Excerpts* from the book

Time-Space-Technics

by

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From Chapter 1 (Constructing the Model)

Time-Space-Technics (TST) is the first comprehensive attempt to apply evolutionary systems theory to the historical development of human societies. It represents a feasibility study to ascertain what fresh insights can be gained by such an approach to societal structure and process. Specifically, TST creates a unique typology by organizing and classifying societies as open systems equilibrating with their natural environments in a hierarchy of levels of integration. In doing so, it identifies an evolutionary sequence of societal world-views.

TST recognizes as a *conditio sine qua non* that an evolutionary process has existed since the universe's inception, one that at all stages exhibits recurring isomorphic regularities and patterns. Likened to "a large-scale map", this "grand evolutionary synthesis" shows where we are in nature's scheme, and enables us to identify processes that can decide our future. Evolution is self-organizing, self-regulating, and open-ended, comprising a seemingly limitless number of interacting superordinate and subordinate entities. Its overall movement has been towards progressively complex organizational states. Invariance-symmetry exhibits a continuous patterning of forms and functions in the inorganic and organic domains, from the simplest to most complex levels of organization, accompanied at each level by the emergence of novel properties. Isomorphism demonstrates one-to-one correspondences among these patterned levels and lies at the heart of systems theory.

Three mega-levels of organization are identified: the physical (or inorganic), followed by the biological (organic), and thence the sociocultural, with each successive mega-level building upon

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a previously organized foundation. After this planetary processual overview, the thesis concentrates on the sociocultural stage and its emergent attributes. Here the model examines the relation of our species to others, and the evolution of unique cognitive and normative characteristics enabling us to become progressively powerful actors in shaping the global environment.

Inherent in structural-processual dynamics is invariance under transformation: more precisely, a correlation of invariance with symmetry, and transformation with symmetry-breaking. Symmetry has affinity with form, organization, equilibrium, order, evolutionary continuity, and invariance of underlying structural and spatial patterns (such as the hexameter pattern of the snowflake), while asymmetry inheres in motion, process, disequilibrium, disorder, systemic and temporal transformation. We are dealing with systems that are dissipative, i.e., with obtaining and expending energy, and with a universe (as mega-system) that is orderly but continuously maintaining this order through fluctuations, with a system either returning to the status quo ante or quantizing to a different level of organization.

This concept of invariance under transformation combined with isomorphism provides the epistemological key to evolutionary systems theory and – for our purposes – the systemic analysis of societal evolution.

Sociocultural systems employ two types of technics by which to equilibrate with their environments. Technic is defined here as "any branch or method of applied learning"; it is employed in preference to "technique", with its more restrictive connotation, namely, "details of procedure essential to expertness of execution in any art, science, etc." With regard to the physical environment, people conceptualize and fabricate tools essentially to *attain* greater control. These can be designated *material technics* (T_M), which may be as rudimentary as an Acheulian hand-axe or as complex as the telemetry that keeps a space-capsule on its flight-path to Mars. Material technics have a special relevance to the *spatial* organization of phenomena, with the *viability* of a given society in large part determined by those technics controlling and modifying its material environment.

Once material technics have attained this viability, how is it *maintained*? For this function a second type of applied learning is required. *Societal technics* (T_S) comprise the institutions and methods by which a community undertakes to organize, and retain, balance among its members and with the environment. These technics include religious mores, law codes, governmental administrations, caste systems, economic institutions such as guilds, corporations, etc. As a

correlative proposition, a society's *longevity* tends to be proportional to the effectiveness of its members in adjusting their culture and activities to the continued exploitation and modification of the environmental potential. Consequently, societal technics relate especially to the *temporal* dimension: they function to provide continuity.

In systems theory, material technics have a close affinity with positive feedback processes, societal technics an equally logical affinity with negative feedback processes. Negative feedback dominates in maintaining sociocultural equilibration in any given level, while positive feedback is required to move from one level to another. (Note the use of "to another" rather than "to the next": knowledge and organizational control can be both acquired and lost, so that deviation-amplification may result in either an increase or loss of societal integration.) There is a strong correlation between symmetry or balance and the dominance of societal technics. Conversely, an equally strong correlation exists between asymmetry or imbalance in a societal system and dominance of material technics – as by technological invention and the exploitation of energy sources – to regain a previous equilibrium state or to move to a new level of societal organization and environmental control.

At the level of the human organism (L8), societies display their own hierarchy of integrative levels. The evolution of sociocultural systems proceeds from the Palaeolithic (S1) to the emerging global (S5) stage. As with Morgan, we can regard the evolutionary process in two senses: (1) the "unfolding of that which is enfolded", i.e., explicating the potential; and (2) the "outspringing of something that had hitherto not been in being." The "unfolding" process is *horizontal* inasmuch as sociocultural development calls for actualizing the potential of the transacting components of the Universal Culture Pattern (UCP) as enclosed by the parameters of a given level (S1…Sn). Conversely, the "outspringing" process is *vertical* in that it occurs across the boundaries of a given level to quantize to a new level with its own parameters. Once quantization has taken place, the "unfolding" process again actualizes the potential of that level. In TST terms, the "unfolding" process relates to incremental evolution, the "outspringing" process is synonymous with revolution.

Planetary history attests to an overall thrust from simple to more complex integrative levels – but the overall process is not necessarily unidirectional. True, biological information is genetically encoded at L5-L7 and transmitted with almost complete certitude in "impleted" (intra-dermal) space, so that the evolutionary process does point to progressive complexification. Above L7,

however, cerebrally derived information is transmitted across "expleted" (extra-dermal) space – and history is replete with the distortion or loss of such information. Add to information loss a failure of T_M and T_S to equilibrate viably, and a societal system can quantize "downward".

Theoretically, at any level a system can equilibrate indefinitely within its given environment. The coelacanth was supposed to have become extinct in the Cretaceous period (135-163 million years ago), but continues to exist at optimal depth and temperature in the Indian Ocean. Numerous societies in turn have shown a capacity to remain viable over long time-spans. Such, for example, are the Inuit surviving as S1 societies, necessarily remaining at the food-gathering level since their habitat is north of the tree-line, or again, the S2 cultivators of New Guinea. (The penetration of alien S4 T_M and T_S can drastically alter or destroy the UCP of less complex communities; commensurate with the dynamics of PIL, the more complex tends to dominate the less complex.)

To generate a major quantum shift, a corpus of systemic innovations is required, one capable of affecting all segments of the UCP. The factors responsible for a shift from one level of societal organization to a more complex level are:

1. Technological-scientific innovations
2. Increased production and consumption of energy
3. Increased environmental control capability
4. Exponential growth of populations
5. Economic growth and social complexification
6. Increased production/distribution of information
7. Increased societal feedback and control
8. New aesthetic canons and modes of expression
9. New cultural world-view.

There are two ways to regard these factors. The first would be the traditional approach: to see them as a corpus of basically autonomous elements functioning in a chronological, functional sequence. Hence quantization might originate with technological innovation, which in turn results in a logical sequence of increases in energy consumption, environmental control, information, population, economic activities and social complexification, and in aesthetic experimentation, culminating in a new world-view. But historical evidence does not support a linear approach. The key factors responsible for a societal system's new organizational level quantize together. All segments of the UCP are involved, and the quantizing factors interact and synchronize their

respective activities, so that the landscape swiftly transforms as a new cultural identity. The whole is both greater and other than the sum of its parts.

Nonetheless, the key role of T_M in quantization is evidenced by the fact that of the nine factors identified, the first three fall unequivocally in that category. If by that we meant that the other factors are mere epiphenomena of technological change – that causal change is unidirectional – then TST would constitute a form of technological determinism in a strong sense. TST rejects strong technological determinism, since it must be recognized that in the evolutionary dynamic *all* segments of the UCP are *constitutively interacting* in a whole that is other than, and more than, either any one segment or the simple addition of all of them. What we maintain is (a) that there is an overall historical *tendency* for the technological powers (material technics) of human society to develop, (b) that all other segments of the UCP must be compatible with the existing level of technological development, and that not just any conceivable set of segments will be compatible, (c) that the development of material technics typically provides the *positive feedback* for initiating societal complexification. TST asserts that there is a strong explanatory link between a society's environmental control capability, its institutions, and its world-view.

Human societies, like all living and open systems, are maintained by a continuous flow of energy. Not only is energy flow required to maintain a socio-political system, but the amount of energy must be sufficient for the complexity of that system. The evolution of human society, from Palaeolithic to industrial forms, is marked by the appropriation of more and more energy from the environment. There appears to be a relationship between the ability to utilize greater amounts of energy and the ability to allow for societal complexification and social hierarchies. More complex societies are more costly in energy terms to maintain than simpler ones; they require greater support levels per capita. As societies increase in complexity, more networks are created among individuals, more hierarchical controls are created to regulate these networks, more information is processed, and there is increasing need to support specialists not directly involved in resource production. All this complexity is dependent upon an energy flow at much greater scale than that characterizing small groups of self-sufficient foragers or agriculturalists.

The more evolved and complex the social organism, the more energy is required to sustain it and the more entropy is produced in the process of maintaining it. Historically, every civilization ends up sucking more order out of the surrounding environment than it ever creates and leaves the earth more impoverished. Societal collapse sets in when a mature civilization reaches the point at which it is forced to spend more and more of its energy reserves simply to maintain the complex social arrangements, while experiencing diminishing returns on the energy enjoyed per capital. Thus societies collapse when the energy flow is impeded and no longer available in sufficient

quantities to sustain the increased populations, defend the state from attack, and maintain the internal infrastructures.

Society's interaction with its natural environment is the essential given from which all explanation of the structure and evolution of society must start. This is not a claim about causal dominance. That a society's environmental control capability is, in particular, key to understanding its world-view is a claim about reciprocal effect, involving at once recognition of the role of material technics in *selecting* (delimiting the options for) a compatible world-view and the disposition of a world-view to *facilitate* a certain level of environmental control capability. What explains the existence of a viable world-view is the effect it has on society's institutions and ways of interacting with the natural environment. A world-view must be functional for a society's interaction with its environment if that world-view is to persist.

A world-view is an overarching conception of reality that makes sense, to those who hold it, of the place of human beings in the world. A *dominant* world-view is an organizing principle that pervades and colours all segments of the UCP. A world-view does not evolve incrementally from earlier ones; each *ab initio* is a unique construct appropriate to a specific level of organization. Nevertheless, a world-view gestates at another, earlier level, in opposition to that level's dominant world-view. While progress in material technics provides the positive-feedback "push" for the transition from one level of organization to another, the gestating world-view that accompanies this development provides positive-feedback "pull" for the transition; it legitimates the emerging order and is the organizing principle around which elements of the new societal level coalesce. Conversely, a dominant world-view provides powerful negative-feedback for maintaining the established societal order.

