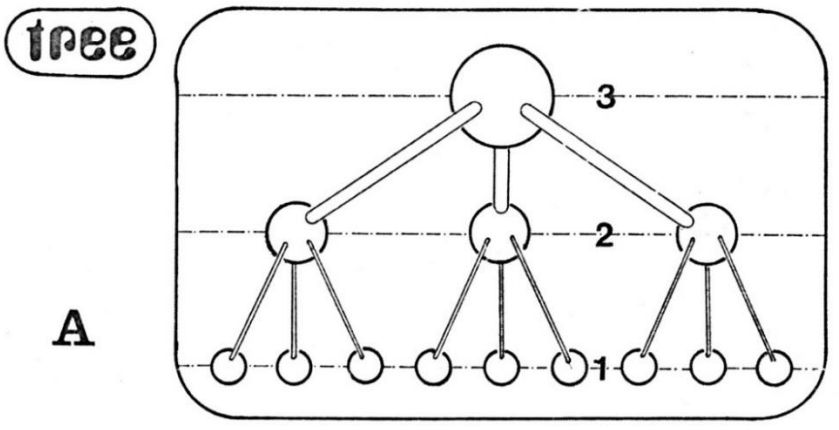
[115] Rapoport, Anatol, and Horvath, William W. Thoughts on Organization, in Buckley, W. ed. op.cit. p.71

[116] Simon, Herbert, op.cit.

[117] Alexander, Christopher, The Determination of Components for an Indian Village, op. cit. reproduced also in: Alexander, C., Notes on the Synthesis of form, Harvard Univ. Pr., USA, 1964, pp.136-191 vide, , Manheim, Marvin, Hierarchical Structure, MIT Report, 7 MIT Pr, 1966, USA,

decomposition for social complexities was, also stated by him. In a paper titled "A City is not a Tree",[118] Alexander refuted the methodological relevance of tree like decomposition of a hierarchy for any social phenomenon, where the extremely complex interaction pattern of the elements rarely takes the form of a tree like hierarchy. Hence, the basic axiom of existence of tree like hierarchy in such complexities became no longer valid. In the same paper Alexander introduced the term "semi-lattice" for the multi-level interaction among the elements of a social complexity. Although, the ideas in "A City is not a Tree" established a more profound logical ground for any societal problem situation, still it did not bring great operational ease.

[118] vide., Fig.s 8a and 8b,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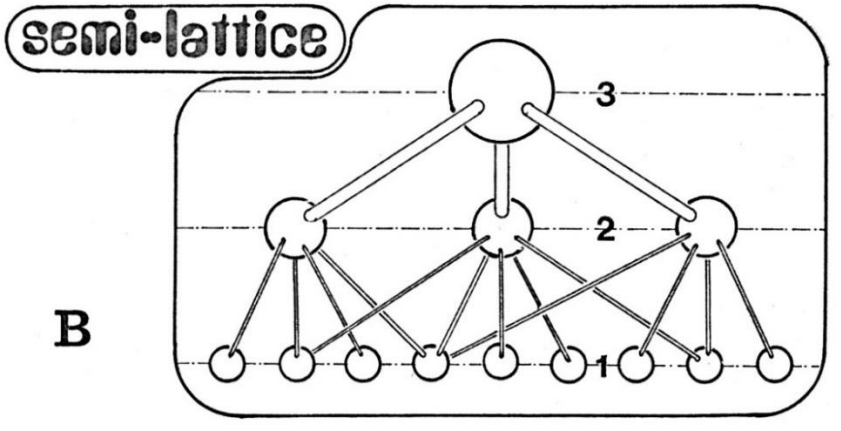
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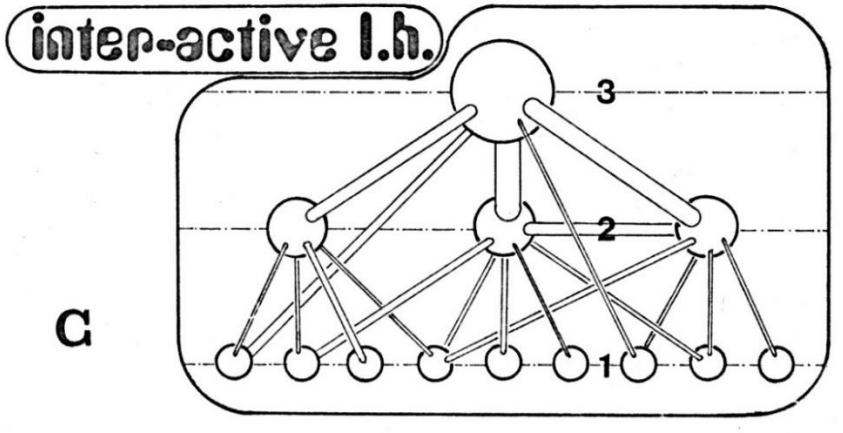
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The main contribution of the idea of "A City is not a Tree" lies in the statement concerning the over-complex nature of man-involving phenomena. Alexander's modification in his own methodological model is just a slight change on his mathematical, then computer programme.[119] The developments in the operational part of the methodology are still evolving. They are getting substantially more sophisticated as more aspects of the complexity are taken into consideration. These methods, for the time being, are in exploratory and experimental stages.

In any decisive process concerning a complex situation a hierarchical conceptualization and operation may be formulated in two basic processes. The first one is the analytical part composed of the logical and structural decomposition of the complexity into more comprehensible, therefore into more operational parts. The second part is the process of synthesis constituted of several levels of decision making, covering the large spectrum between the primary level, concerning the componential parts and the highest level of concerns, the complexity itself. The surface of contact between these two hierarchies becomes the decisive area, where the two processes of different categorization but similar structuring are matched. This level can be the level where the basic decisive elements are introduced. At the first stage the structural (and functional) decomposition takes place step by step stating from the level of the complex whole, subsystems, ..., and the elementary variables. On the surface of contact, the objective and/or subjective values, goal implications, needs, requirements, etc. can be derived from these elementary structural variables and translated into elementary decision variables.[120] These variables (or factors) can be recomposed into decisiors and decision implications in the form of levels, a similar process to decompositving at the decision(s) concerning the whole. Here the demarcation of the complex whole of the observer's concern from the rest of the univere appears as an issue in abstraction as a part of the methodical approach.

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[119] HIDECS is a method developed by C. Alexander and M. Manheim at MIT, Cambridge, Massachusets. HIDECS 2 assumes a tree like hierarchy where no interaction among the elementary subsets exists. After the statement "A City is not a Tree" they developed HIDECS 3 which assumes cverlappings of elements in the lowest subsets, then onwards programme again presupposes a tree like hierarchy. HIDECS basicly decomposes a system of vertices and links into subystems . HIDECS also modified by G.T.Moore and K. Panze at the University of California, at Berkeley. Another method of hierarchical decomposition is RECØMP which determines a measure of interaction between subsystems. RECØMP is developed at the University of Toronto by A.Bernholtz and E.Bierstone.

[120] vide., Fig. 9

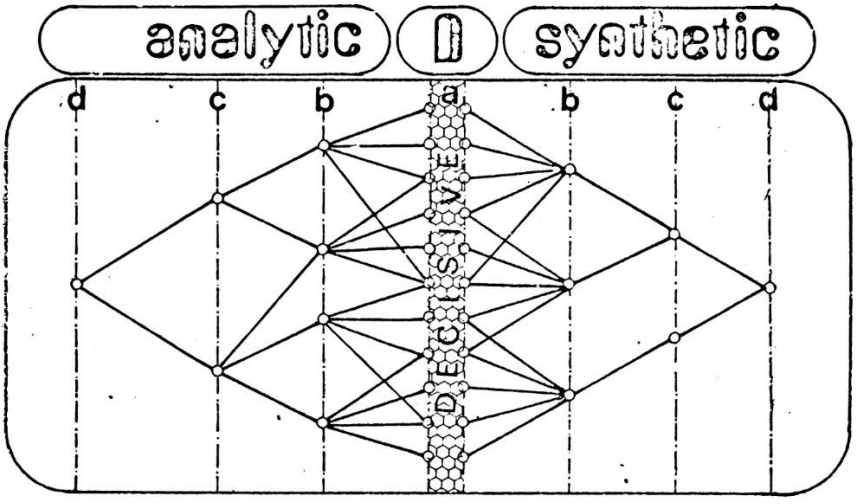

Fig.9

Koestler's"[121] notion of "holons', reconciling the atomistic and holistic approaches to hierarchical structures seems to be appropriate for facilitating a meaningful method of demarcation. Logically, the basic axioms of the preceeding argument, such as the existence of wholes and sub-wholes as systems and the existence ofa structural pattern in the form of a hierarchy can be critisized, and can even be disproved. As a part of the logical discipline, these are not to be taken as concrete facts claimed to be true a priori, but are objective ways to investigate a complex phenomenon. In any such approache to complex problem situations it is futile to try to avoid non-objective approaches at all, apparently this is also meaningless. The main concern of the construction of a conceptual framework is to make a non-biased objective basis for primary communication. Such a framework then provides access for personalization as subjective approache as means of enrichment: creative processes.

Due to the lack of such a conceptual framework concerning the complex aspects of the phenomenon,vast numbers of oversimplifications has been made, either under the name of mathematical models or some other metaphor The utilization of other axiomatic disciplines and the interpretations of thier implications requires particular attention in order not to dissolve the complex situation of concern into nonrepresentative simplicity.

[121] vide., this Ch. Art.8.4.

As it has been discussed previously concept of systems provides a sound discipline for comprehension of a complexity as being composed of a set of sub-wholes. A system defined as "a set of objects together with relationships between theobjects and between their attributes."[122] In a social system the elements are human beings and groups of human beings, and the relationships are the organizational pattern revealing quite a complex and unique structure.

For the delineation of the elements of any problem situation, the methodologial problems are relatively simple than those of relationships, since the elements are more or less easily comprehensible, in terms of groups, institutions, or some other functionally differentiated elements. Meanwhile the network of organization bringing the elements together to constitute the system, an has extremely complex pattern. In any social system almost all of the above mentioned categories of organization are inherent as certain patterns of relationships. Each category of organization may include certain sets of relationships which interact together to compose a critical organizational pattern, the aim of which is to perform a peculiar function for the system. In almost all decomposition methods this aspect of system has been neglected, although it is stated in the very definition of a system. As a consequence of this negligence of decomposition patterns, only one type of relationship is taken into consideration. In most cases this single relationship is called 'interaction'. In reality, complex systems depending on organization, rather than order, formed multiple varieties of organizations. These patterns of organization reveal qualitatively quite dissimilar and diversified structure and performance.