TST identifies three historical world-views and a fourth, emerging one. The world-view shared by societies at the S1 and S2 levels of organization is designated *Mythos*. That of S3 societies is designated *Theos*, and that of S4 societies is *Logos*. Today a new world-view is forming, one that manifests the consciousness of stage S5 and that this study calls *Holos*.

Our lithic ancestors had a mythopoeic epistemology compatible with their view of reality. It is represented by "That am I" or "Thou am I". In Western scientific thinking, an object, an "it", can be related to other objects whose behaviour in given circumstances is predictable. But where lithic societies are concerned, we are dealing not with subject-object but with subject-subject. The whole world was animate and personal to our lithic forebears. Faithful to a monadic and internally consistent world-view, their investigations of the phenomenal world resulted in unique breakthroughs, as in tool-invention and plant and animal domestication. Indeed, one can argue

that an "I/Thou" view of reality was the paradigm required for conceiving and achieving the long and tedious process of altering the relationship of floral and faunal species to our own – and our species to them as well.

As our thesis advances, it traces a progressive shift from mythological (Mythos) to mythological-rational (Theos), and thence to rational (Logos) epistemological stages. In Logos it results in an uncompromising demarcation between "I" and "it", a total shift from *personal identification with* to *impersonal detachment from* in the environment-human nexus. Today, however, Logos – with its dualistic, two-valued (either/or) orientations – is in turn yielding to multi-relational forms of logic and orientation (both-and) that go far to identify the world-view of Holos.

It should be emphasized that the model presented here is just that: a model, or ideal abstraction from historical reality, based on principles of evolutionary systems theory and focusing on attractor points (states of systemic integrity and stability) that shape historical change. Real, or empirical, history displays the vagaries and recalcitrance of human agency operating under structural pressures. It does not conform precisely to the model because every society involves the unpredictable decisions of human agents, as well as carrying the accumulated weight of its unique past – the cultural traditions that are the "memory" of previous historical eras – and in part because societies seldom exist in isolation and are frequently disturbed or disrupted by external influences. This tension between the ideal and the real will be amply illustrated in the story of Logos, from ancient Greece to the present. The model, though never fully realized in the historical record, nonetheless reflects real structural constraints on historical development. As such, it is the contention of TST that a systems model can provide important insights into the past development of human societies and can outline the conditions that must be met to establish a viable world civilization in the future.

From Chapter 2 (From the Big Bang to the Conceptual Rubicon)

For aeons, life perpetuated itself through *asexual* reproduction, involving self-division whereby an organism cloned itself. The complex and elegant orderliness of organic matter can be observed in the process of mitosis (cell reproduction). This word is from the Greek for *thread*, and provides a key to the symmetry of living forms and functions. Where in an inorganic crystal the structure may be seen as an ordered array of points distributed symmetrically around a point at the centre, the living cell advances from centro-symmetry to linear symmetry, where two polar bodies take up positions during mitosis. The axial line thus established becomes the centre of a symmetry of forces: the chromosomes arrange themselves along this equatorial plane, while astral rays are anchored to the polar bodies (providing an effect observed when lines of longitude are drawn on a terrestrial globe). Meanwhile, wholeness is restored to the cell's volume by the dissolution of the nuclear membrane. "Thus the cell activates itself in the geometric sequences possible in our three-dimensional space: point, line, plane and volume." (We shall see this mathematical sequence repeated in the geomorphological evolution of sociocultural systems.)

At the level of self-reproducing "clones", each organism exists in a state of comparative self-sufficiency and isolation from other organisms. But about a billion years ago occurred systemic quantization calling for sexual reproduction by the coupling of an organism and partner. The biological innovation of sexual coupling "vastly increased the possibilities for generating the variability, diversity, and complexity of species that has produced the richness that is the wonder of life on this planet." Sexual reproduction involves meiosis, a process of cell division producing gametes, cells containing only one copy of each different chromosome from their parent cells (instead of the normal two copies), so that when two of these gametes (e.g., sperm and ovum) unite, the full complement of chromosomes is restored.

Sexuality, itself an emergent property of biological evolution, bears with it a major qualitative attribute: the genesis of the *normative* dimension. During the long period of asexual reproduction, an organism, while aware of other organisms, would have *cared for itself*, its instinctual value being inner-directed. (By "instinctual", we refer to an organism's response to environmental stimuli that is largely hereditary; it does not involve reasoning and its behaviour pattern is constant.) But with meiotic coupling came the next qualitative stage: caring about another. Organisms "would have been forced out of their previous comparative isolation to periodically feel an urgent new need for another organism of a very special type – an organism very much like

themselves in general appearance, but at the same time subtly differing from themselves in sexual equipment."

We encounter here the evolutionary basis for future moral sensibility. As the aeons followed one another, coordinated activities were required for mutual survival, and what Darwin characterized as the *parental instinct* developed whereby organisms were instinctively impelled to protect and nurture their offspring. To do so, the brain had to evolve to a new part of the limbic system. Known as the septal subdivision, it appeared with emergence of the reptiles. This innovation was demonstrated by the dinosaurs; reconstructions of how they lived some 200 million years ago indicate that they built nests and warmed and protected the eggs out of which their offspring would emerge.

The dinosaurs themselves climaxed a long and ever-complexifying process of gene exchange and variability, out of which countless different species emerged, stage by stage over the planet: worms, jellyfish, trilobites, clams, insects, the first trees and amphibians. But again the evolutionary curtain rose to show new actors taking centre stage: warm-blooded mammals. Studies of the limbic system show that the emergence of the third of its three main parts, the thalamocingulate division, occurs solely at the mammalian level of evolution. It added a further capacity for the more prolonged nursing of the infant, and to enable mother and child to stay within sight and hearing of one another. It also provided a new capacity for the group enjoyment of *play*. It was this novel attribute that would have "served originally to promote harmony in the nest, and then later in life, affiliation among members of social groups.... From the standpoint of human evolution, no behavioral development could have been more fundamental" because it "set the stage for a family way of life with its evolving responsibilities and affiliations that has led to worldwide acculturation." This "social bonding" seems in turn "to have favored the evolution of the human sense of empathy and altruism." In effect, the compassion and altruism that Dawkins could not discover at the level of the so-called selfish gene has now been located in a series of emergent cerebral properties.

Descartes was wrong when he claimed that non-humans are all mindless machines. There is a fundamental continuity between humans and other species. Humans share 98.4 percent of their genes with chimpanzees, our ancestral line having parted from theirs some six million years ago. Chimpanzees are more closely related to humans than they are to gorillas. Indeed, on the basis of genetic distance, it is questionable whether *Homo sapiens* constitutes a biological family distinct from the (other) apes, or even a genus distinct from the two species of chimpanzees. Darwin was

right to insist that many of the characteristics that we think of as typifying humans, including abstract thought, emotions, and moral sensibility, can be found in at least incipient form in many non-humans. Recent studies have revealed that the conceptual powers of mammals and birds are significantly greater than formerly assumed. Yet though Darwin claimed that differences between humans and non-humans are differences in degree only, the course of evolution has turned differences in degree into qualitative differences. Given the impressive mental powers of chimpanzees, which may approximate those of normal three-year-old human children and which may include some grasp of human language on the part of "enculturated" chimpanzees (those raised by humans in a culturally enriched environment), it could be suggested that chimpanzees and perhaps a few other of our nearest kin, though not on our side of the Conceptual Rubicon, are, metaphorically speaking, in the midst of the stream itself. In this regard there is evidence of cultural variation in tool-usage and social behaviour among chimpanzee communities in the wild. However, it remains only humans who display any capacity significantly to modify their environments in a planned and accelerative fashion.

In order to describe the crossing of the Conceptual Rubicon, we need to rely on more than cranial capacity as our causal vehicle. We encounter an overlap between the lower part of the range found in *Homo* and the upper part of the range of *Australopithecus*, indeed the upper part of the pongid range as well. Brain size, bipedalism, opposable thumbs, tool-making, abstract thought – none of these by itself is sufficient to explain the crossing, a transition that required a confluence of factors. Among all the interacting factors, however, the acquisition of language is key, for language enables humans to develop sophisticated mental models of the world, to communicate these concepts to their fellows, and to build on socially accumulated knowledge.

The dictionary defines "concept" as "an abstract idea generalized from particular instances" – and it is obvious that many concepts derive from immediate sensory data. It is this capacity to abstract, and to universalize from particulars, that lies at the heart of the "rational and reflective", transcending the distractions and limitations of the present-tense "sensory and spontaneous." Although, as Darwin maintained and as recent studies of creatures from chimpanzees to parrots confirm, various non-human animals possess the power of abstract thought, in human beings this power, mediated by the use of language, is qualitatively unique. Another distinction between human and non-human animals is the length of time through which our consciousness extends. In non-humans this dimension is small; it stretches but a short way into past and future, but in humans it grows both quantitatively and qualitatively.

Even as the organic levels of organization have emerged out of, and in turn been superimposed upon inorganic levels, so our emergent species in turn will superimpose its own manipulative, i.e., sociocultural-technological, stages of equilibration upon preceding levels. But unlike the genetic traits transmitted in impleted, "biological" space, our species' cultural traits are transmitted in expleted space through the communication of knowledge and behaviour patterns. In non-human species, only the threshold of this kind of communication is attained; thanks to its conceptual, symbolic, and verbal capacities, in humankind such communication will be expanded to evolve technologies equivalent to the externalization – and universalization – of its highly evolved nervous system.

From Chapters 3 and 4 (Mythos)

The Palaeo*lithic* and Meso*lithic* stages of systemic evolution convey the concept of stone tools and the remarkable inventiveness and ingenuity exhibited in their manufacture. But there comes a point after which the law of diminishing returns applies, when it is no longer possible to make a "better" or more efficient hand-axe, blade, or microlith for a hunting-fishing economy. Beyond this point of optimal efficiency of function we may observe continued refinement to the aesthetic component, such as by polishing the artifact's surface, or its incising with designs. Indeed, polished stone surfaces were a feature of Neolithic tool-manufacturing, yet there was little T_M invention in the New Stone Age.

This does not mean that lithic T_M will henceforth be discarded; instead, we can look for an analogy in biological evolution. Once a species has been established, its continuation will be ensured so long as environmental circumstances remain compatible. Similarly, today there are Mesolithic and related cultures which still employ the basic lithic T_M which Stone Age societies devised.

The Mesolithic represents, in another related sense, an ultimate stage in evolutionary development. By then humans had attained an optimal technological plateau as regards prime-movers when they supplemented their own body systems, namely, their muscles and natural leverage, by the addition of external leverage attachments, as noted above. To make a technological quantum leap beyond that plateau, humans must employ non-human prime mover sources. These can take the form of water or wind, or again, other biological systems – animals inhabiting the same ecosystem. Mesolithic folk made this conceptual breakthrough by domesticating the dog in order to propel sleds and, as a concomitant, to extend controllable space. It is understandable that Homo would first turn to organic sources for additional energy – inasmuch as animals are especially conspicuous in any food-gathering economy – prior to devising mechanical agencies powered by water or wind. Yet important as this initial step was to a new symbiotic relationship between our and other species, domestication would have to await full quantization in the next stage of societal evolution when it became one of several factors responsible for systemic transformation.

From the foregoing, we can suggest that the Palaeolithic/Mesolithic level is as far as humans can proceed beyond an adaptive relationship with the terrestrial environment so long as they remain on a food-collecting plateau. Because they must depend on a food supply which they neither create nor can ultimately control, they are limited to at most a semi-sedentary existence. Here we are reminded of an analogy with D'Arcy Thompson's theory of transformations, which

points out that morphological (and related) limitations present in the parameters of any classification (mathematical, physical, or biological) necessitate the presence of a "principle of discontinuity" in the evolutionary process. At this stage, incremental progression must give way to a new conceptual model with its own corpus of societal and material technics.

Just as the sphere exists in three dimensions, while its two-dimensional projection is a circle, it is logical to find circular forms in the "lowest", i.e., the simplest stage of sociocultural organization, that is in Palaeolithic and Mesolithic spatial constructs. Thus, in *impleted* human space, we find curvilinear forms in the earliest known remains of humanly constructed shelters or huts. These are tent standings marked by a ring of mammoth bones. They date from the Middle Palaeolithic Mousterian phase, at Molodova in south Russia, and perhaps before 40,000 BCE. Again, circular tent-sites with stones or bones to hold down the tent or to secure its guy-ropes have been found in the Ukraine and at sites near Hamburg, such as Arhrensburg; these last date from the final glacial phase, about 8500 BCE.

Mesolithic Jericho, too, was constructed on a curvilinear basis yet the upper or Neolithic levels assume rectilinear forms. As we shall see, in Neolithic societies (in the Old and New Worlds alike) we find evidence of a progressive shift from spatial curvilinearity to rectilinearity, and also to rectangularity, seemingly a correlate of progressive specialization in coping with the functional needs of society.

That a patterning principle is also at work in sociocultural constructs in *expleted* space lies at the fore of various modern geographical theories: Thünen on agricultural location, Weber on industrial location, and Christaller on cities as "central places" to provide goods and services for a surrounding tributary area. Animals possess a territorial sense; some (such as baboon troops) subsist in areas with roughly circular perimeters (even as the schematic depiction of instinctive behaviour patterns, based upon negative feedback, will assume circular Gestalten). In turn, when Palaeolithic communities acquired semi-permanent habitats (such as the Neanderthalers living in caves), their hunting grounds tended to assume a roughly circular area so as to optimize the relationship of economic distance to habitat, i.e., of spatio-economic "situation" to societal "site". Where Mesolithic societies engaged in fishing occupation and were sited along the littoral of, say, the Baltic Sea, the expleted spatial configuration would assume (schematically) an elliptical shape. Present-day villages tend to have circular marketing areas, and we would expect in theory to find Neolithic nodes of village size with similar characteristics.

Our discussion of societal evolution in this chapter sustains the logical hypothesis that a direct correlation exists between the manner and extent of cultural-technological development and the rapidity and degree of ecological change. For example, extreme ecological alterations triggered rapid movement towards more advanced forms of environmental adaptation and control in mid-latitude Europe, whereas gradual societal transformations occurred in Africa and India, regions of minimal or slow-moving changes in the environment. But the nature of the human response to these respective environmental processes led to very different results.

In western Asia, the change towards greater aridity took place in an environment which, though disturbed by this aridity, nevertheless possessed biotic communities which proffered a natural potential to enable humans to proceed to a succeeding ecological-economic plateau, that of food production. In the middle latitudes, such as in Europe where deglaciation expanded the food-growing environment, the presence of both sufficient solar radiation and copious amounts of rainfall conduced to provide an *aurea sectio* for food-gathering economies. The rich vegetation cover tended to extend the Mesolithic stage for two reasons: (1) it offered an optimal environment to sustain large populations of herbivores and fish; while (2) its density acted as a brake upon the existing logging and ground-clearing capabilities of Mesolithic technology. Hence, in transalpine Europe, the Mesolithic represents a northward extension and further evolution of the Late Palaeolithic cultures – already existing in the Mediterranean zone – and manifests itself clearly both as a "stage" and "age".

In contrast, as our forebears migrate into still higher latitudes, that is, into regions of ever-diminishing solar radiation and concomitant biotic limitation, they reach a point of quantum impoverishment: that of the tree line where environmental restrictions defy advancement beyond the food-gathering stage. Here the Mesolithic is no longer a "transitional" economy. The forces of adaptive and manipulative equilibration meet at a point of balance resulting in a so-called "stationery" economy (and culture) – which would appear to describe the traditional Inuit "tour de force" culture.

From the foregoing, it is apparent that "stage" and "age" are far from being coterminous. By whatever ecological-technological means it was accomplished, "Mesolithic" constitutes a stage in human environmental control – but its length of duration would appear to be in inverse ratio to the capabilities of existing T_M to diminish the strength of the external factors of adaptive equilibration.

Let us carry our line of reasoning a step further by postulating that in any of the age-stage relationships in our systems thesis, it is "age" which represents the more inconstant variable in the

equation. First, it reflects the respective strengths of adaptive and manipulative equilibration forces, which vary according to the dynamics of the homo-environment relationship. Second, "stage" directly reflects the conceptualizing process, and this process is continuous, precisely because it is universal and open-ended, that is, evolutionary. In other words, it is normative for Homo, to move from food-collecting to food-producing (through the various technological stages described as Palaeolithic, Mesolithic, Neolithic), and thence to advance *seriatim* to metal and still more complex technologies and economies. History attests that this cultural-technological sequence occurred in very different times and places (and independently) in both the Old and New Worlds. (The strength of the argument for unidirectionality in the conceptualizing process can be further tested by attempting to find evidence of cultures which proceeded from a food-producing to food-gathering stage – or again, from the use of metals to reliance only on stone artifacts.)

Consequently, within the planet's *aurea sectio*, that is, in those physical environments possessing biotic communities capable of supporting both food-collecting and food-producing economies, it will be therefore normative – consistent with its cultural and technological dynamics – for our species (a) to advance unidirectionally (as described above), (b) to universalize our environmental control, that is, to explete the anthroposphere to the extent of the capabilities of each successive development in T_S and T_M until a new ecological balance is struck between the equilibrating forces, and (c) to accelerate the processes of technological and cultural change.

By the same criteria, we shall find "age" dominant in the equation precisely to the extent that the forces of adaptive equilibration either retard, or again in certain environments (those outside the *aurea sectio*) totally inhibit the capabilities of existing T_M to universalize, and accelerate, the processes of progressive manipulative equilibration.

Finally, from the foregoing we are required to qualify the definition of Mesolithic as a "transitional" period: (a) from an evolutionary standpoint *all* technologies and cultures are open-ended and therefore in constant transition, while (b) from a strictly durational standpoint, certain Mesolithic cultures have never advanced to a succeeding or food-producing stage. However, the Mesolithic exhibits a characteristic that is constant throughout the evolutionary process. This is to provide one or more conceptual innovations which in their empirical development helps to set the stage for the next technological and cultural stage. Thus, just as the semi-sedentary form of communal living anticipates the permanent settlement pattern of the food-producing cultures, so in turn the domestication of the dog heralds a new relationship by Homo with other species which will reach full realization in the Neolithic stage. Again, the utilization of pottery is normally

associated with fixed settlements and food-production. However, crude pottery is found in some Mesolithic sites, attesting to sufficient fixity of habitation to justify making this basically fragile artifact, and also to an expanded conceptual approach towards the time dimension – since pottery stores water and foodstuffs, as a concomitant it reflects a new emphasis by its users to think not only in terms of time-present, but increasingly in time-future as well. This "stretching" of the durational concept is a necessary correlate of the farming season (as we shall see in the Neolithic stage), but certain Mesolithic communities have already provided a conceptual prototype.

A useful way to begin the analysis of a historical phenomenon is by learning from what it does *not* represent or explain – even as examination of *terra incognita* in an early explorer's map tells as much about the state of knowledge of the day as its demarcated land and ocean areas. The absence of cave paintings with their naturalistic depiction of single and separate images calls for an explanation why and how Neolithic art turned to new subject-matter and new techniques of expression. That "we find an art that is entirely different in kind, an art in which completely new formal elements are present" is because "These elements reflect a new way of life."

Again, in contrast to later societal and aesthetic epochs, "a theme notable for its absence from Neolithic art is imagery idealizing armed might, cruelty, and violence-based power. There are here no images of 'noble warriors' or scenes of battles.... And in marked contrast to later male-dominant civilizations, like that of Egypt, there is here no sign of mighty rulers who take with them into the afterlife less powerful humans sacrificed at their death."

What then is Neolithic art, and what are its formal elements? The most striking immediate feature is its shift from Palaeolithic naturalism to geometric art and abstraction. Neolithic artists created geometric patterns and formalized pictures of cattle and flocks which they painted on pottery and the carved handles of farm implements. In the Iranian plateau, for example, animals appeared most often to serve as the inspiration for developing designs. The development of Neolithic crafts was not only of economic and social value but significant for this new stage of aesthetic consciousness. Although basketwork of this period has perished, the geometrical designs on its pottery are strikingly similar to those found in the basketwork of anthropologically primitive peoples of historical times (such as the Tlingit of Alaska). To take another example, the oldest style contributing to the formation of the multiform decorative art of Indonesia is of Neolithic origin; it is characterized by conventionalized frontal-type figures of ancestors, magic symbols such as buffalo horns and human heads, renderings of the so-called tree of life, and fairly simple geometrical ornaments.