In order to have a totally inclusive discipline for comprehension and operation of complexities, supplementary to hierarchic decomposition of the elements and the relationships, decomposition (and integration as well) of functions in

[122] Hall, A.D., and Fagen, R.E., Definition of System, in Buckley, W., ed.op.cit. p.81, Definition of a system varies greatly depending on diffent authors different interests. At each new definition certain aspects of the concept are emphasized. Hall's definition contains almost all of them, because it is very general. Such a general definition, which is generalized in order to expand the area of applicability, does not bring a clear conceptualization in content; nor a differentiation among the concepts as set, group, whole and system. In order to be particular in definition it will be appropriate to omit non-living systems, and concentrate on the living and open systems, in context of social phenomena. An integrative definition of open systems was done in: Ozkan, Suha, op.cit. p.11,"a) A system is to be composed of a set of elements with at least a functional relationships among them. b)It should have boundaries within which its organization, and input/output to and from the system are defined c) A system has to have at least one goal, that is to maintain itself. This process is facilitated by system's organization.

the complex whole must be included in the discipline.[123] The following article investigates the 'functions' in detail, to clarify this point.

FUNCTIONS

Functional integration of social complexities is proposed in order to avoid a non-objective bias leading to a deformation of the actual determinants of the situations. Functional integration also leads to various ways of utilizing different kinds of operational models, each of which can be fed into this integrative process.

The types of functions are categorized by Ackhoff[124] as follows:

a. Deterministic Causality, (Cause-Effect relationship)

b.Probabilistic Causality, (Producer-Product relationship)

c. Corelation,

In the pure and natural sciences there has been an unending attempt to discover the 'deterministic causality' of the observed events. Now it has been formulated that rules governing the basic relationship patterns of the events are not deterministic but probabilistic.[125] Within the framework of proposed functional integration the aim is not to assert or look for a determining causality of the interacting elements. The concern with functional integration is to disclose a methodological discipline to trace the functionally integrative structure of man involving phenomena. Such a structure may as well be constituted of all of the above functional categories. The important thing is to agree on the existence of fuctional relationship patterns as the main causes of interaction among the constituent elements of any system. The types, qualities or categories of such

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[123] vide., Fig. 8c

[124] Ackhoff, Russel L., Scientific Method, op. cit. p.16 a) x is necessary and sufficient for y. b) x is necessary but not sufficient for y. c) x is not known to be either necessary nor sufficient for y, they tend to be present or absent together.

[125] Richenbach, Hans, op. cit. p. 163, "The issue is whether causality is an ultimate principle or merely a substitute for statistical regularity,..., with the analysis of atomic occurances in terms of Planck's concept of the quantum, that gave the answer. From the investigations of modern quantum mechanics we know that the individual atomic occurences do not lend themselves to a causal interpretation and are merely controlled by probabilitylaws. This result, formulated in Heisenberg's famous principle of indeterminacy, constitutes the proof that the second conception is the correct one, that the idea of strict causality is to be abandoned, and that the laws of probability take over the place once occupied by the law of causality."

functions is a subject of the methodological discussions in their specific context.

The causal determination of any phenomenon is methodologically futile:

> The law of causality even if true, holds only for ideal objects; the actual objects we deal with are controllable only within limits of a certain high probability because we cannot exhaustively describe their causal structure. The significance of the probability concept was seen for such reasons before the discoveries of quantum mechanics. After these discoveries it is even more obvious that no philosopher can evade the concept of probability, if he wants to understand the structure of knowledge.[126]

The functional explanation of relationship patterns has to be made by taking the total spectrum of functional relationships into consideration.[127] In cases of dealing with complex structures, such as social systems, anticipation of simple causal deterministic interaction may be misleading:

> Complex systems are diabolical. We approach them expecting to find simple cause effect relationships to explain the troubles in a system. Not only is there no simple cause -that 'cause' is in the structure, and in the interactions of components interrelated in complex ways- but even worse the system deludes us into a sense of false security by presenting apparent cause-effect pairs that match our expectations. Such apparent causes are usually coincident symptoms; they are not leverage points through which the behaviour of the system can be corrected. In fact the Tobvious' correction exerted on the apparent cause will make matters worse.[128]

The functional integration of societal phenomena reveals patterns of interaction among the elements of a social system. Using General System Theory as a main theoretical basis provides sufficient conceptual tools to capacitate such an

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[126] Reichenbach, Hans, ibid, p.163

[127] Boulding, Kenneth, General Systems Thoery, Skeleton of Science, op.cit., "..fields of interaction of population can be discussed in terms of competitive, complementary or parasitic relationships among populations of different species consist of animals, commoditiees, social classes or molecules," p. 201

[128] Forrester, Jay W., A Deeper Knowledge of Social Systems, Technological Review, April 1969, p.21. MIT, Massachusets, USA,

integration. It at the same time gives access to subsequent theories under the same discipline, most of which are quite recent.

In the last decade many planning and design theorists concerned themselves with the functional relationship patterns of interaction, and tried not to commit themselves to plain manipulatory techniques of the old tradition which deal only with the perceptual elements of the complexity. This not a simple diversion in the methodological structure but an entire change in the logic of the approach.

> In examining a social system such as a city, one should not begin by attempting to solve its problems. First one must identify the system structure that creates the undesirable symptoms. Unless the underlying causal relationships are understood and altered, any effort to relieve symptoms struggle against the still present forces that continiue to work toward undesirable ends. In fact, efforts merely to treat symtoms usually increase the counterpressures within the system and neutralize the corrective efforts.[129]

FUNCTIONAL CONCEPTUALIZATION

The characteristics and the objectives of General System Theory has been dicussed previously.[130] Basically it is a common theoretical basis covering the total knowledge known to man. The laws applying to the totality of the universal complexity, are established in a general integrative level. These laws are valid when they remain general. For the specific applications, further investigations are required to facilitate particular involvement. The key axiom is the hierarchical structure of all living and non-living things, The whole spectrum of the existing hierarchical structure of the universe has been delineated before. Whatever the applied common denominator may be, the structure reveals itself as a hierarchy. That hierarchy is indeterminate at both micro micro levels.[131]

Taking society as being composed of 'living systems'[132] or as 'open hierarchical systems'[133] brings a great ease in the functional description of the

[129] ibid., p.26
[130] vide., Ch.7, Art, 7.5.
[131] vide., Ch.2, Art.2.2.
[132] miller, James G., op.cit.
[133]Koestler, Arthur, Ghost in the Machine, Hutchinson, London, 1967, App. I, pp.341-348

properties of the system. And also increases the comprehensiveness of the constituent sub-wholes. It should be kept in mind that "a system as whole is not an object but a way of looking at an object. It focuses on some holistic phenomenon which can only be understood a product of interaction among parts."[134]

Observers' interests in any complex phenomenonare of utmost importance as a part of the method. Such interests justify any other non-conventional way of investigation of symbolis representation. In the past, for example there have been many different ways of interpretating astronomic systems. If we disregard our present objective knowledge about them, for argument's sake, each one of the interpretations is a manifestation of self-contained approach in its logical consistency. In this case, Ptolemaic man-centered universe is not much different than the more objective interpretation of the universe in the Copernican explanation. Thus, hierarchical systems interpretation is another way of looking at complex phenonemena which not only brings clarification of the structure of the complexity, but also integrat all functional and causal elements constituting that complexity.

> Thus the systems view by itself offers no operational aid to problem solving in complex situations without an appropriate corresponding subsystem concept.[135]
>
> Parts and wholes in an absolute sense do not exist in the domain of life.[136]

Here, it becomes clear that, the existence of 'general open hierarchical systens' is not a search for an actual absolute structural pattern, but a way of comprehension of any complexity without abstracting it from its environment. The criticisms directed at systems theories claiming non-existence of sub-wholes in absolute form, are both welcome and at the same time unrelated to the present discussion.

> The concept of holon is intended to reconcile the atomistic and holistic approaches... holons are self-regulating open systems which display both autonomous properties of wholes and the

[134] Alexander, Christopher, Systems, Generating Systems, Architectural Design, December 1968, p.605.
[135] Kaiser, Edward J., A Review on the "Notes on the Synthesis of Form" in the J. of the American Inst. of Planners, Vol,xxxi, No:1 January 1965, p.83
[136] Koestler, Arthur, op.cit.p.341

> dependent properties of parts. This dicotomy is present on every level of type of hierarchic organization.[137]

The Tholon' concept of Koestler brings forward a sound sub-whole understanding which even covers the twofold internal structure of a system. Following Koestler it can be stated that in any sub whole (or whole) there exist two contradictory relationship patterns, one being that of 'autonomy', requiring self sufficiency and the other being 'dependence' The latter is the system's interactions with its environment, in other words, system-suprasystem relationships.

The lowest level where a meaningful integration of societal processes can be made the regional level. This is partly due to almost all functional elements can be comprehended in their totality at this level. Partly due to macro determinants can be effectively meaningful at this level. On a regional level of societal integration both matter-energy and information[138] inputs and outputs of the social system can be delineated externally. Also the pattern of functioning of subsystems can be investigated internally.

For the problems of environment, the related critical subsets of society are to be stated, so that, the problems of environment can be fitted into them. In such an integrative approach, it will be seen whether architecture as an activity (or subsystem) reveals the characteristics of a critical subsystem or not.

On the regional planning level Sheather,[139] constructed a model containing critical subsystems of GST. He did this in order to start with the problens of planning of a region, in fact a megalopolis. In the hierarchy of decision making about the environment, the regional level is the unique one, consisting of the variables of both physical structuring and political decision making. Planning disciplines as such, when properly applied as an integrative discipline, can provide a substantially important basis for the other micro scale environmental activities, e.g. urban design, architecture, etc.[140]

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[137] ibid., p.341

[138] For a detailed definitions, vide., Miller, 3.G., op.cit. pp.1937, where he defines "Matter: is anything which has mass (m) and occupies space. Energy: (E)... ability to do work" vide., also Ch.3 "Information, (H)... is the degree of freedom that exists in a given situation to choose among signals, symbols messages or patterns to be transmitted" and"the living systems....are made out of matter-energy and organized by information."

[139] Sheather, G. op.cit.

[140] For their present implementations it is impossible to take it for granted, that planning disciplines can perform such a role anywhere on the globe. In particular the regional planning decisions are not only influenced but actually determined by those of the political, and of the

In the present application of such disciplines the decisions are either diverted or biased by certain other forces of social organization, whose goals may or may not be in contradiction with those of society.

In a hypothetical study like Sheather's the taxonomy of critical subsystems can be taken as the basic integration on a regional level. The real variables of the natural environment can be fed into this framework. Three categories of the critical subsystems can be summarized as follows.[141]

a. Matter-Energy Processing Subsystems,

   Ingestor, Distributor, Decomposer, Producer, Storage, Extruder, Supporter, Motor,

a+b. Matter-Energy + Information Subsystems,

   Reproducer, Boundary, Control and Motivation,

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resulting establishment. In the subsequent level the urban planning decisions are under great influence and pressure of profit maximization tools and manipulatory rules aiming at the maintenance of existing system. As a micro level, activity, architecture is asked to conform the planning decisions. In most cases these decisions are far from incorporating internal dynamics of the social and environmental system.