Throughout history a close nexus has linked art and religion. The role that religion per se plays in Neolithic society is dealt with when we take up the Mythic. Meanwhile, the aesthetic expression of Neolithic religion is illustrated in such phenomena as abstract and animal symbols from nature together with megalithic shrines and tombs, inspired in turn by veneration of the Earth Goddess or Mother. Among the symbols from nature are butterflies and serpents (signifying metamorphosis), egg-shaped stone sculptures with the faces of fish, cult vases in the form of birds, and large stone heads of bulls with curled horns such as those painted on the walls of shrines in Catal Hüyük. "And everywhere – in murals, statues, and votive figurines – we find images of the Goddess. In the various incarnations of Maiden, Ancestress, or Creatrix, she is the Lady of the waters, the birds, and the underworld, or simply the divine Mother cradling her divine child in her arms."

In late Neolithic times, tombs incorporated the conceptual linkage of death and rebirth; it has been suggested that their significance was analogous to that which caves had for Palaeolithic peoples. The intricate passageways to the cave's interior, where contact was supposedly made with the spirit world, are now represented by the winding and tortuous routes leading to the interior of Neolithic tombs. There in the central chamber, the womb, the dead are laid, and presumably it was to that same chamber that the spirit would one day return. The crouched position in which many of the Neolithic dead were buried might well have been a symbolical representation of the foetus. Similarly, geometrical designs on the walls could have acted as symbols of the tortuous journey that the soul must make through the spirit world.

These tombs, together with temples and circular monuments, are known as megaliths because of the large size of stones used in their construction. Found along Neolithic trade routes, evidence of this megalithic cult exists in regions of Africa, Europe, Asia, and the Americas, with the style varying in the different environments.

Neolithic art and architecture are notable for their use of circles. "The circle is the first perfectly regular form to appear in primeval art; it is also the longest lived.... In primeval art the circle in all its various guises – balls, hollows, perforations, spots – exerted an extraordinary fascination. Its meaning was manifold, but was always related to the external human desire for procreation, for fertility.... The circle, which Plato deemed the most perfect of all forms, exerted its magic sway even in primeval times." This is exemplified in the discovery of Australian cave paintings, some 75,000 years old, with their hundreds of perfectly drawn circles.

Circles and rings figure prominently in megalithic architecture. Scattered throughout the British Isles are thousands of small and large megalithic sites, two of the most famous being

Avebury and Stonehenge. These sites existed as ritualistic sanctuaries. It is suggested that concentric circles in these megaliths represented the passage from the present world to the next. A remarkable feature of the construction of British megalithic sites was the use of a common unit of length, according to an Oxford professor of engineering science. Years of surveying have led him to conclude that this unit of length – which he terms the "megalithic yard" – was 2.72 feet. That it is not possible to detect by statistical examination any difference between the values determined from English and Scottish circles raises an interesting question: was there a common source from which standard rods were dispatched and, if so, was that source in the British Isles or on the Continent? The ubiquity of the sites and their use of a standard measuring device strongly suggest that late Neolithic societies had developed important elements of a comprehensive systemic organization when the circles were constructed – which would likely have been between 2100 and 1500 BCE.

"That am I." This represents perhaps the most significant aspect of mythopoeic thought. It lies at the core of animism and totemism, as well as illuminating the factor of empathy in lithic humans' relations with non-human life. In our planet's overall evolution of forms and consciousness, a quantum shift occurs from pre-human levels of awareness to our self-consciousness. In lithic societies this new stage of "individuation" has already occurred. At one level of reality – what we might call the functional – Homo can plainly distinguish between subject and object, while at the mythopoeic level identifying with all aspects of the phenomenal world. This identification is assisted by group rites, magic, sacrifice, and the like. We can try to specify more clearly the closeness of this relationship by changing the demonstrative pronoun in the term "That am I" to a personal pronoun, "Thou am I."

Here we get to a relationship at the heart of scientific thought: the correlation between "subject" and "object", and which constitutes the basis of Western scientific thinking. "An object, an 'It', can always be scientifically related to other objects and appear as part of a group or series. In this manner science insists on seeing 'It'; hence, science is able to comprehend objects and events as ruled by universal laws which make their behaviour under given circumstances predictable." But the concept "That am I" or, again, "Thou am I" changes the subject/object relationship entirely – and for the following reason. These terms utilize the verb "to be", which is intransitive, i.e., it takes *no object*. In mythopoeic epistemology, we are therefore dealing not with subject-object but subject-subject. Whereas "It" can be conceived in essentially discrete and inactive terms, as an entity to which the subject is not emotionally linked, "Thou" – be it man, beast, plant, or lightning and thunder – is replete with life, and consequently cannot be

approached with intellectual detachment. The whole world is animate and personal to our lithic forbears.

Northrop points out that in non-technological societies, time is qualitative and subjective (whereas technological societies tend towards "constructed" and mechanized concepts). Homo is part of a "cosmic equilibrium" which shows up in aesthetic expression, such as "going-on-ness" or, again, the "relatively undifferentiated character" of music in India. Studies have shown that among food-gathering Canadian Indians, time is experienced as *immediate* and *present*, while in his studies of Amerind language patterns, Whorf demonstrates that "time" and "space" are not conceived as separate, abstract terms. "Present" time is associated with localized or "near" space, whereas the subjective is intimately related to the stretching of objectives to the far-away in space and to the long-past in time, or again, to the still unmanifested in the future.

Food-gathering societies especially emphasize the present tense, living as they must in terms of immediate requirements. However, Neolithic economies show a shift towards spatial and temporal mensuration. Rootedness in the land creates a new sense of fixed boundaries, while the horticulturist has to give thought also to time-future, since planting involves acceptance of environmental risks in anticipating a harvest that has yet to materialize. These new concepts give rise to psychological differences between food-gatherers and food-producers. Yet in each stage, lithic durational concepts assume a circular morphology. Environmentally, the passage of time is "most commonly experienced as a cyclical change of the seasons, and in every type of human economy these seasonal changes are crucially significant." Conceptually, "The circular course of time impresses itself ... more and more. There are no new times, no moment that has not yet been attained. There is only primordial time, today as in the past and in the most distant future."

True, primordial time may also contain the concept of a "Golden Age", but this is still part of a myth of the world's continual renewal, nor is it likely to possess a corresponding end of time. When such a concept does emerge so that life is conceived from proceeding from Alpha to Omega, time and events become uni-directional, as positioned on a tangent to the circle. Such a shift from curvilinear towards a rectilinear durational Gestalt represents the breakthrough from "myth" to "history", namely, to a state of humanly measured time which is irreversible and moving away from the past, without any reassurance of a return. This new development in durational conceptualization may begin in some lithic societies, but becomes dominant in the next stage, that of the archaic civilizations (Theos).

From Chapters 5 and 6 (Theos)

The S3 stage of development occurred in Afro-Asia in the valleys of the Tigris-Euphrates, Nile, Ganges and Indus, and Yangtze-kiang and Huang-ho. Quantization results in all these regions from a linkage of transformations in physical location, generation of energy, economic activities, population size, settlement unit, societal organization, and political structure. These regions evolved autonomously from their respective S1 and S2 societal stages, but were progressively interconnected by routes of trade and culture exchanges.

In lithic societies the basic unit was organized according to blood – hence ancestral – relationships. In S3 systems, traditional localized groupings remain, but now serve as foundational units for more complex, stratified structures, as embodied in a new type of polity, the *state*. They provide the skills of specialized craftsmanship, labour units for state services and projects, and for military service. The state comprises both a new type of community and a delimited extensive territory – with both under the centralized control of a single ruler.

S3 societal institutions assume the form of religious, political, and administrative hierarchies. Metaphorically, the lithic communal circle has been replaced by a differentiated gestalt, the stratified pyramid, one that is theocratic. S3 societies share a conceptual invariant: religion is the central sustaining and regulating force. Whereas the S1 and S2 paradigms were strongly earth-directed, those of S3 have a celestial, or heavenward, orientation. The Earth Mother has been subordinated to a pantheon of sky gods. This male-dominated godship had its earthly counterpart in kingship.

We encounter S3 cultural systems in both the Old and New Worlds, the latter attained independently, thousands of miles from Afro-Asia and millennia after the Old World's four hydraulic civilizations originated with their shared theocratic view of reality. All cultures in the New World began with S1 nomadic migrations from Asia. Thereafter the human drama was played out on two separate stages, with their respective casts adapting the same evolutionary script to different continental conditions. Plant domestication in the Old World began well after the Bering Strait bridge ceased to exist some 10,000 years ago, and in the New World several millennia still later. The plants domesticated were different: wheat, barley, and rye did not exist in the New World; instead the Amerinds domesticated squash, beans, peppers, and maize. And instead of non-existent wild horses, sheep, and cattle, they domesticated the llama and alpaca. As in the Old World, inhabitants of the Americas evolved from S1 through S2 to S3 levels of systemic organization – and to do so invented a parallel corpus of material and societal technics

responsible for societal transformation. The overall pattern was identical, while differing in specific aspects. The most important environmental difference was the absence in the New World S3 polities of the large rivers that had marked the hydraulic civilizations in Afro-Asia. With precipitation no less at a premium in Mesoamerica and Peru, cultivable land severely limited, they met the challenge by inventing highly sophisticated irrigation systems capable of supporting large urban populations. As in the Old World, tools evolved from flint and wood to copper, and metallurgy came to include alloying platinum and gold.

The world-view of these archaic civilizations might be termed the "celestial paradigm". In each a well-defined concept of "world order" evolved to provide society with an explanation of its origins and a justification for its continued existence. The view of reality begins with the emergence of cosmic order out of chaos. Primacy of the male principle is shown in the cosmogonic creation myths; the female principle has of course to be recognized for its indispensable generative role, but it is now subordinate. The cosmos is hierarchical in structure, with the supreme being assisted by a pantheon of lesser deities. Since the cosmos is a divine state, its government on earth takes the form of a theocracy. Consequently, terrestrial kingship exists by divine fiat to embody and legitimize celestially-derived authority, and with it to maintain "right order" and justice.

In these theocratic societies, celestial godship and terrestrial kingship are united by a view of reality and causality infused by *volition* – the will to use power to maintain an all-embracing order in which the cosmic and earthly polities are mirror images. The gods themselves personify that universal power whose *telos* is the continuous maintenance of cosmic balance. In systems terms, such action ensures the dominance of negative feedback, and with it the unwavering assurance of cosmos triumphing over chaos.

In coming to terms with the quantum shift from S2 to S3, we shall concentrate in this chapter on the riverine societal systems that emerged in several strategically located, but widely separated, valleys: Tigris-Euphrates, Nile, Indus-Ganges, and Huang-Yangtze. In each case, quantization occurs by the systemic linkage of transformations in physical location, generation of energy, economic activities, size of population and societal organization, political structure, and settlement unit. We shall see that the net result is to herald the advent of that stage of sociocultural complexity called "civilization" (later to be defined). However, the link found in this chapter between S3 developments and various river valleys does not mean that fluvial environments have been the determining cause in creating civilizations. Far from it. As Toynbee observed, the Rio Grande moves to the sea in environmental conditions not unlike those of the Tigris-Euphrates and Nile, yet no civilization emerged along its banks in pre-Columbian times.

In fact, when examining later the evolution of societies in the New World, we shall find the emergence of S3 systems which were *not* the product of some dominant environmental factor, such as a single river valley and drainage basin, but flowered in a variegated Mesoamerica and the Peruvian Andes. In contrast, in the Amazon and Orinoco valleys the Amerinds remained rooted to lithic organizational levels. With good reason, however, the fluvial societies of the Old World have been called "hydraulic civilizations" because of the strong environmental role played by major river systems.

The Afro-Asian Steppe extends from the Sahara through the lower middle latitudes of Afro-Asia to the western Pacific. Evidence indicates that from 12,000 BCE it was marked by general desiccation of an oscillating character. For example, in the fifth millennium BCE the belt was wetter than today. The water tables were higher; there would have been more streams and springs in the upland areas; while in the great river valleys their fringes were marked by marshier land in which game abounded. These fringes offered a physical environment conducive to their impletion by peoples living in a Mesolithic, hence semi-sedentary, economy, or in a Neolithic steppe economy, basically food-producing but supplemented by hunting and fishing. After 4000 BCE as climatic oscillations moved towards a drier phase, migration became part of an overall economic adaptation that became progressively dependent upon waters of major rivers and the rich alluvial soils which they annually flooded.

We have seen that early advances in food cultivation did not occur in areas of broad, uninterrupted expanses of arable land. Cultivation of northern Europe's forested plains, Russia's steppes, and the American prairies came long after the development of small tracts in scattered parts of the world where horticulture first took root. This has been explained by the fact that plains and other unbroken expanses permit people to disperse as population increase exerts pressure on available resources. To bring about intensive cultivation requires an important geographical characteristic: areas of cultivable land must be circumscribed. These are typically "narrow valleys, as sharply confined and delimited by mountains or deserts. It is in such areas that most of the early advances in agriculture, and in other aspects of culture, took place." However, while these constraints provide a critical impetus to generate food supplies capable of increasing population beyond previous horticultural limits, additional factors – such as economic incentives and political institutions – are also required to maximize use of "circumscribed arable land."

This thesis is borne out by the environmental evidence. The first truly agricultural societies in the Old World emerged in the narrow – what we may describe as ecologically "one dimensional" – valleys of four river systems. Each environment was sharply confined and delimited by some

combination of steppes, mountains, deserts, and ocean expanses. Its chief physical resources were rich alluvial soils and large amounts of seasonally generated water, but requiring to be harnessed in order to benefit the land beyond the river banks. Since, for the most part, rainfall was never adequate to meet the needs of intensive cultivation, the harnessing of fluvial waters took the form of irrigation schemes, many of them elaborate and long-enduring.

These hydraulic civilizations experienced other factors in common. They arose between the fourth and second millennia, and being contemporary, conceptual/cultural interactions undoubtedly occurred – together with the exchange of various material and societal technics – among at least three of them. All four fluvial societies were located in the broad belt of lower to middle latitudes in the northern hemisphere, again conducing to physical contact and societal exchanges. The Neolithic societies from which each had evolved would in time become subordinate entities (sub-systems) within the new S3 entities.

Lithic peoples perceived the temporal dimension in cyclical terms – environmentally validated by the periodicity of the annual seasons and the moon's waxing and waning – and this "primordial time" could best be expressed in the present tense. It is also sacral time – the "Great Round" – which is governed by the Great Mother who is responsible for birth and fate. This inherited concept of sacral and cyclical time is retained among the archaic civilizations at the theopoeic level. In all of them, for example, the pursuit of celestial knowledge draws no distinction between astronomy and astrology inasmuch as both are concerned with the movements and relationships of celestial bodies, but with astrology attributing to their configuration a relationship with humans, as set forth at the moment of birth. Time's cyclical nature is also expressed in Indian cosmogony, which posits the periodic creation and demise of the universe in Brahma's cosmic Day and Night sequences (so that the "Big Bang" of Western science can be explained here as a recurrent phenomenon in a universe that has always existed). Moreover, as set forth in Buddhism and Hinduism, the temporal cycle is indispensable for the reincarnation (or transmigration) of the human soul.

But S3 time is not solely cyclical; now it includes, as a quantum addition, its linearization. Duration is "extended backward" from the present tense to become historical time and so account for events occurring in the distant past and deemed responsible for society's current situation. So at this juncture we find the detailed keeping of chronicles by priestly scribes, often to legitimate a dynasty's claim of divine right to rule, or mandate from heaven, and at times pronounced to have originated in a society's "golden age". A concomitant of this advent of historical time is its

segmentation into periods, into *terminus a quo and terminus ad quem* (the bounding of duration as experienced in "becoming" in contrast to boundless "being").

Time is now also linearized so as to "extend forward". In its sacral manifestation, it assumes a teleological or, again, eschatological form. As with astrology, future time is related explicitly to human purpose and destiny. The Egyptian Pyramid Texts, dating from the middle of the third millennium BCE, provide impressive evidence of the belief that postmortem survival was possible, and that employment of a prescribed technique – in this instance an elaborate mortuary ritual – could ensure eternal security and felicity. This Egyptian prototype sets a pattern found in other archaic civilizations and subsequently in S4 religions. In its various schools of metaphysics, Indian thought conceives duration in both cyclical and lineal terms. Karma, or action, explains present situations as resulting from past experiences and forms of behaviour; concomitantly, *dharma*, the law of causation, includes the concept of duty to ensure by present enlightened action the attainment of worthy future goals, such as self-actualization and liberation (*moksha*) from the bondage of illusion (*maya*).

Where did Chinese civilization stand in this contrast between cyclical eternal recurrence and linear irreversible time? The first concept was prominently held by Taoist philosophers and in Neo-Confucianism, in which cosmic, biological, and social evolution was renewed after periodic "nights" of chaos. Nevertheless, Needham and other sinologists believe that linearity dominated, as attested by the country's remarkable historical tradition. Yet the Confucian outlook was not essentially backward-looking. The Sage gave assurance that men and women would live in future peace and harmony whenever and wherever his interpretation of the Tao was practiced. "The apocalyptic, almost the messianic,... the progressive, certainly the temporally linear, these elements were always present," and had been spontaneously developing since Shang times. So "in spite of all that the Chinese found out or imagined about cycles, celestial or terrestrial, these were the elements that dominated the thought of the Confucian scholars and the Taoist peasant-farmers."

The linearization of time was accompanied by the invention of T_M which periodized and quantified the means by which it could be rationally comprehended. In astronomy the behaviour of celestial bodies corroborated periodicity in celestial and terrestrial phenomena. At the same time, the measurement of their current behaviour – and capability to predict future behaviour – required the advancement of mathematics in order to quantify their temporal-spatial movements. Again, the invention of calendars could now more readily periodicize the solar year into some 365 identifiable daily segments, while shadow and water clocks miniaturized the day into hours. Combined, these new technics had a long-term societal impact. They set in motion a new

conceptual phenomenon destined to become a mind-set in S4 societies: the mechanization of our understanding and use of time as a universal construct. In effect, a palpable shift from the mythological towards the rational in humanity's world-view.

A similar conceptual shift concomitantly occurred in this coordinate construct, where we find a dualism between sacral and profane spatiality. The sacral temporal "round" is matched by sacral curved space. Mention was earlier made of the Egyptian "primeval hill", the source of creation and traditionally located at Heliopolis. That this hill was presumably circular would have been in keeping with mythopoeic spatial curvature inherited from the S2 world-view, but now reconceived in sacral pyramidal form with its emphasis on verticality. Again, in Mesoamerica, the ancient "formative pyramid" at Cuicuilco was constructed upon an immense circle. And as every pyramid-temple in Egypt was identified with the primeval hill irrespective of its geographical location, it stood in place for boundless cosmic space by virtue of the logic of *pars pro toto*.

Conceiving space as sacral and enshrining it in holy precincts is familiar to societies at all levels of systemic organization because of the universality and immediacy of the spatial dimension as an organizing and integrating principle. S3 societies in the Old and New Worlds alike planned great public buildings and laid out urban centres so as to conform to the rules of geomancy, the "sacred geometry" – often with pyramids and ceremonial axes surveyed in appropriate alignment with the four cardinal points. And in those axes and temple precincts the sacral dimensions of space and time conjoined in ceremonial rites and games to reenact the theopoeic world-view in distinctive trappings of theocratic majesty and aesthetic splendour.

The S3 stage constitutes a new dimension in spatial control and exploitation. The two lithic stages impleted habitable areas in small settlements, such as caves or villages. Where not solely *terra incognita*, the regions beyond remained essentially in their natural pristine state with little evidence of human adaptation, far less manipulation. But with the advent of the first civilizations, both physical and sociocultural landscapes undergo profound transformation. The harnessing of strategic river systems in the Old World by irrigation and other technologies had created, together with unifying societal technics, hydraulic civilizations. Since fluvial waters made these societies viable, while the length of the cultivated land far exceeded its breadth, they qualify as one-dimensional space control systems. In the New World the S3 level was attained without the presence of major rivers. But because large amounts of available water were equally essential for this societal stage in Mesoamerica and the Andes, irrigation canals and aqueducts connecting widely dispersed urban centres and supplying intervening agricultural lands qualify in turn as one-dimensional space control networks. By means of this hydraulic pattern, in both the New and

Old Worlds occurred the Urban Revolution with demographic concentrations in impleted space, and broad environmental control and societal exploitation in expleted space.

Meanwhile, the uses of controlled space had been expanded as well to cope with pressing but more mundane concerns. The *social* segment of the UCP called for the settlement of new territorial tracts for expanding populations in general, and satisfying the specific land requirements of urban nodes. The *political* segment, responsible for the authoritative control and allocation of societal resources, had a primary interest in the acquisition of territory over which it could claim sovereign ownership, since S3 marks the stage at which the political state emerges. At the same time, the *economic* segment assumes a new distinctive role as well. Whereas in lithic communities land had been held in common, with its usufruct shared by all, now the concept of "property" and "ownership" of land and other resources came to the fore, with their control and benefits more or less proportional to the individual's status in a societal system which had become hieratical and hierarchical.