[141] Sheather, G., op. cit. p.14. Defines these critical subsytems as. "Ingestor: Brings in Matter-Energy across system's boundary from the environment of suprasystem. Distributor: Inputs and outputs of subsystem are conveyed to system's components. Decomposer: Outside inputs are broken down to compatible elements of subsystem. Producer: Forms enduring associations among Matterenergy items in input decomposer form. Storage: MatterEnergy inputs and outputs from decomposer producer or extruder are stored until demanded. Extruder: Matter-Energy products and wastes are gathered, stored and then transmitted from system. Supporter: Matter-Energy flows through this subsystem and maintains spatial relationships among the components of system. Motor: Provides motion in relation to environment keeps system 'open' to the components of environment. (a+b) Reproducer: Template of new system, transmission of information, not essential for the present functioning Boundary: A region with edge density and finite protection, container and supporter. Control and Motivation: Central control determining rate, direction aspect of the system movement. Selects from inputs optimum solution and signals systems outputs. (b) Input Transducer and Internal Transducer: Receives 'markers' from system's environment. Changes markers to suiable form for systems transmission. Channel and Net: Channel is the route in spatial region sending 'markers' from transmitter to receiver. Net is formed by the intersecting nodes and channels. Decoder: Detects regular patterns from environmental inputs and records for system's use. Associator: Carries out first stage of learning process forming enduring associations among items of information. Memory: Inputs of information from environment or supra system through internal transducer and associator are stored over time. Encoder: Acts from decider and recodes internal systems into public systems for transmission into the environment. Output Transducer: Transfers internal 'markers' of sysytem beyond its boundary. Decider: Executive or adminstrative subsystem controlling controlling system causing components to coact."

b. Information Processing Subsystems,

Input-Transducer and Internal Tranducer, Channel and Net, Decoder, Associator, Memory, Encoder, Output Transducer, Decider,

ADAPTIVE PROCESSES

For the sake of the simplification of the problem, if we disregard the all aspects of architectural involvement other than adaptive activities, we see that the adaptive activities do not belong to a definite critical subsytem where they can be depicted. Architecture does not reveal itself as an open system (or subsystem), since it does not undergo critical processes required to be a system. Thus, it is a mere inclusion or an artifactual subsytem. This is also its complete dependence on another system as determining, goal setting, and changing organization. The social organizational aspects of architecture such as architectural practice, architectural education, etc. may be considered subsystems of the subsequent levels of social organization. A general systems integration at such levels is absolutely insufficient within the scope of a theory of design. Although an integration as such, can be claimed to be realistic, it can not bring the totality that this work is after. Architecture, including its existing and desired state of being, contains the elementary variables of most of the critical subsystems. It can simply be considered as 'reproducer' in matter-energy+information subsystems; as 'supporter' and 'producer' in matter energy processing subsystem.

It may seem logical to innovate a new subsystem called 'adaptator' and integrate all environmental problems into that subsystem. Architecture in its broadest definition contains other variables than adaptation, which may be left out if the integrative process is concerned only with adaptation. Therefore, it will be more appropriate to integrate the social structure and trace the variables of each subsystem overlapping with those of architecture.

The variables of each critical subsystem can be classified under their main structure of being as physical, biological, social and symbolic.[142] Many of the critical subsystems of society contain elements that can also be grouped under architecture in its hypothetical context. Although this functional integration seems to be complicating the whole process of comprehension, it is not since

[142] ibid., p.34

the efford is not to leeve any critical determinant out of the integration. This will bring the required darity to the ill-defined problems of architecture.[143]

The macro environmental functional integration of the forces of society has to be made, at a multi-disciplinary level. This proces has to be free from short term manipulations of the management and should contain all critical elements of objective reality in a cause-effect pattern. The aim of such an integration is in the first place, to take almost all comprehensible forces of social structure affecting environmental structure into consideration. Such an integration will contain a vast number of dissimilar variables which can hardly be structured on the basis of objective interaction. A problem as such, is unavoidable; it is basic predicament of a complex problem situation.

> Subsequent to 1900 and actually earlier... Josiah Willard Gibbs,... said: "Let us develop analytical methods which can deal with two billion variables."[144]

Gibbs' endeavor was to tackle problem situations of great complexity. At the present time there are tools and techniques available to enable us to deal with vast number of variables, meanwhile the methods still require development and refinement. An integrative level, where interdisciplinary communication is possible, has not yet been established.

SOCIAL CHANGE

The methodical handling of complexity since it can never be complete, does not disclose the total variables of social phenomena. Ommission of time, as well as change and development as a function of time, would provide greater ease in the determination of the total forces. This would be unrealistic. The irreversible nature of all existing processes in the universe has been discussed before. The ultimate implication of this is that whatever the conditions may be both living and nonliving matters undergo a continious process of change. In the general context, the non-living universe changes towards disintegration, increase of entropy, then stability. The living universe, through a continious input and outflow of energy, increases its level of organization. The tendancy is to achieve a less probable but more orderly state.

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[143] vide., Appendix I, reproduced from ibid., p.34 where the underlined elements are considered to be that of architecture.

[144] Weaver, Warren, Science and Complexity, op.cit. p.537

The artifacts and inclusions, in order to support the orderly state of the social system, undergo changes towards an increse of their order ihrough continious supply of energy from the system. They are made out of nonliving matter. They do not go through critical processes and they are subject to changes that are determined by the changes in their supra-system (society). Architecture and planning as artifactual inclusions reveal quite the same characteristics. They completely depend on society to support their organizational pattern. Changes occur as the determining system facilitates changes.

Architeture as an artifactual process can change both in its philosophical content and expressive qualities. The philosophical content of architecture changes parralel to the values and attributed or expected meanings of artifacts, types of requested order, moral and social values, etc. The expressive qualities change firstly due to new innovations in the handling of the problems of environment and network patterns, and secondly due to assesments and attributions connected thereto.

The successive causal train of artifactual processes includes relationships of production as the basic ingredient of social structure. In other words, when the relationships of production change the social structure follows that change with paralel changes.[145] This, of course feeds back to new relationships 'production, and so on. The artifactual processes change as a determined effect of social structure, so does that built environment.

Even though there exists a determining interaction in the functional relationship between social and environmental structure, there is a great difference in their comparative cycles. The average life span of any built object is considerably longer than the'span of changes occuring in the social structure, within the same period of time. This discrepancy gets larger as the growth of societies proceeds especially since the aspects affecting change happen to be exponential in rate, e.g. late twentieth century. The continious change in society enlarges the discrepancy of fitness between social structure and artifactual structure. As a consequence of such changes, environmental structure becomes obselete over time. In most cases, obselesence comes much earlier then the expected life period of artifacts. This implies the fact that no artifactual pattern can be absolutely fit to its determining context, unless it undergoes corresponding patterns of change in the same cycle. This may be interpreted as non-exitence of architectural fit in the same sense as a snale's shell rapid social change

[145] This nineteenth century argument generated by Marx, Engels, et.al. as the first 'systemici integration of society, for more up to date interpretation vide., Lange, Oskar, Political Economy, Vol. General Problems, Tr. A.H. Walker, Pergamon Pr. Oxford, 1963

requires equally rapid environmental change to obtain reasonable fit, if desired a priori. A fit as such, can only be made available by the innovation of 'living architecture'. In terms of architectural design, in order to increase the fitness between social structure and built environment architects tried to enlarge the degree of variability of the parameters for fit. By doing so, they aimed to accomodate larger discrepancies of unfitness. This discrepancy provided provided for the incoporation of decision making sometimes even at an individual level whatever the circumstances may be the absolute appropriateness of architectural artifact is a vital aspect, and it ranges between the treshold of sufficiency and extremely satisfying provisions. When the context of architectural design is expanded to incorporate the total social and physical determinants into the design process, it would not be logical to search for an absolute fit, since social change is not towards a determined end. Otherwise it would be very positive attempt to establish both theoretical and practical basis such a predetermined fit. The continious process of change in society causes structural changes in anything that is related or dependant to society. Therefore, no decisive environmental approach can simply set predetermined concrete goals to be satisfied as a final target. This requires a further study of change in societies.

If we again go back to the system characteristics of society, we see that it has a tendancy to maintain its steady state. This is required to sustain itself as an aggregate of organized parts. Maintenance of steady state facilitates the functioning of organization by more or less equal distribution of mater-energy and information. Though, at any cross section, it is at a steady state as a system. Still, this steady state can never be maximized to an absolute. In other words the continious process of input and outflow of energy required to constitute the system never tends to arrive at an absolute level of steady state other than what is required for the systems functioning. Hence, the goals of living beings -and of their organization are not the realisation of an absolute homeostasis but the maintenance and promotion of the organizational pattern. Unlike the non-living universe, the living universe at any cross-section of time is in a steady state (relatively), but never attains -or has no tendancy to attain- a homeostasis absolutely.

To define the ultimate goal of architectural design - or any other social involvement- as the maintenance of -or being fit to- any steady state of the system or any relationship pattern, is nothing but negligence of the dynamics of that system.

POTENTIAL DIFFERENCE

Change or development from one state of being to another one means the existence of a movement. Like the physical sciences, GST also accepts the existence of movement in a system if there is a potential difference. "Matter-energy and information always flow together. Information is always borne on a marker. Conversely there is no regular movement in a system unless there is a potential difference between two points, which is negative entropy or information."[146] In any system increase in the potential of one of its elements either causes a movement towards that element or from it. Movement due to potential difference facilitates the distribution of certain network elements such as, matter-energy or information. The distribution is towards the realisation of equi-potential areas which imply a homeostasis. But this again is a dynamic state of being. The distribution of potential (matter-energy and information) promotes the order of the system to a higher degree of organization or at least sustains its present level of organization by supplying energies for its maintenance.[147]

Change and development does not always mean growth. They of course, contain dynamics of growth, but still growth is a specific case of change, realised by positive feedback within the system. Social change here is mostly concerned with continious change in the patterning of the constituent forces of the system."[148]

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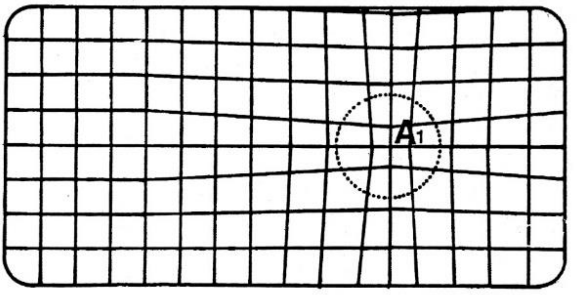
[146] Miller, James G., op.cit., p.199

[147] vide., Fig.10, Symbolizing change due to potential difference:
a. Hypothetical absolute steady state where all forces are equally distributed.
b. Increase in potential in point A1, that influences the total pattern of distribution of forces in the system.
c. Then, distribution of the potential occurs, that results in an increment in the level of order of the system.
d. Following more or less equal distribution eithr the previous potential increases (if periodical) or some other potential in the system comes into existence B1.

[148] Forrester, J.W., Counter intuitive Behaviour of Social Systems, Technological Review, January, 1971, pp.53-68, MIT, USA, "Exponential growth cannot continiue forever. Our greatest immediate chalange is how we guide the transition from growth to equilibrium." p.60 Forrester's is a different interpretation of growth and it is somehow complementary to GST law of optimum size for organization, Bertalanffy, Ludwig von, General System Theory, op.cit. p.40 "the larger the organization grows, the longer is the way of communication and, this depending on the nature of organization, acts a limiting and does not allow an organization grow beyond a certain critical size."

A



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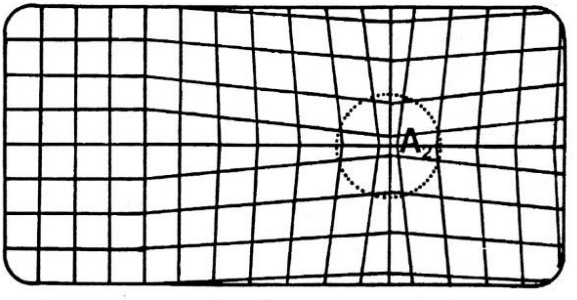

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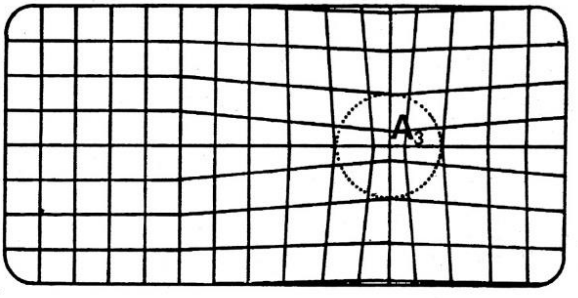

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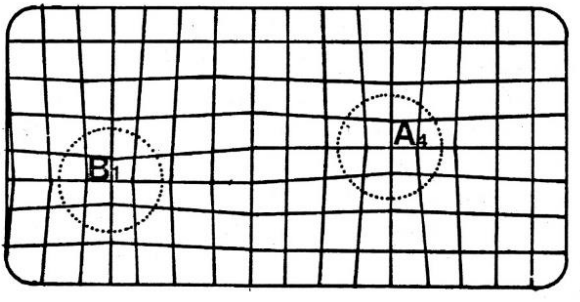

CONTRADICTION

Another element producing change in systems, especiall in social systems, is the existence of contradiction, either within the system itself or between the system and its suprasystem. While the contradictions within a system take the system through a process of change, the contradictions between the system and hierarchically higher systems make both of the systems change in order to interact as a whole. This change sometimes occurs only in the system as a means of a daptation to its suprasystem. In rare cases the suprasystem adjusts itself to contain its subsystem within the same whole. Frequently all related systems go through a process of change as a part of their development.[149]

The contradictions in society, whether among the social elements of society or between social and artifactual elements of society must be considered as potentials for change. Until the emergence of a systemic integration of philosophy after Hegel, contradictions had always been excluded from the scope of philosophy. Hegel became the first philosopher who integrated contradiction philosophically as a part of the whole scene. All through the existence of societies the internal and external contradiction have been the main ingredients for change in social structure and thought process. Change through contradictions is one of one of the basic means of avoiding the changeless state of homeostasis. Lange in 'Dialectical Nature of Development' in his book on cybernetics provides the cybernetic fotmylation of the process of development where contradictions play an important part.

> In a system constituting a whole there appear contradictions which prevent the system from remaining in a changeless state. The contradictions in the system induce changes leading to a readjustment which makes the contradictions diappear. But these very changes open the way to new contradictions, in turn, induce new changes etc. As a result, wholes can never remain in a changeless state; they must change constantly. The

[149] Forrester, J.W., Counterintiutive Behaviour of Social Systems, op.cit. p.68, gives an example from urban systems to illustrate a similar contradiction: "In a hierarchy of systems, there is usually a conflict between the goals of a system and the welfare of the broader system... The goal of the city to expand and raise its quality of life... The broader social system of the country and the world that the goals of the urban areas be curtailed and that the pressures of such curtailment become high enough to keep the urban areas and the population within the bounds that are satisfactory to the larger system of which the city is a part."

> changes, however, show a definite direction; in other words: they represent a process of development.[150]
>
> If a system is stable this contradiction diminishes with time until it finally disappears. On the other hand, in an unstable system this contradiction increases with time, it is this contradiction that produces the cumulative character of the process of development of the system, once the system thrown out of equilibrium.[151]
>
> The motion of the system its development, is, therefore, a self generating dialectical process, i.e. one in which contradictions occuring within the system produce its continiual motion of development.[152]
>
> Examining the problem of development, we obtain a precise concept of dialectical contradiction inherent in a system as well as an explanation as to why this dialectical contradiction is the source of motion and of self-generating development of the system.[153]

In the continious process of social and environmental change there exists at least one contradiction which produces movement. The interaction of contradictories innovating new syntheses and different states of being as a philosophical school goes back to Plato, when it was named dialectics.[154] The dialectical nature of the development of knowledge and organization created great awareness of change and lessened the confidence in: absolute truth and absolute states of being. In the development of science, dielectical developments played a substantial role, e.g. "Newton and Planck-Bohr formed respectively thesis and antithesis of a Hegelian antinomy. The synthesis is the statistical theory discovered by Heisenberg in 1925."[155] Interpretation of contradiction as a potential requirement for a motion aiming at a development has had wide philosophical repercussions. Dialecticians and dialectical materialists even asserted that dialectical logic trancends the classical logic of

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[150] Lange, Oskar, wholes and Parts -A General Theory of System Behaviour, Tr. E.Lepa, Pergamon Pr. PWN, Warszawa, 1965, p.1

[151] ibid., p. 72, Cf. Ashby, W.R. Introduction to Cybernetics, op.cit. 'power: of veto' p.100ff,

[152] ibid., p.73,

[153] ibid., p.74,

[154] 'He dialektikê' (techne) in Greek means (the art of) argumentation usage of language.

[155] Wiener, Norbert, op.cit. p.37

Aristoteles.[156] Tse-Tung, one of the contemporary ideological follower of the dialectical materialism of Hegel, Marx, Engels, Lenin, et. al. in his philosophical writings says:

> Every process, whether in the realm of nature or of society, progresses and develops by reason of its internal contradiction and struggle, and the movement of human knowledge should also progress and develop along with it.[157]
>
> As opposed to the metaphysical world outlook, the world outlook of materialist dialectics holds that in order to understand the development of a thing we should study it internally and and its relations with other things; in other words, the development of things should be seen as their internal and necessary self movement, while each thing in its movement is interrelated with and interacts on the things around it. The fundamental cause of development of a thing is not external but internal; it lies in the contradictoriness within the thing. There is internal contradiction in every single thing, hence its motion and development. Contradictoriness within a thing is the fundamental cause of its development, while its interrelations and interactions with other things are secondary causes.[158]
>
> It is necessary not only to study the particular contradiction and the essence determined thereby of every great system of the forms of the motion of matter, but also to study the particular contradiction and the essence of each process in the long cause of development of each form of motion of matter. In every form of motion, each process of development which is real (and not imaginary) is qualitatively different.[159]

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[156] The discussion on logical grounds is not aimed here for two contradictory views Cf. Popper, Karl R., Conjectures and Refutations, op.cit., Ch.15, pp.312-335, and Lefebvre, Henri, Dialectical Materialism, Jonathan Cape Pub., Tr. John Sturock, London, 1969. Popper says "If two contradictory statements are true any statement can be claimed to be true." Lefebvre, H. op.cit. p.38 "Dialectical logic trancends static assertions but it does not destroy them. It does not reject the principle of identity, it gives it a content."

[157] Tsc-Tung, Mao, Four Essays on Philosophy, Foreign Languages Pr. Peking, 1968, p.17

[158] ibid., p. 26,

[159] ibid., p.38,

> Processes change, old processes and old contradictions disappear, new processes and new contradictions emerge, ard the methods of resolving contradictions differ accordingly.[160]
>
> The universality or absoluteness of contradiction has twofold meaning. On is that contradiction exists in the processes of development of each thing a movement of opposites exists from beginning to end.[161]

Existence of a continious process of change in societies and in all open systems is basically due to the presence of contradictions which create potetial for change. This aspect has an important methodological-implication for design and decision processes. It suggests that no design or process should aim at an absolute resolution of reconciliation of such contradictions. The contradictions may be among the elements of society themselves or between then and artifactual elements. In any case an irreconciliable contradiction means that either environmental or social change is going to happen. The process of design then logically becomes something entirely different than optimal decision making a process which aims at the reconciliation of conflicting elements. In the process of design the explored or unexplored contradictions are the hints for succeeding states of being. Any contradiction will continue to be effective until it is absorbed in the system. This is the main reason why contradictions are refered to here as potential contradictions. Methodologically, the awareness of the existence of potential contradictions as determinants of change is to brought be into the field. Otherwise, search for optimality among the vast number of interacting contradictory forces has no potentiality. to surpass the marginal manipulatory techniques dealing with the effects of the processes.

PREDICTIONS

The difference between the change cycles of the built environment and social structure, forces environmentalists to predict the future states of being of social phenomena. This is partly required to extend the life span of the artifatual element and, partly to help make decisionsin relation to the forces of social phenomena. As has been discussed before, these predictions can never be deterministic. This is both due to the nature of social phenomena and to the

[160] ibid., p.38,
[161] ibid., p.30,

nature of progress over time, including the creations taking place as the social process proceeds its development in time.[162]

In any predictive activity there are two major points to be taken into consideration. First, all the existing forces determining, the structural integrity of the situation have to be taken into consideration and a causalfunctional relationship structure has to be comprehended. While doing this, the method of demarcation of the situation of interest from the whole complexity is vitally important. Trends of development of these forces provide the related information about the future stages of development. The second point is the consideration of the future forces that are going to appear in the process as the newly innovated or created forces. These forces in most cases turn out to be unique characteristics of the specific stage on which the observer's interests are focused. The trends of development and the relatedness thereto can be traced through a historical survey of the phenomena which also provide a basis for the comprehension of existing forces. The predictions based on the consideration of the forces and the forces that are likely to appear (conjectured) are bound to be limited in time and area. This is because of the nonavailability of a scientific basis for determining the total forces which are to appear in the later stages of development.[163]

[162] vide., Ch.4, Art.4.3.

[163] This needs a further explanation: Fig.11 indicates the process of prediction performed for a social phenomenon. Under the circumstantial givens of time ti the prediction p1 based on the trends of t1. If this trend is projected for longer period or time projected state for t6 can be A, the consideration of other likely forces may conjecture B as the more probable state for t6, when the actual state will be C. For a longer period of time e.g. for t8 predicted state D may happen to closer to actual state as E, but path of the actual process is entirely different.