The mythopoeic world-view of lithic peoples emphasized the pre-eminence of the female principle, as symbolized in the Great Mother. With the 180-degree swing in S3 sacral space to a celestial pantheon that is male-dominated, accommodation must be made for the inherited S1/S2 model of reality. This takes the form of divine consortship. Isis, the most famous of Egyptian goddesses, was the sister-wife of Osiris and mother of Horus. Ishtar, the chief goddess of Babylonia and Assyria, was identified with the Sumerian mother-goddess and, associated with the planet Venus, was described as "the mistress of the gods"; Parvati, the daughter of Himalaya (the personified mountains) was the wife of Shiva and, as an embodiment of the Mother Goddess, provided the *shakti*, strength or potency, of her male counterpart. In Mesoamerica, the Classic Period saw the creation out of the previous period's nature-worship of a dual-sexed pantheon; the most prominent deities included the Rain God and his consort the Water Goddess, together with the Sun God and the Moon Goddess.

In other words, the binary principle, requisite for process and procreation throughout the phenomenal world, is universally articulated in the theopoeic world-view. And eminently so in the ancient Chinese concept of the paired Yin and Yang, formed from the Tao of the combined essence of heaven and earth. As a consequence, too, the binary concept is manifest in a political duality: heaven and earth co-existing by divine fiat as paired godship and kingship. And this principle would continue to find expression at the core of hermetic doctrines later in L_{10} societies: as above, so below.

Bilateral symmetries abound in S3 sculpture and architectural plans. The rotational symmetries prominent in lithic societies are retained – and necessarily so because curvature and the feminine principle have symmetrical equivalence. But now they are subordinated to linear and rectilinear gestalts, the latter's symmetrical equivalence with the masculine principle thereby affirming the predominance of the male in these societies – which we have seen were also responsible for the linearization of fields and urban precincts and properties, as well as the concretization of the durational dimension into linear time.

The nexus between symmetry and rest and equilibrium, and between asymmetry and movement and change, can be considered here in terms of the sexes' relationship and its reversal in societal dominance between S2 and S3. In lithic times, the female principle predominated as the asymmetric "figure" revealed against the existing societal "ground". Hence the feminine sex was innovative and transformative, as reflected in the invention of indispensable domestic crafts, new social mores, and by matrilineal governance. But the 180 degree-shift from terrestrial to celestial world-views was inevitably accompanied by a similarly sweeping reversal in symmetry-asymmetry relations. And with it the male principle elevates itself as "figure" on the societal landscape, now being transformed by patrilineal forms of governance and the invention of large-scale public works at which masculine muscle-power and drive excelled.

From Chapters 7, 8, and 9 (Logos)

Metron means “measure”. From the same Indo-European linguistic root *ma-* came two words, the Sanskrit *maya* (already discussed in "Theos") and the Greek *metron* which, according to some scholars, represented a profound conceptual parting of the ways between Eastern and Western approaches to the nature of reality. The Eastern route has been described as *philousia*, the study of essential Being. As we saw earlier, *maya* recognizes the significance of measurement in connection with understanding the phenomenal world, but underscores the Indian view that it is illusory to suppose that the supra-phenomenal world can be measured by the physical senses, or understood and articulated by our minds since, unlike them, it is not subject to the constraints of space and time. Hence, *philousia* concerns itself with being and pure continuity, which defies categorization and measurement in phenomenal terms. In contrast, the Greeks involved themselves in *philosophia*, a love of wisdom combined with emphasis upon factual knowledge of all aspects of the phenomenal world – hence the central value of *metron* in order to measure and comprehend the world as discovered and apprehended through our senses. By combining *logos* and *metron*, we obtain a basic key to Greek and subsequent Western thinking: Reason should apply itself to a cosmos that is largely measurable. Consequently, the emphasis upon logic, quantification, and the scientific method which Western societies were to utilize in constructing their epistemologies and science.

The Greeks’ warning about the dangers inherent in *hubris* is another facet of a world-view which also emphasized the normative dimension. Humans are not only reasoning creatures; they have a special worth or virtue (*aretê*) – as have all other entities in their own right. Human nature finds fulfilment in certain ends, and to do so the individual must develop his or her *aretê*, or inborn capabilities, as far as possible. This calls for knowledge and the full development of a person within a social framework. Because of this sense of human worth and its potentialities, “the Greeks believed in liberty, since only the free can fully recognize their natures; and they were quite logical in doubting whether a slave can have *aretê* in any real sense, since he is not free to be himself as he would wish to be.” Among free people, *aretê* requires recognition of other persons' virtue and worth, and therefore calls into play the concepts of equity and social recognition. In combining *aretê* and *logos*, we obtain a reliance upon reason and discourse among equals in the resolution of problems – so that these concepts in turn form the basis for democracy (*demos* + *kratia*, rule), government by the people, with decisions being taken by the majority, that

is, where consensus is found among the greatest number of reasoning persons (with *metron* applied to ascertain the majority). Again, the combination of *aretê*, *logos*, and *metron* is at the heart of the validation of education as a T_S, since it recognizes the innate worth of knowledge by the application of reason to the study of our world, and with it the value of education in terms of democratic access and discourse.

It is this recognition of the dominant role of humanity in shaping the course of history which distinguishes the *logos* of the S4 paradigm from the *theos* of the previous world-view. "Greek civilization was ultimately made possible by a belief in the special worth of man. The Greeks did not see him as a corrupt and fallen being.... [He] was indeed an unprecedented creature, worthy of awe and wonder in the scale of his inventions and his enterprises.... What mattered was the belief that he deserves respect for something unique in him and has unanswerable claims to find his own destiny."

Take these three concepts of reason, comprehension of the material world by means of measurement, and the inclusion of values and worth, and we have an embodiment of human attributes. This fusion of *logos*, *metron*, and *aretê* culminates, moreover, in the goal of the Hellenic world-view: *sophia* or wisdom. And in their fusion, too, we find the Greek ideal of beauty. *Logos* enables us to distinguish between the inharmonious and harmonious, the valid and invalid. *Metron* provides the means to measure proportion and attain the "golden mean" and "golden section" (as in the Fibonacci sequence employed, for example, in the Parthenon).

Because the Western world-order was erected upon largely Hellenic conceptual foundations, it is important to point out a radical divergence that took place between the Greek world-view and that of the archaic civilizations…. As Cassirer puts it, "Western (as opposed to "mythic") thought is distinguished by its tendency to distance itself from the given – to remove both the concept of the self and the concept of the world from the sphere of mythical thought." Cornford echoes Cassirer when discussing the implications of Ionian science on the Greek mind: "There is no longer a supernatural background ... intelligence is cut off from action, thought is left confronting nature, an impersonal world of things, indifferent to man's desires and existing in and for themselves. The detachment of self from object is now complete."

Where earlier societies were monistic in their orientations and belief systems – as expressed in terms of I/Thou – the Greeks perceived the world in dualistic terms – I/It. Just as they employed

their mathematical skills to measure and objectify celestial phenomena, so they applied in turn their knowledge of geometry to measure terrestrial space, and to impose cartographic grids upon the multiforms of our human habitat. Dualism's two-valued orientations would acquire logical consistency, justification, and applicability with Aristotle's "law of the excluded third". This Greek world-view, based upon reason and measurement, and perceiving reality in a separation of subject and object, knower and the known, would have profound consequences for the post-classical development of Western thought.

The shattered Graeco-Roman world state quantized retrogressively to different levels of systemic organization, depending on such factors as location, population size and density, and the extent to which T_M and especially T_S could withstand the combination of domestic and external forces of dissolution. As we saw, the more populous and urbanized eastern portion remained viable against mounting odds for a thousand years after the West had collapsed. Nonetheless, in keeping with systems dynamics, the West bottomed out by re-equilibrating, although areas adjoining the old imperial perimeter came close to retrogressing to Stone Age levels of sustainability.

It was a period of grave insecurity in a turbulent environment, with people reduced to the subsistence level, existing in a "natural economy" where land was almost the only wealth. "The consequence was that, more than ever, services, whether private or public, came to be paid by temporary or permanent grants of land, and this practice was to have political and social reactions of prime importance." Towns decreased in size and numbers, while numerous free villages, or *vici*, became private estates. After the end of the seventh century, the issue of gold coins disappeared, and in the next century even silver tended to pass out of currency, with payments being made in grain and animals. "These are unequivocal signs of the retrograde trend of the economic system to more primitive forms." That this was no less a period of intellectual retrogression is attested by the Frankish historian, Gregory of Tours (538-594) who lamented, "Woe to our times, because the study of letters is dying out among us and no man is capable of preserving in writing the doings of the present."

How humans come to grips with their environment is reflected in the changes they bring about in the landscape. Evidence of Roman power was still seen in the ruins of massive public buildings and triumphal arches in a hundred cities, and of aqueducts, bridges, and roads in the surrounding countryside. The medieval landscape in western Europe was no less significant for the way of life it portrayed. The great Roman roads, along which had posted imperial couriers and marched

legions guarding far-flung frontiers, had fallen into disuse to be overgrown with brambles. For where once all roads had led ultimately to Rome, in medieval Europe there was “no place to go” in the former compelling sense. With the overthrow of the imperial structure and economy, life had decelerated to the subsistence level. Cities call for highways, but now villages took root in woodland clearings – western Europe was still heavily forested in the Middle Ages – and along natural routes by land and water, such as near fording places or within bowshot of sites that could be readily defended. In place of imperial highways there proliferated a network of narrow, winding farm roads leading to the fields and of woodland trackways linking scattered villages. Here then, is a typical profile of the medieval rural landscape: a clearing near a stream with a cluster of cottages at one end of a small bridge; above the roof line the tower of the parish church; and above the tree line on a nearby eminence, the rounded tower of a baronial keep. These three main elements – castle, village, and church – have special significance for medieval life.

Having bottomed out, Western society would now begin its laborious systemic reconstruction to regain – and eventually surpass – the Graeco-Roman material level. It would do so by new developments in rural and urban life, accompanied by invention of new technologies. This period of systemic reconstruction is essentially due to the increasing dominance of positive feedback processes and components in both material and societal technics. For its part, the medieval Church played a dual feedback role. It would lead the way as *the* positive feedback instrumentality in reconstructing post-classical Europe during the turbulent centuries to around 1100 CE. Subsequently, with attainment of the High Middle Ages, it used its unique influence and power as the one universal (“catholic”) institution to maintain the status quo in all segments of the UCP. As part of its perceived mission, the Church undertook a bridging role between the spiritual and temporal powers – ostensibly for the greater glory of God.

With the end of the predominantly thalassic, urban-oriented Roman world, commerce dried up, manufactures languished, and cities shrank. Bath in England became completely depopulated, while Rome's population declined from at least a million in imperial times to less than 50,000 in the early Middle Ages. In Carolingian and later times, towns were less commercial than administrative centres and places of security. They might also be the sees of bishops, with cities perhaps having palaces for archbishops. Rome itself existed as the ecclesiastical capital of the western world. Where civil nobility was land-centred, the ecclesiastical nobility was town-

centred, the bishop now the prime authority in a largely ecclesiastical population of clerics, artisans, teachers, and students.

The interplay of economic and geographical factors provides perhaps the chief clue to understanding urban revival after 1000 CE. From the 11th century are signs of ever-growing commercial activity, especially the expansion of trade routes. Defeat in 1002 of the Muslims by Venice opened up the eastern Mediterranean, while in conquering Sicily the Normans had largely swept Moorish pirates from the western basin. In the next two centuries the Mediterranean reacquired its historic role for the movement of people, ideas, and commerce. Meanwhile, trade and traffic had been building up along interior lines of communication between southern and northern Europe. Road and bridge building resulted, along with founding Alpine hospices. These routes were employed by the growing Church administrative organization north of the Alps, by pilgrims bound for the Mediterranean to take ship to the Holy Land, and of course by traders bound to or from the burgeoning towns.

Renewal of urban life took place especially in three areas: northern Italy, with Venice and Genoa becoming active in the eastern and western maritime basins, and Florence soon to become an important banking centre; southern France, where various Roman cities had been preserved to become strategic ecclesiastical centres, while Marseilles and other towns became prosperous again as the Mediterranean regained its former economic importance; and Flanders, a dynamic cloth centre, with its pastures supplying wool, while the soil was rich in Fuller's earth and suited to growing dye plants. At the end of the 12th century, Flanders was one of the most densely populated parts of Europe. Indeed, its agriculture proved totally unable to support its surplus numbers. Faced with the same problem confronting England in the 19th century, Flanders “turned itself into a sort of medieval black country, exchanging manufactures for food.” It became the greatest emporium of European trade. To its four great seasonal markets came wool from England and Spain, dye plants from Picardy, Toulouse and the Mediterranean, wine form the Rhineland and Bordeaux, furs from the North, and even silks and spices from the Orient brought by the Italians in their great annual trading fleet of galleys.

When merchants and artisans settled permanently in the towns, they organized guilds. The merchant guild ensured a monopoly of trade within a given locality, with membership usually including all merchants of a particular town. With its monopoly of the town's import and export trade, the guild could enforce its standards as it will. The system was hierarchical, a principle

omnipresent in the Middle Ages, be it in fiefs, manors, guilds, universities, and in both civil and ecclesiastical organizations. While stressing interdependence among its members, this hierarchical type of social structure was very much in keeping with the pyramidal gestalt appropriate for a theocratic world-view.

The towns spearheaded the drive to a new social order as they grew in population and wealth. In northern Italian cities the merchant guilds became strong enough to group themselves into associations of free citizens, and to acquire local autonomy. A self-governing city of this type was called a *commune,* while in England urban autonomy was secured by different means. There royal authority was strong, and in charters granted by the king the inhabitants won extensive legal and financial powers. They managed their own fiscal business and paid their taxes directly to the royal treasury. The monarch was content to grant a charter to a town so privileged when it weakened the nobles' power and won the townspeople's support for himself….

The triumph of the townsmen in their struggle for greater self-government was significant. It meant that a new class had evolved in Europe whose interest in trade instead of warfare was to revolutionize all social and economic history. This class was born of the burg and hence known as burghers or, in French, the bourgeoisie. The town movement was a people's movement, and with its emergence went the fall of feudalism, the waning of the Middle Ages, the dominance of monarchical states, and the advent of modern society. And in this millennial process, the rural and urban landscapes had been transformed.

As we saw, by arriving at universal underlying concepts, the Greeks laid the foundations for a new philosophy and methodology of science. This approach all but disappeared for a millennium prior to the 16th century, but the absence of a scientific method did not prevent major technological advances. It can be argued, indeed, that in this period, “technology was the parent of science.” During these centuries a large number of important inventions and ideas spread from eastern Asia to western Europe. They included the wheelbarrow, deep-drilling machinery, iron-casting techniques, lock gates, paper, printing, gunpowder, the stern-post rudder, and the magnetic compass.

Another major area of technological advance occurred in the use of prime movers (natural agencies applied to the production of power). In Neolithic, fluvial, and classical societies, humans and animals were almost the only source of power. Our medieval ancestors succeeded to an unprecedented degree in maximizing the muscle power of draft animals by a new harness to pull heavy loads, and a new type of horseshoe to improve traction. We might add a third development:

a tandem harness to utilize the strength of several horses. These inventions are said to have done for the 11th and 12th centuries what the steam engine did for the 19th. In addition, medieval artisans increased the number of prime movers beyond sheer human and animal power. They developed water mills, both horizontal and vertical, as well as windmills with rotating turrets to catch the variable winds in the higher latitudes. Useful not only for grinding grains, these water- and windmills provided power for draining marshlands, for reclaiming areas from the sea (as in the Low Countries), for lumbering, and for new woollen mills, such as those in Flanders.

The new material technics made possible a substantial growth in the cultivation of arable acreage, while increased ploughing force also meant exploiting the richer bottomlands. For their part, sawmills facilitated the progressive clearance of woodland, while windmills drained lands and created fresh farming tracts. New forms of production also encouraged the founding of new urban settlements, and stimulated the siting of textile industries along river courses. In turn, textile machinery increased mechanization of work; in 1338 there were more than 200 textile workshops in Florence, where 30,000 lived by producing cloth – developments which in turn led increasingly to a division of labour. The new machine technology would give rise to its social counterpart: centralizing large numbers of people in workshops as wage-earners, all of which would eventually break down the medieval economy.

The Renaissance not only heightened mankind's awareness of itself and its relationship to God but quickened its perception of the physical world and stimulated a new interest in science. The same curiosity which had prompted the humanists to seek out the intellectual treasures of the classical world inspired Columbus and a band of like-minded explorers to seek out the riches of the unknown world that dipped ever beyond the horizon's receding rim. The quest propelled them around the southernmost tip of Africa and thence to the Indian sub-continent and beyond, across the North Atlantic to the Caribbean and coasts of the Americas, and eventually across the Pacific's seemingly endless expanse until the entire world had been encompassed. Europe stood on the threshold of planetary dominion.

In this breath-taking epoch of geographical exploration and overseas conquest, our forebears were once again aided by that unusual combination of backward-peering and forward-thrusting factors that constitute the Renaissance. They rediscovered not only the ancient maps of Ptolemy and other classical geographers but, perhaps even more important, the cartographic technics that these ancients had employed, such as the grid system of lines of latitude and longitude. To these

the new mariners added the empirical knowledge gained from close observations during their voyages of discovery. And from this fusion would emerge progressively accurate maps of the globe's continental coastlines.

Mapping of the world was accompanied by an ambition to map the heavens. Was the earth the centre of a fixed universe or part of a cosmic order governed by natural law, as some of the ancients had believed? Put simply, did the sun rotate around the earth – as the physical senses appeared to confirm – or did the earth circle the sun? A Polish astronomer addressed this question. Nicolas Copernicus (1473-1543) was near-sighted and possessed no telescope – it had yet to be invented in the West – yet long observation of the movements of Mars convinced him that the sun was the centre of our planetary system. His treatise advocating the heliocentric paradigm was condemned by Catholic and Protestant theologians alike, who feared that it contradicted Scripture and robbed the earth of its central place in God's creation. Copernicus' death seemed to leave his opponents in possession of the field – if not the heavens – but in fact a mighty revolution had begun. By the early 17th century two other remarkable astronomers, Johannes Kepler (1571-1630) and Galileo Galilei (1564-1642), had verified the theory and explained the mechanics of planetary motion.

These three men had done even more than establish the scientific foundations of modern astronomy: they had corroborated the truth held by the Greeks but for a millennium forgotten or rejected by medieval theologians: the universe is governed by immutable, mechanical laws that can be mathematically determined. Once again the Renaissance's mating of classical theory with contemporary empirical evidence had resulted in a conceptual revolution comparable in magnitude with its new geographical knowledge. Already the world had been encompassed, and now it had been placed in its proper sphere within the all-encompassing heavens. What more might not be accomplished if thinkers would only establish new methods of enquiry to harness science to the service of mankind? The English scientist and philosopher, Francis Bacon (1561-1626), provided a major portion of the answer when he advocated the inductive method; while a younger French contemporary, René Descartes (1596-1650), supplied much of the remainder in championing the deductive, or mathematical, method. Their technics paved the way for the magnificent scientific advancements of which we today are the opulent, but often overwhelmed, beneficiaries.

Following the first effective application of printing at Mainz in 1447 by Gutenberg, an intellectual revolution was set in motion. Whereas the medieval scribe had employed a tool

technic in transcribing by hand one book at a time, the printed page was produced by: a machine involving automatic action, a prime mover that could be human or otherwise, and repetition. The resulting multiplication of knowledge enabled an idea to leap-frog from one locality to another, and thereby also circumvent the barriers to spatial compartmentalization that had hitherto militated against any large-scale dissemination of new ideas and attitudes. In turning the vernacular literatures into mass media, print created a more homogenous type of society, acted to centralize government, and in turn strengthened the forces of nationalism and the nation-state. By its dissemination of uniform materials, the printing press helped lay the foundations for a mass society; at the same time, because it brought a variety of new information and concepts to the reader, it encouraged the spread of education and the development of the individual. With Gutenberg, according to one scholar, Europe entered "the technological phase of progress, when change itself becomes the archetypal norm of social life." It stimulated the "passion for exact measurement," and gave to "typographic man" a new time-sense: one that was "cinematic and sequential and pictorial" (whereas today's electronic media are non-sequential and recreate the world "in the image of a global village").

The attraction of lodestone for iron was known from antiquity; in 1256, the earliest work in the West on the compass appeared, and by the 15th century sailors made use of a needle that pivoted on a card showing the points of the compass. Other major aids to navigation also came into use in this general period. They included: the development of sailing charts and the Mercator projection – which has been described as the culmination of mankind's process of geometrizing its two-dimensional environment by conceptualizing the globe in terms of a grid; and the invention of methods for obtaining accurate soundings, as well as astronomical instruments – including the astrolabe and quadrant – for estimating latitudes, and later the chronometer for ascertaining east-west movements accurately, i.e., for determining longitude at sea. These inventions were accompanied by significant advances in shipbuilding – including superior rigging and sails, improved steering devices such as a stern rudder, and butt-jointed planking which permitted increases in the size of ships, so that larger vessels in turn were easier to defend against pirates and, more importantly, could carry adequate stores for long voyages. By 1700, the wooden sailing-ship "had nearly attained the peak of perfection then possible.