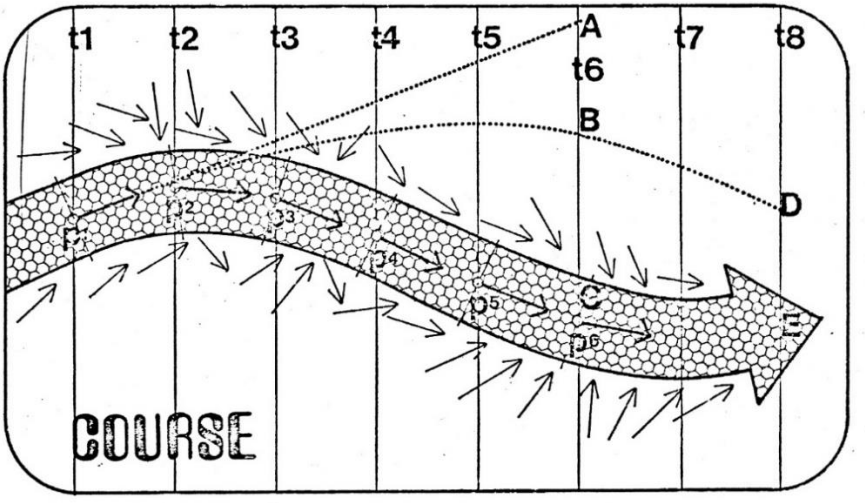

Fig.11

The discipline of integration can be extremely helpful to tackle the determination of acting forces at a given cross-section of time. This leads to the conception of the phenomenon as an organized whole (system). "A system can be defined as 'a group of material or non-material elements which mutually depend on one another to form an organized whole'."[164] Integration under the structural pattern of 'system', besides other things, provides a basis for conjecture about probable changes that are likely to happen due to changes in the componential parts of that system. This can be facilitated through an investigation of interdependencies of constituent parts. Such an investigation has to concentrate especially on those parts which recieve the influences from the supra-system and cause dependence of one system on the other.

Predictions devoid of consideration of the element of creation, such as change, feedback, etc., fail. The failure of such predictions is mostly due to the one-dimensional quality of the structure of the prediction. The best examplė of such one-dimentional predictions, is the prediction of population based on existing trends. In the early eighteenth century Montesquieu extrapolation from the decrease of population of the world, conjectured that in ten centuries time the

[164] Jouvenel, Bertrand de, The Art of Conjecture, Weidenfeld and Nicholson, Tr. Nikita Lary, GB and USA, 1967, p.74

earth would be deserted. Later Malthus predicted the probable problems which he supposed would arise due to the discrepancy between the rate of increase in agricultural production and human population. Both of these predictions have been refuted, by Hume and Mary respectively.[165]

General System Theory brings a clear explanation of the optimal size of organization and cybernetics defining feedback and control mechanisms, and scientifically avoids linear predictions that always have tendancy to define absolute ends for the process of progression. The criticism of attitudes projecting existing trends of development over long periods of time is also valid for similar predictions such as: enslavement by machines, extinction of life because of pollution, etc.

The social process the architectural as well travel on a path of progression in time. Due to the irreversible nature of the process this development neither goes backward nor repeats itself. Better comprehension of this development requires multi-dimensional axes rather than a single path of progression.[166] On these axes as many forces as desired can be incorporated. Together with all determining forces, the prediction itself has an effect on the formation of the future state of being. On the social level predictions have formative or repellent effects depending on the specific conditions and values.[167] Therefore as elements of communication, the predictions influence the actual path of the process and can divert it considerably.

[165] Montesquieu, P. Letters Persones, 1721, Letters cxii, "After performing the most exact calculation possible in this sort of matter., I have found that there is scarcely one tenth as many people on the earth as in ancient times. What is suprising is that the population of the earth decreases every day, and this continiues, in another ten centuries the earth will be nothing but a desert." Hume, D., in his, On Populousness of Ancient Nations, refuted the idea. (quoted from: Jouvenei, B. de, op.cit. p.13.

[166] vide., Jencks, Charles, Architecture 2000, Predictions and Methods, studio Vista, London, 1971, For a predictive structure of architectural traditions. Six traditions are claimed to act upon architectural decision process, in the period between 1920-2000.

[167] Oedipus Effect, vide., Reichenbach, H., op. cit. pp. 105ff, Popper, K.R., Poverty of Historicism, op. cit. pp.13ff.

CHAPTER 9

DESIGN METHODS FOR THEORY OF DESIGN

The most important attempts at a sound theorization of 'environmentalism' have been made under the name of “Design Methods”. This was partly to the characteristics of design as a critical process of decision making, from engineering design to planning design; and partly due to other scientific achievements which could only be made available for an activity of broad general boundaries, such as design. The contributions to design method have not been exclusively to architectural or environmental design, but to more definite and specialized involvements such as engineering, product design, etc. In most cases the intercommunication among other fields of design is facilitated either through analogies or abstractions at a more general level where the basic source of knowledge lies. Therefore, design, the common denominator of the activity acquired rather differentiated and sometimes even distorted contents, depending on the methodological context within which the design activity was facilitated.

As far as its logical structuring is concerned, 'Design Methodology' starts together with any design work, provided that the designer becomes coscious of what he does. Obviously such a primitive definition of method is far away from constituting a theoretical basis, because of its individual centeredness. It is therefore subjective and lack communicative conceptual basis. The search for objective design approaches for arhitecture goes back to an unknown period in history. The first known organized attempt under the title of ‘Design Methods’ was held in 1962 at Imperial College, London.

LONDON, CONFERENCE OF DESIGN METHODS, 1962, LCODM

The conference was organized by poeple of various disciplines,[168] the central aim being to enable cross fertilization among the different fields of design and

[168] The organizers of 1962 LCOOM included J.C. Jones, Lecturer on Industrial Design, Manchester; P.Slann Imperial College of Science and Technology; F.Height, Royal College of Art; B. Archer, RCA; P. Brooker, Inst. of Engineering Designers, R. Coleman, Critic: P.Cowan,

to provide access to newly developing techniques for the solution of complex problem situations. The conference covered a wide range of design activity from town and regional planning to industrial design. As it happens in most such conferences, the contributions became rather fragmented, mainly centering around individual interests, technical capabilities, and intellectual awareness.

It was in 1948 that Wiener in his introduction to 'Cybernetics' said: "ten physiologists ignorant of mathematics will get precisely as far as one physiologist ignorant of mathematics, and no further."[169] In analogy, this was the situation in design where the problems in need of solutions from designers were increasing in complexity and magnitude, but designers were still trying to handle them according to the discipline of existing normative theory of design. The growing necessity for making certain advanced techniques available for design and decision purposes, and for acquiring symbolic terminology where a set of complex operations could be delineated, opened a way to the utilization of scientific techniques for their appropriate use in design process.

From this point of view the 1962 conference carries extreme importance in the contributions of Alexander, Esherick, Gosling, Jay, Jones and Pask.

Jay,[170] in his paper attempts to outline a design concept for town and regional planning in their widest context. Although he does not claim that the new mathematical models can replace the planner's own normative judgement, he still emphasizes the necessity for the utilization of systematic methods for planning designers. Jay's paper mostly deals with the statement of appropriate decision making techniques for planning. Most of his systematic approaches have become the most elementary planning techniques of the present day. This may prove that his conjectures on the direction of development have been verified in time.

While Jay dicusses the necessity for ‘mathematical models, data processing, sampling methods, system simulation’, etc., in the same conference Alexander[171] claims that such methods are only useful for the manipulation of known components of a community, "All these methods, though they are

Bartleit School of Architecture; A.Froshaug, RCA; D. Thornley, Manchester Univ.; The conference was chaired by: J.Page, Sheffield Univ.

[169] wiener, Norbert, op.cit. p.2

[170] Jay, L.S., A Systematic Approach to the Problems of Town and Regional Planning, pp. 11-21, in Jones, J.C and Thornley, D., eds. op.cit.

[171] Alexander, Christopher, Determination of Components of an Indian Village, ibid., pp. 83-114

perhaps more precise than an average designer's intuition, still leave the essential structure of the city the same as it was before.[172]

Alexander's paper was probably the most stimulating and contributory paper of the conference. He applies the hierarchical decomposition (and recomposition) of the requirements based on a model (HIDECS 2)[173] developed by himself and M. Manheim. He decomposes the hierarchy in a tree-like structural pattern.[174] Then he translates the requirements into spatial diagrams by utilizing non-numerical mathematics. The transformation of subsets into physical patterns and the synthesis of these patterns into major sets, reduces the entire village (in his example) into four basic sets. These subsets can furher be adjusted in reconsideration with other the other givens of the specific situations, i.e. topography, soil, etc. In Alexander's method the contribution of intuition and creativity is kept in its maximum while the processes of analysis and synthesis undergo a highly sophisticated objective mathematical process.

During the whole process of design Alexander is definitely against the disciplines allowing only piecemeal changes. For the growth of any living structure, he stresses well integrated structures. His first axiom for this integration is:

> We cannot add unregulated quantities of elements to a developing structure, but only certain well-integrated units which bear a proper relation to the presently functioning whole. And we cannot change or replace arbitrarily chosen pieces of a functioning whole, but again, only units which are sufficiently well-integrated to function as units or components of the whole.[175]

Alexander's second axiom is:

> If a changing system in contact with changing environment is to maintain its adaptation to that environment, it must have a property that every one of its subsystems with an independent function is also given so much physical independence as an isolable component, that the inertia of those components which for the time being require no modification, does not make it

[172] Statistical decision theory, Linear programming, Location theory, etc.
[173] ibid., p.85,
[174] vide., Ch.8, Art. 8.2.
[175] ibid., p.86,

> impossible to modify those other components which do need to be changed.[176]

Alexander with the development of his paper in the following year, personally innovated a remarkable approach for design for complexity. Criticisms directed towards his method and the repercussions of his argument, still goes on. His theory will also be discussed later in this chapter as an individual contribution.

In the conference the most important contributions were the ones applying newly developing techniques fo design. Gosling,[177] in his paper he proposes systems engineering as a theoretical discipline for design. He introduces system engineering as being an appropriate basis, but he does not overestimate its relevance. Very much depending on the logic of 'systems and subsystems' he finds systems engineering beneficial for the operation of complex problem situations. Gosling does not mention the elements making environmental design situations over-complex, i.e. open system characteristics of social phenomenon, etc. Consequently, systems engineering, it as he introduces to it the fields of design, is exclusively valid for product design. This has been proven to be true by present applications of this technique which have become one of the most important tools for complex problem situations, but its sufficiency for the totality of environmental problems is still under question. Systems engineering as far as its philosophical context is concerned is integrated in a higher level by GST, and has even constituted a sound basis for current sociological theory. Gosling's conjecture on the relevance of systems engineering was quite right, but his paper as presented was not thorough enough.

An outstanding paper by by Esherick[178] is quite concise and is loaded with the fundamental problems of design, Esherick conceives design as 'a part of contin ous process'. This avoids the fragmental or piecemeal approaches, to start with. Esherick focuses on the social aspects of architecture and he declares: "Much has been said about architecture being a social art, but very little has been done to make it so."[179] Esherick's design approach is composed of two major aspects, the first being ‘analysis’ and the second being 'design' he gives design a different content by calling it 'design system'.

[176] ibid., p.88,
[177] Gosling, William, The Relevance of System Engineering, ibid., pp.23-32,
[178] Esherick, Joseph, Problems of the Design of a Design System, ibid., pp.75-81
[179] ibid., p. 73,

> Design system follows analysis; has the characteristics of design organized as a system. Incorporates feedback to the designer. It should not because of its structure, form the end product, i.e. as areproductive structure, it should be neutral. Its measure of effectiveness is its sensitivity and responsiveness to different values of analytical goal inputs.[180]

Esherick is aware of different kinds of general purposes of design, he classifies them as 'positive' and 'negative' (neutral). Although the terms positive and negative are not fair because their other implications especially in such a classification of extremely large contents, still the idea is worth quoting:

The first case I will call positive; it is a design for single or unified functions where the entity to be designed is to be used directly and overtly for known or knowable processes. The second case I will call for convenience, and to make the dichotomy clear, negative, although neutral might be a better word; it is a design for complex and contradictory functions where future growth of process is unknown or unknowable, where even moral right to engage in prediction or predictability may be questionable, where the primary objective is to minimize control to generate maximum freedom of communication, freedom of motion, freedom of choice, where the maximum conflict and contradiction will be possible -and the manner of use of the designed entity are matters of the individual self-control and individual self-direction of the users.[181]

The abstract aspects of this rather discriminated approach that the calls ‘negative’, later turned out to be appreciated design features in 'unselfconscious' design process in Alexander,[182] then Jencks.[183]

The presenee of Pask as one of the few cyberneticians of the time, brought a view from a different angle, in the conference. Pask,[184] in his paper does not impose eybernetics as an appropriate theory for design, or make another generalistic contribution, but he discusses the cybernetic interpretation of pereeptual process. He puts forward a technical view in an entirely specialized language.

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[180] ibid., p. 77,
[181] ibid., p.78
[182] Alexander, Christopher, Notes on the Synthesis of Form, op.cit., pp.46-54,
[183] Jeneks, Charles, op.cit, pp.49-62
[184] Pask, Gordon, Conception of a Shape and the Evolution of a Design, pp.153-167, in Jones, J.C., and Thornley, D., eds. op.cit.

Concerning activities like product design, engineering design, etc. Jones, Norris and Williams discussed the methodological aspects of these activities. Jones[185] proposes a linear process where each step requires the completion of the preceeding one in order to proceed. The sequence is composed of three major steps; Analysis, Synthesis and Evaluation, there are no feedback loops other than the refinement of the design. The whole activity is directed towards a definite goal, product.

In brief:

> Analysis: a. Random list of factors, b.Classification of factors, c.sources of information, d. Interactions between factors, e. Performance specifications, f. Obtaining agree
>
> Synthesis: a. Creative thinking b. Partial solutions, c. Limits d. Combined solutions, e. Solution plotting,
>
> Evaluation: a. Methods of evaluation, b. Evaluation for operation, for manifature, for sales,[186]

Jones' process of design, althought it seems very general, cannot constitute a valid basis for architectural design activity. Therefore, it is limited in application to product design.

Papers by Williams[187] and Norris[188] have neither general nor particular relevance for architectural design. Williams', being a very brief summary of what happened on the field of 'Design of Instruments, and prospects based on them, and Norris', being a specific problem solving technique, have a limited view into the situation.

Lucas[189] summarizes his experiences with computer, which is helpful specifically for those who are directly involved in the application of computers. In his 'philosophy' he does not generalize his method to contribute to the theory of design. Like Alexander, Lucas also presents the technical information of his experiment.

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[185] Jones, J Christopher; A. Method of Systematic Design, ibid., pp.53-73
[186] İbid.,
[187] Williams, G.M.E., A Methodology for the Design of Instruments, ibid, pp. 33-36
[188] Norris, K.W., The Morphological Approach to Engineering Design, ibid., pp. 115-145
[189] Lucas, A.H., Some Experiences of Structural Analysis with the Aid of an Electronic Digital Computer, ibid., pp.141-151,

Co-editor, Thornley[190] discusses the impotance of design method in architectural education, He also supports his paper with an outline of his design course programmes of 1958 and 1962. His paper, sorting out his thoughts and views on design studios, can hardly be considered as a particular contribution to the search for sound theorization of design.

Lewis,[191] on a specific basis, presents his and other's experiments on 'communication' in problem solving groups. His approach is quite specialized and does not provide access to the other available general theories dealing with a similar subject in a broader framework.[192] The papers by Denny,[193] O' Doherty,[194] Coleman and Hodgkin[195] deal with creative processes, , mostly supplied by interpretations in context to creativity in arts. Since, in general, creativity is one of the basic issues of design, in a Design Methods Conference it needs to be discussed in particular relation to the basic subject matter.

BIRMINGHAM SYMPOSIUM ON DESIGN METHODS, 1965, BSymDM[196]

Birmingham Symposium was organized with a similar aim in mind as the preceeding conference in London. Design was taken as the central activity for various different disciplines, such as architecture, engineering, industrial design, stage design, typography, etc. The relavant contribution of this symposium to architectural design in particular is highly quetionable. Among twenty-eight contributors not more than four of them seem to be involved in the design process, either in a direct relation to architectural design or in closely connected fields, viz. Broadbent, architect; Jones, industrial designer; Penny, architectural sociologist; and Pleydall-Peirce, tutor in philosophy.

With its exclusive interest in hardware producing engineering, the symposium became a platform where various aspects of engineering design were discussed in a context as elaborate as the term 'design' implies. Though the technical achievements of the symposium from the 'design' point of view cannot be neglected, still it can hardly be considered as a substantial contribution to architectural design. It i is central theme of this work that the artifactual

[190] Thornley, D.G., Design Method in Architectural Education, ibid., pp. 37-51
[191] Lewis, B.N., Communication in Problem-solving Groups, ibid., pp. 169-183
[192] Cf. Hodgson, Anthony M., op.cit., Vol.2, No.s 1&3
[193] Denny, Robin, The Creative process, in Jones J.C. and Thornley D. eds op.cit. pp.185-193
[194] O' Doherty, E.F., Psychological Aspects of the Creative Act, ibid., pp.197-203
[195] Coleman, Roger, and Hodgkin, Howard, Creative Methods in Painting, ibid., pp. 195f
[196] Gregory, S.A., (ed), The Design Method, Butterworth, 1966, London,

processes and their outcomes, artifacts, can never be abstracted from their social determinants. The characteristics of such processes are quite similar to any other man-involving processes that have been discussed previously. In architectural design the artifacts perform their functions transcending the expectations of them as mere tools. Meanwhile any engineering tool can be considered as an extention of human organs, therefore not only architectural or planning design activities but also the engineering design activities need to be integrated into societal processes. In this symposium the only elements relating the design process to the social one were marketing, sales, client, need, etc.

Besides its closed system characteristics due to definite boundaries for design, the technical achievements of the symposium cannot be ignored. In particular the papers grouped under 'design techniques' bring together quite sophisticated discussions on models and their uses, illustrated with the presentation of some pratical projects. Gregory[197] classifies models in three groups i.mathematical models, ii. abstract models, iii. communication models. This classification is quite different than that of Ackhoff[198] but not better. Then, he subdivides the material models' into i.mathematical and b.optimization models.

The papers grouped under 'design techniques' are the applications of certain models and flow diagrams. Their philosophical implications are limited and they, are too limited to form the basis for a general hypothetical theory for design. Shahbenderiang,[199] Partongo,[200] Needham,[201] Matchet and Briggs,[202] Ellis,[203] Davies,[204] Corney,[205] McMullen[206] are the contributors who developed or utilized various techniques for design. Again, when Ackhoff's terminology is refered to, the hierarchical consistency of 'toolstechniques-methods' can be found.[207] In the symposium, since the utilized techniques do not belong to the same methodological category as the higher discipline, this consistency is non-

[197] Gregory, S.A., Models in Practical Design, ibid., pp. 143-155
[198] Ackhoff, R.L., Scientific Method, op.cit. pp.108ff, Classifies models as: i.iconic, ii analogue, iii. symbolic,
[199] Shahbenberian, A.P., The Implications of Economics in Engineering Design, in: Gregory, S.A., ed. pp. 157-165
[200] Parton, K.C., The Use of a Digital Computer in Design Process, ibid.pp.167-74
[201] Needham, A.M., A Practical Design:, ibid., pp. 175-181
[202] Matchett, E. & Briggs, A.H., A Practical Design Based of Method, (Fundamental Design Method), ibid., pp.163-199
[203] Ellis, F.L., Design Realization, ibid., pp. 201-210
[204] Davies, A.L., Selection of Materials, ibid., pp. 211-217
[205] Corney, C.T., Reliability and Maintenance, ibid., pp. 219-233
[206] McMullen, P., New Ideas in the Drawing Office, ibid., pp. 241-246
[207] Ackhoff, R.L., Scientific method, op.cit., pp.5ff

existent. Consequently, theoretically no feedback can be facilitated properly to check the method. Although technically highly sophisticated methods are utilized, philosophically they do not contribute much to the handling of complex problem situations of environmental design and subsequent design theory.

Three papers are collected under the title of Design Method'. The first is by Gregory,[208] it puts a specific emphasis on the satisfysing aspects of design; “The design method is a way of solving certain classes of problem: relating product with situation to give satisfaction.”[209] The end of design is human satisfaction. If design fails to deliver satisfaction it fails as a design."[210] This reveals definitely the consumer oriented design approach. Within a similar framework such approaches have been far better developed by OR researchers. They classify problem solving activity as: "adaptizing, optimizing, satisfysing".[211] Gregory mentions creativity as one of the basic issues of design, on that it is impossible to disagree. McCrory agrees to the above mentioned definition of the methodology of design:

"Methodology in design is rather the framework for the design process within which a sequence of action steps can be based and from which check points to evaluate progress can be established."[212] McCrory defines design as: "Design is considered as the process of selectively applying the total spectrum of science and technology to the attainment of an end result which serves a valuable purpose,"[213]

Eder,[214] classifies design methodologies under six basic catégories: Experience' is what he considers as the intuitive trial and error method. 'Modification' is altering the design according to the performance and shortcomings of design in order to avoid the undesired outcomes. 'Design trees! is the breaking down of decision in the form of a treelike hierarchy, from general to particular. 'Fully systematic method' is more or less the same stated by Jones in the previous CoDM, 1962 [215] conference. The last of Eder's five categories for design method is : "System Search' which is "obtaining the required system properties

[208] Gregory, S.A., Design and the Design Method, ibid., pp. 3-10
[209] ibid., p.3
[210] ibid., p.7
[211] Ackhoff, R.L., Fundamentals of Operations Research, J. Wiley & Sons Inc. International Edition, New York, 1968, pp.444f
[212] ibid., p.11
[213] ibid., p.11
[214] Eder, W.E., Definitions and Methodologies, ibid., pp.11-31
[215] Jones, J.C., A Method of Systematic Design, in Jones, J.C., and Thornley: eds., opcit.

by connecting the available elements in a suitable way, and thereby bridging the gap between the inputs and the outputs."[216]

In his introduction to the section titled 'The Human Perspectives'[217] Gregory does not go beyond the aspects of marketing and aesthetic needs which have been critically dicussed above. Contributors to this section include Mayall,[218] Stobart,[219] Shackel,[220] Penny[221] and Peplow,[222] almost all of whom have extremely limited understanding of society and its dynamics. They all reduce everything to an oversimplified man-product relationship. Such an interpretation of humanity may seem to be satisfactory for an engineering designer, but it does not disclose any unexplored aspects of design as an activity taking part in the complex set of interactions within the man-society-environment whole. The papers grouped urder "The Elements of Design" can be claimed to be the most contentful of them all. Watts,[223] interpreting design as a helical progression from the abstract to the concrete going through continious cycles of analysis-synthesisevaluation, outlines probably one of the most comprehensive product design process.[224] He utilizes set theory for the evaluation of the end products.[225] Newman[226] defines design as "a pattern created by man, with the purpose of meeting some specified requirement... whatever the requirement a design is essentially the result of a creative act."[227] Newman discusses the whole cycle, "from design to pattern and from pattern to thought process." He brings quite a different view in a rich terminology,

[216] Eder, W.E., op.cit., p.29
[217] Gregory, S.A., The Human Perspective, The Design Situations and its Opportunities, ibid., 35-38
[218] Mayall, W.H., Design and Human Satisfaction, ibid., pp.39-44
[219] Stobart, A.F., Invention, Design and Market Research, ibid., pp.45-48
[220] Shackel, B., Ergonomics and Design, ibid., pp. 49-57
[221] Penny, A.M., Sociology and Design, ibid., pp. 59-64
[222] Peplow, M.E., Design Acceptance, ibid., pp. 65-73
[223] Watts, Ronald D., The Elements of Design, ibid., pp. 85-95
[224] vide., Fig. 12, Reproduced from, ibid., p. 85
[225] vide., Fig. 13, Reproduced from, ibid., p. 87
[226] Newman, A.D., Patterns, ibid., pp. 105-109
[227] ibid., p.105

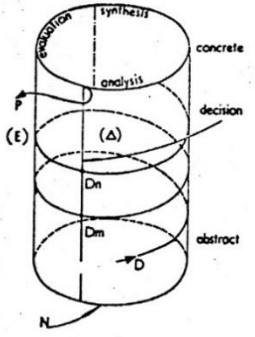

Fig.12

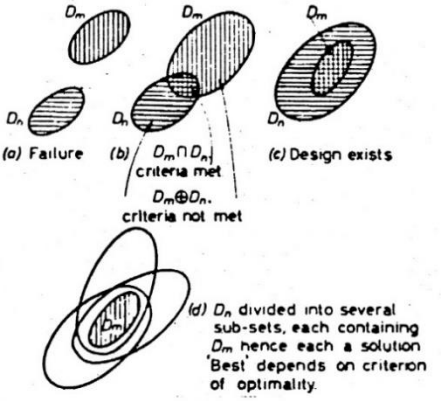

Fig.13

providing access to the clear conceptualization of design as patterns and sub-patterns. Broadbent,[228] the organizer of the-following symposium, is the only architect of BSymDM. His paper on creativity covers the total range of the creative act. He concisely summarizes the creative processes as; i. attribute listing, ii. Morphological analysis, iii. Forced relationships, being 'interaction techniques', and i. Brainstorming, ii. Synectics, with personal, direct, and symbolic analogies, being group activities. Pleydal-Pearce[229] deals with the 'choice' aspects of design. He conceives actions as 'overt' and 'covert' actions, the former being the physical and the latter being the mental actions. He also terms a completed action as 'act' and he discosses the philosophical implications of act and choice together with their causal and determinant factors. In the same section Gregory[230] deals with Decision Theory's relationship to design, considering decision both under certainty and uncertainty. Farradane[231] proposes nine categories for information processing, obviously, he sees information processing as the central issue of design.

The contributions to 'Management and Design' are closely linked to product design manufacture and marketing process. They have almost no relevance to

[228] Broadbent, Geoffrey H., Creativity, ibid., pp. 111-119
[229] Pleydell-Pearce, A.G., Choosing and Evaluating, ibid., pp. 121-129
[230] Gregory, S.A., Design and Decision, ibid., pp. 131-140
[231] Farradade, J., Information for Design, ibid., pp. 97-103

larger scale design activities. The papers were submitted by: Turner,[232] Davis,[233] Ross,[234] Buck[235] and Gregory.[236]

Jones, as the only person who contributed both to CODM 1962 and BSymDM, performed his authoritative role in reviewing the subject. Jones[237] classifies design situations under four titles: i, environment, ii. flow systems, iii. products, iv. parts. These categories are not exclusive, in a design situation more than one, or all of them may exist. (e.g. in architecture all four exist.) He analyzes methods under four titles: a. Methods of Diverging; "the common feature of the so-called systematic methods of designing."[238] These methods "permit a widening of area of search for interpretations of the problem and solutions for it." b. Methods of converging, are "evaluative rather thean exploratory."[239] and they tend not to diverge but towards an optimal solution. c. Strategies, are: 'minimum commitment' and 'choice between in-out and out-in design sequences'.[240] d. Computer Aided Design: the utilization of available quickly responding instrumental techniquess, i.e. sketch pad, key board, etc.

Eder[241] discusses the relevance of his previously mentioned methodologies to different fields of technology, e.g. mechanical engineering, electrical engineering, etc. Beck[242] outlines an ad-hoc report of his Professional institution, which typifies the narrow framework of institutionalization. Gregory[243] declares the emergence of Design Science':

> Design science is concerned with the study, investigation and accumulation of knowledge about the design process and its constituent operations. It aims to collect, organize and improve those aspects of thought and information which are available

[232] Turner, B.T., Design Policy Formulation, ibid., pp. 249-258
[233] Davis, R., Innovative Design as a Policy Function, ibid., pp. 259-267
[234] Ross, I.M., Effect of Organizational Procedures on Design, An Outline of the Problems, ibid., pp. 269-277
[235] Buck, C.H., Communication, ibid., pp. 279-285
[236] Gregory, S.A., Design, Management, Realization and Change, ibid. pp. 287-92
[237] Jones, J.C., Design Methods Reviewed, ibid., pp. 295-309
[238] ibid., p.304
[239] ibid., p.306
[240] ibid., p.307
[241] Eder, W.E., Technologies and Varieties of Design, ibid., pp. 311-315
[242] Beck, H.V., Preliminary Research into Electromics Design, ibid. pp. 317-22
[243] Gregory, S.A., Design Science, ibid., pp.323-330

concerning design which are likly to be value to practical designers and design organizers.[244]

In spite of all the negative aspects of the symposium, that keep it away from being relavant to the problems of environmental design, BSymDM can be considered as a positive effort for the foundation of design theory. That the list of references used by the contributers containing four hundred sources, in close or loose connection with design is considerable achievement.[245]

PORTSMOUTH SYMPOSIUM ON DESIGN METHODS IN ARCHITECTURE, 1967, PSymDMA

Portsmouth Symposium is probably the most remarkable attempt that has been organized for the theorization of architectural design. Although the symposium has been frequently criticised for not forming a coherent whole as a basis for design theory, it still has attained a particular relevance to environmental design. In the last decade architects striving to refer to a scientific theoretical basis instead of their intuitive frameworks and normative values, introduced quite a number of new techniques to the fields of design. Most of these techniques can be called 'borrowed techniques' since they had been developed for certain other fields of science. They seemed to be appropriate to design problems, either through analogies or through distations of actual situations. The expertise that architects possesed was to relate the scientific technique and the real relavance of the specific techniques to the context that they were utilized remained unanswered, sometimes even unasked question. However the terminology of theory of design was undisputeably enriched and the conceptual parametę of the boundaries were remarkably broadened. Although one may reasonably claim that the expressionist chaos of the percptual language was replaced with the theoretical chaos of borrowed techniques, this can as well be interpreted as the transitional state of being, from one to the other.

PSymDMA needs to be evaluated under the influences of such forces. It is not the beginning nor the final decision on the subject, but large step towards a design theory. The symposium can be categorized among those which not only dealt with the problems of environment in terms of technology but in terms of social context also.

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[244] ibid., p.323

[245] vide., Scher, Peter, Theory of Design, Report on Birmingham Symposium, Architect's Journal, 24th November, 1965, pp. 1223-1228

There is a for conceptual language to correlate the conceptual elements of environmental system and the behavioural system, thus describing the environment behaviour interface, dicussed by Studer.[246] Until recent years 'design theorists' or 'methodologists' tried to avoid the behavioural determinants of environmental structure. This was partly due to the confused state of the theory of behavioural sciences providing no definite method of relating their givens to environment, and partly due to architects inexpertise in translating the available givens of the behavioural sciences into their own concern. "Describing such an interface in a comprehensive, integrated and functional way assumes the resources of a comprehensive, integrated and functional science of behaviour. No such science exists."[247] Studer has a great deal of confidence in the emerging theory of the behavioural sciences. His model provides the required integration of behavioural determinants. He also, emphasizes the complementariness of the designer and behavioural scientist. Studer underlines the necessity of multidimesional analysis of 'need' which is in its present form very much dependant on pre-conceived forms provisions.[248] He emphasizes: "the needs themselves cannot be observed." They are mostly defined in terms of behavioral patterns. He constructs a model, including most of the relevant (known) variables in a design process, which covers physical, behavioural, symbolic, etc. entities. That model also contains feedback loops facilitating the modification of designed physical system.

Archer as one of the pioneers of design methodology, was among the organizers of CoDM in 1962. His presentation in the symposium is a concise summary of his thesis at RCA.[249] His endeavour is to utilize the available advance techniques for the act of designing. Since his field of application is industrial design, he does it quite succesfully. His paper consists of four major parts: i.

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[246] Studer, Raymond G., Dynamics of Behaviour Contingent Physical Systems, in, Broadbent G., and Ward, A., eds. Design Methods in Architecture, AA Paper No:4, Pub, Lund Humphries, 1969 London, pp.55-70

[247] ibid., p.59

[248] The discussions on 'need' in architectural context is an everlasting dispute, in 1958 Maldonado, T., op. cit., p.177 wrote: "., the French philosopher Henri Lefebvre, recently wrote: 'By the side of the scientific study of the productive relations which affect political economy, there is... room for a conccrete study of appropriation: for a theory of needs.' According to Lefebvre, this theory should answer the following questions; 'where and in what field do living man make contact with objects of consumption how do they attain goods in the actual sense of the word? how are they appropriated?.. whence come needs? Where are they formed? How? And how do they find what they look for? do needs form a whole? is thaere a needs' structure or needs' system? What is this structure?"

[249] Archer, Bruce L., The Structure of Design Processes, Reproduced by the Clearinghouse, USA, 1969, PSymDMA version in: Broadbent, G., and Ward, A., eds. op.cit., pp. 76-102

Nature of act of designing, ii. Systematic model, iii, Operational model, iv. Designing programme, In the first part he tries to establish the operational symbolization of the act of designing. The solution lies in the domain of feasibility acceptabilty, and functional relationship.[250] His systematic model covers

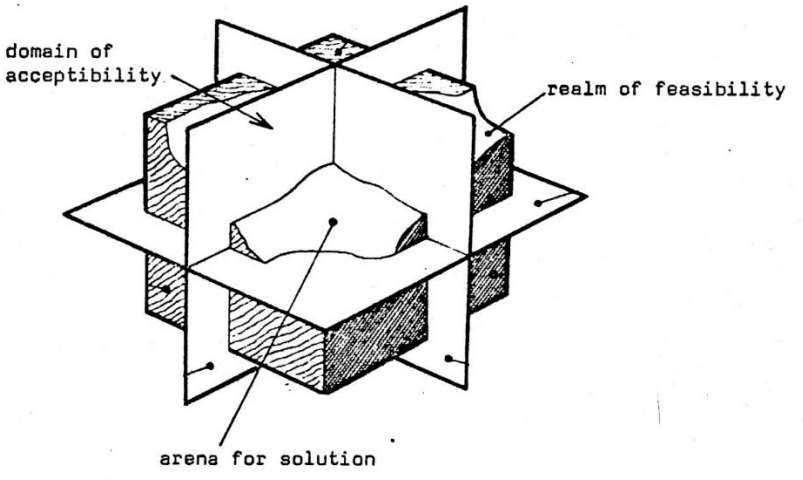

Fig.14

more complex problem situations, but still depends on obtaining optimum solution for agrred objective. This philosophically, is a search for fulfilment of geals under contradictory forces. Operational model, lists

whole sequence of required activities for industrial design where a critical path is to be followed. The last part is the programming of the activity, in terms of phases and sub-activities. Archer, utilizing the techniques and the subsequent terminology of the recent theories, viz. OR, systems analysis, CPM, cybernetics, etc. attains. a highly sophisticated level which contains his personal efforts of more or less the last ten years.

Poyner's[251] paper, in essence, refers back to his previous work in cooperation with Alexander.[252] He emphasizes the necessity of searching for causal relationships among the elements of design. The continious process of

[250] vide., Fig. 14, Reproduced from: ibid., p.83

[251] Boyner, Barry, The Evolution of Environmental Structures, ibid., pp.31-36,

[252] Alexander, Christopher, and Poyner, I. Barry, The Atoms of Environmental Structure, Research and Development Pub. Ministry of Public Buildings and Works, London, 1967

elimination of contradictions among the elements is mentionaed as the source of 'The Evolution of Environmental Structure'. He delineates this as an everlasting process which is a quite valid way of looking at the process, but in his paper he provides neither conceptual nor operational tools, sufficient enough to cope with the problems of the environment.

A rational approach is prosed by Guerra,[253] of Naples. His approach includes even the fuzzy elements of art, (creative instinct). His rational process can also be considered as the rationalization of the conventional processes of design. His aim of obtaining 'form' through the refinement a priori, agreed diagrams and fed information about site and building seems to be a limited version of the application of graph theory. His ultimate concern with the trinity of 'Firmitas-Utilitas-Venustas' generates numerous questions and weakens ones confidence in his method as an innovation if it can be called so, at all.

Hanson[254] discusses his application of Alexander's[255] method to a housing scheme at Cambridge. Hanson's application of the method does not go beyond an amateurish exercise. The translation of the subsets of the complexity into diagrams does not trancend the rationalization of certain anticipated physical form configurations. In reality the diagrams are expected to be the first step of transition from conceptual entities to physical entities. Thus, they are to form access to a variety of alternative forms, satisfying the objectives of the concerned subset. His achievment as a planning pattern does not go beyond being trivial.

Three different ways of designing are compared by Best.[256] These are Alexander's, Aalto's and an OR based students. Best conceives the act of designing in five stages as 'input-encoding-process-decoding-output'. Different methods are utilized for these stage by different designers. The relationships between the designed form and process differ greatly depending on the concerns of the designers. Best himself defines design as a variety restriction process. In this process the unstructured information of the situation is interpreted to facilitate various homorphic reductions. Then after variety regulation by invariant reduction and residual descrepancies, the design

[253] Guerra, Guido, A Geometrical Method of Systematic Design in Architecture, in: Broadbend and Ward, eds. op. cit., pp.45-54

[254] Hanson, Keith, Design from Linked Requirements in a Housing Problem, ibid., pp.37-44

[255] vide., Alexander, C., Notes on the Synthesis of Form, op. cit., App. pp. 136-191

[256] Best, Gordon, Method and Intention in Architectural Design, in: Broadbent, G., and Ward, A., eds. op.cit. pp.147-165

solution is realized. His diagrams produced for an actual design situation, a hospital, are extremely limited and dreary.

Rapoport[257] formulates the antithesis of the approaches utilizing models and other objective techniques for design. His scepticism towards techniques has mostly been caused by the unrelatedness of a model to tha reality. Since the models are logically consistent within themselves, they may become an end within themselves. Rapoport's complete rejection of newly emerging methods based on the process of breaking up a complexity into its simpler and more comprehensible constituent parts to obtain operational entities is unfair and can be criticised; but still, the intangible aspects of design on which he focuses are valid and no methodologist declares that he has sufficienty or completely resolved those. It is quite probable that Rappoport's reaction may create a temptation for future developments in theory of design. His proclamation that methodological approaches produce no better end results than the traditional methods is a very early conclusion on a subject which is in an explorative stage, with a history of even less than a decade.

'Splitable' and 'unsplitable' design problems are discussed by Jones.[258] One signifies a problem situation where the complexity can definitely be broken into its constituent parts, and the other covers a whole range of over-complex situations where such an operation is almost impossible. Splitable and unsplitable problems are also called the problems of 'hard' and 'soft' systems, respectively. Supplementary to his previous contribution, systematic design composed of analysis-synthesis-evaluation, he accepts other kinds of design approaches and he names them 'glass boxes, black boxes, and self organizing systems'. The first is the conventional approach to design as a fully creative process. The second is his systematic design method, and the third is the interrelated composition of the both.

The other papers adress a particular context of design as a problem solving or decision giving activity in the built environment. Markus[259] describes building perfomance measurement and appraisal as 'feed forward' elements of design decision sequence. Luckman[260] writes on his application of OR techniques to building design; Gregory[261] on his analogy between chemical engineering and

[257] Rapoport, Amos, Facts and Models, ibid., pp.136-146
[258] Jones, J. Christopher, The State-of-the-art in Design Methods, ibid., pp.193-197
[259] Markus, Thomas A., The Role of Building Performance Measurement and Appraisal in Design Method, ibid., pp. 109-117
[260] Luckman, John, An Approach to the Management of Design, ibid., pp. 128-135
[261] Gregory, Sydney A., Morphological Analysis, Some Simple Explorations, ibid., pp. 103-108

architecture: and Ward[262] and Longbone[263] on workshops, one for prisoners and the other for the blind, respectively. Moore[264] writes on office buildings.

Non-architectural papers were Daley's and Abercrombie's; Daley[265] utterly criticizing the chaotic state of the terminology of architectural theory due to the use of private languages and Abercrombie[266] discoursing on perception.

..AND THE OTHERS

There have been so many other sympozia searching for a theoretical basis for design. Most of these are directed towards the teaching of design and design method. Probably one of the most important of them was 'The Conference Course at the Hochschule fur Gestantung, Ulm, Germany' in April 1966. Ulm conference contained the educationalists of many schools of architecture of different nations. Ulm conference was followed by another conference which contained mostly the representatives of the

British schools of architecture. It was organized by the Great Britain Depatment of Education and Science and held at Attingham Park, Shrewsbury in 1967, and it is called 'Reporting Back'. At 'Repoting Back' different groups presented their programmes which they prepared at Ulm in the previous year. This contained eleven reports. There were also seperate contributions among which Broadbent's was probably the most interesting in which he puts eight categories of design process in reference to their philosophical and historical context. His categories are pragmatic, iconic, analogue, canonic, rational, emprical, interminate and systematic approaches.[267]

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[262] Ward, Anthony, Rightness and wrongness in the Physical Environment, ibid., pp.166-178

[263] Longbone, Neville, The Physical Organization of Sheltered Workshops for the Blind, ibid., pp. 179-192

[264] Moore, Ian, Design Methods and Development Programming, ibid., pp.22-30

[265] Daley, Janet, A Philosophical Critique of Behaviourism in Architectural Design, ibid., pp. 71-75

[266] Abercrombie, M:L. Johnson, Perception and Construction, ibid., pp. 118-127

[267] Aroadbent, H. Geoffrey, The Design Process, in Dept. of Ed. and Sci.
Ulm Reporting Back Conference, Attingham Park, Shrewsbury, 1967, pp.73f, he associates Pragmatic with trial-anderror; Iconic with the correct way of doing under certain circumstances; Analogue, with translation of iconic forms into more pemanent forms for ritual puposes; Canonic, with philosophizing by the concept of the 'ideal' therefore proportion becomes important; Rational with method; Emprical with knowledge gained by evidence such as aesthetics; Indeterminate with uncertainty and finally systematic as the unique discipline covering them all.

The series of conferences on design theory by the Environmental Design Research Association are quite important. The second of the EDRA conferences was held at Carnegie-Mellon University, Pittsbugh in October 1970. EDRA 2 contained variety of subjects. The contributers mostly concerned with the behavioural aspects of design that had been neglected until recently. EDRA 2 included Simon, Markus, Davis, Canter, Marshal, Wicker, Le Compt et. al, Bechtel and De Long among its contributers. De Long believing in the necessity of the constitution of a design theory says:[268]

> Despite many interesting beginnings, environmental design research still lacks rigour of methodology and the explicit direction of a theoretical reseach programme. It is not yet clear what we are looking for.[269]

[268] vide., Schubeler, Peter, EDRA, AD, June 1971, pp.371f, summarizes EDRA 2 papers as: Simon, Herbert A., Style in Design; Markus, Thomas A., Optimization by Evaluation in the Appraisal of Buildings; Davis, Thomas, Evaluating for Environmental Measures; Canter, David V., The Place of Architectural Psychology; Marshall, Nancy J., Environmental components of Orientations Towards Privacy; Wicker, Allan W., Processes which meditate Behaviour-Environment Congruence: Some Suggestions for Resarch; LeCompt, William F., and Willems, Edwin P., Ecological Analysis of a Hospital: Locational Dependancies in the Behaviour of Staff and Patients; Bechtel, Robert B., A Behavioural Comparison of Urban and Small Town Environments, DeLong Alton J., Coding Behaviour and Levels of Cultural Integration Synchronic and Diachronic adaptive Mechanisma in Human Organization.

[269] DeLong, Alton J., quoted from: Schubeler, P., op.cit, p.372

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