In 1660, the Puritan Commonwealth was replaced by the monarchy's return, but attempts to destroy Parliament and set up a religious despotism touched off the Glorious Revolution (1688).

As a result, the theory of divine right was completely discredited in England; Parliament became dominant and dictated the conditions under which future sovereigns would rule. Its most famous enactment was the Bill of Rights, which would profoundly affect both the U.S. Constitution and the French Declaration of the Rights of Man and of the Citizen. The rational explanation for this significant evolution was the work of John Locke (1632-1704) who, like Hobbes, postulated and original "state of nature". But this was governed in turn by a "law of nature" obliging men not to harm one another in regard to "life, health, liberty or possessions". And because humans interpreted natural law differently, by common consent they contracted to give up some of their privileges to a government that would maintain order and ensure enjoyment of their natural rights. Yet should a government abridge the people's natural rights, they had an ultimate right to overthrow that tyrannical regime in order to "resume their original liberty" and "provide for their own safety and security." By making the people sovereign, Locke both rationalized the Glorious Revolution and provided a philosophical justification for the American and French Revolutions.

Thus in the 18th century, while royal absolutism tried to maintain the crumbling old order, numerous thinkers were envisaging a new order enthroning human reason and social advancement. Where once Saint Augustine had espoused his City of God in the afterlife, many 18th century thinkers foresaw the building of a "heavenly city" on earth, a utopian type of civilization. As in the Renaissance, humanism came to the fore, but now expanded into what would be called the Age of Enlightenment. Its thinkers and artists were less revolutionaries than innovators and reformers who brought a new enthusiasm and energy to traditional forms and classical styles, and with it a strong belief in the human potential.

Here again, the three core concepts embodied in the Greek world-view resonate in the Enlightenment. It was largely shaped by Newton and other scientific geniuses who affirmed anew that reason (*logos*) could make sense of an otherwise unintelligible world by unlocking the mysteries of the universe. The impact of the rapidly developing sciences profoundly affected the 18th century world of ideas. How could traditional Christianity with its acceptance of supernatural and even miraculous phenomena be reconciled with the new scientific concept of a universe running smoothly on the basis of mechanical laws, laws that now could be minutely measured (*metron)*? This problem, described as "the crisis in the European conscience", was to some extent resolved by the acceptance of deism. A scientifically conceived religion in which God acted as the First Cause, essential for the creation set to run by immutable natural laws, deism pictured a system in which there was no place for miracles and faith must give way to reason. Descartes and other continental philosophers placed high reliance upon reason, since for them it was through

reasoning that knowledge is gained. Locke, on the other hand, as an English thinker in the Baconian tradition of inductive enquiry, emphasized the importance of sensory experience in formulating ideas and accumulating knowledge.

The Age of Reason reached its apogee in France with the *philosophes*, students of society whose writings had far-reaching consequences. Most influential among them was Voltaire (1694-1778), who personified a widely held scepticism toward traditional religion, and employed his wit as a devastating weapon against existing social and political abuses, including misgovernment and unjust laws. Despite their trenchant attacks on existing institutions, the *philosophes* were far from negative in their approach. Voltaire was convinced that reason would bring about reform, while Condorcet (1743-1794) depicted history as a march toward progress, in which humankind was working to achieve an international order where equality and justice would rule individuals and nations, and a common language prevail. Condorcet was articulating a humanitarian note that was also being struck by other rationalists, such as the English reformer John Howard (1726-1790), who maintained that prisons should rehabilitate their inmates, not brutalize them, and with others believed that humanitarian reforms, in congruence with natural law, could lead to unlimited human progress.

A relevant new economic theory was needed, congruent with natural law, a basic concept of the Enlightenment. It emerged in 18th century France when developing capitalism clearly demonstrated the importance of profits for stimulating individual incentive. A group of economic theorists, the physiocrats, included Francois Quesnay (1694-1774), personal physician to Louis XV, who compared the circulation of money to that of blood, and likened mercantilist controls to tourniquets that shut off a life-giving flow. He also denounced bullionism, arguing that prosperity depended not on gold and silver in the royal treasury but on the production of goods. While for Robert Turgot (1720-1781), self-centered profit-seeking in a free market resulted in the best service and most goods.

Political absolutism and its mercantilist counterpart were dealt lethal blows in 1776; the first with the publication of Jefferson's *Declaration of Independence*, the second with the publication of Adam Smith's *Wealth of Nations.* Even as the American colonists were incited to take up arms against the suffocating dictates of imposed mercantilism, Smith (1723-1790) argued persuasively that trade should be universalized without restriction because it benefits all parties. This Scottish professor of moral philosophy, who had exchanged ideas with the physiocrats, assigned to the state the role of "passive policeman", and focussed on the role of division of labour and

specialization in increasing production. Since trade increase specialization, it also increased production – which in turn depended on every person being free to pursue his own interests. In seeking private gain, the individual was also guided by an "invisible hand " – the law of supply and demand – in meeting society's needs. "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their reward in their own interests. We address ourselves not to their humanity, but to their self-love."

Little wonder that Adam Smith's work became the bible of classical economic liberalism, extolling the doctrine of laissez-faire enterprise. In Smith and his ideational successors, we see issues approached in a manner appropriate to the world-view expressed in the Galilean-Newtonian "revolution". Where economic activities in the older guild system had been largely sociological in nature since the human relationships involved were basically tool-oriented, they were now "quantified" in terms of principles and "laws" – which were impersonal and held to be "absolute" and infinite. Thus we find the "*law* of supply and demand," and the principle that labour has a "*natural* price." Hence David Ricardo (1772-1823) argued that the "natural price" is that "which is necessary to enable the labourers … to subsist and to perpetuate their race without increase or diminution." Such economic "laws" must not be interfered with by government. Laissez-faire theory held that it was impossible to correct the evils of industrialism. To allow labour to organize into trade unions represented – no less than government intervention – an artificial restraint upon the workings of natural economic forces and laws.

By exponentially increasing the production of energy – and its effective consumption in the form of new goods and services – the Industrial Revolution fostered a rapid increase in population and urbanization (including new factory towns), restructured societal relationships, and transformed existing living standards and goals in the North. Meanwhile, from the standpoint of humanity's capacity to control its terrestrial habitat, the palaeotechnical quantum shift was hardly less spectacular than its eotechnical predecessor, which had initiated the Age of Discovery and the resultant oceanic stage of two-dimension environmental control. Now, the oceanic stage was consolidated and further extended: it became possible to explore and increasingly use the temperate zones, and even extend into the Arctic and Antarctic latitudes.

The palaeotechnical era ushered in the final act of two-dimensional extension and consolidation: the continental stage. During the 19th century, continental hinterlands were opened up not only to the mass movements of raw materials in bulk, but also to mass settlement. Railways intersected Europe, penetrated South America and Africa, and spanned North America,

Australia, and Eurasia from ocean to ocean. The application of new technologies to physical resources on a global scale, coupled with advances in public health, brought an exponential demographic increase. In 1650, the world's population is estimated to have been 470 million; a century later, the figure had reached 694 million. By 1850, global population passed the 1 billion mark; at the beginning of the 20th century, it had risen further to over 1.5 billion. In two and a half centuries, the world's population had more than tripled.

Even as European thinkers undertook to harmonize Greek philosophy with Christian theology, the Neo-Confucians drew upon the older philosophical schools (including Buddhism) for their synthesis. The resulting world-view, based upon organic naturalism, was so utterly different from that of Europe's scholastics that Chu Hsi "has been termed with equal enthusiasm the Herbert Spencer as well as the Thomas Aquinas of China." Needham regards as extraordinary that by employing only two fundamental concepts (*chi* and *li*), the Neo-Confucians attained with "this economy of principle" a world-view "so congruent with modern science" – and did so in a civilization "which not only had not developed modern science, but was destined not to be able spontaneously to develop it." For them, the universe was essentially moral because it "had the property of bringing to birth moral values and ethical behaviour when that level of organization had been reached at which it was possible that they should manifest themselves." Organization among animals begins to approach this normative level, but only with the fully developed nervous systems of humans as social beings does the universe manifest ethical values. "Thus long before the Darwinian age evolutionary naturalism was very clearly stated by Chinese philosophers. But they envisaged a whole succession of these phylogenetic unfoldings rather than one single evolutionary series."

This world-view stressed that order and harmony inhere in nature. Congruently, as early as the first century the Chinese were aware of the directional property of pieces of magnetite, and they were the first to develop the magnetic compass for navigation. "In a way, the whole idea of the Tao was the ideal of a field of force. All things oriented themselves according to it, without having to be instructed to do so, and without the application of mechanical compulsion. The same idea springs to mind … in connection with the hexagrams of the *I Ching,* Yang and Yin, Chien and Khun, acting as the positive and negative poles respectively of a cosmic field of force. Is it so surprising, therefore, that it should have been in China that men stumbled upon what was in very deed the field of force of their own planet?"

Chinese organic naturalism, though lacking in theoretical rigor, bore distinct resemblances to non-mechanistic scientific outlooks in recent times. In its concern with the self-generating aspects of nature and organic relations, it was pointing forward to such modern concerns as the conservation and transformation of matter-energy, biological growth and the evolution of species, electromagnetic fields, and the interdependence of parts in cybernetic, ecological, and economic systems. Yet these were matters that could only be tackled effectively in scientific and mathematical terms beginning in the 19th and 20th centuries. It is said that Chinese science was trying to run before it could walk. Whether, given sufficient time, organic naturalism might have on its own given birth to some form of modern science is a question that defies answer. Instead, it was in Europe and via the mechanistic model of the world that modern science arose.

The Palaeotechnical "conquest" of space – both impleted and expleted – was attended by a quantification of time. Mechanization of the temporal dimension had already started in the Eotechnical era – from the monastery bell (tolled against the "escapement" of sand from a glass) to clocks in town squares, and their miniaturization in portable timepieces, an evolution climaxed with an unprecedented degree of temporal precision achieved by John Harrison. In 1713, the British government offered 20,000 pounds for construction of a chronometer that could determine a ship's longitude within 30 miles. Harrison's remarkably crafted timepiece was sent on a round-trip voyage to Jamaica, and on its return to Portsmouth in 1762 was found, despite constant motions of the vessel and changes of temperature, to have lost only 1 minute 54½ seconds – thereby determining longitude within 18 miles. Added to the much earlier and simpler astrolabe's determination of latitude was now the chronometer's ability to pinpoint longitude on the rotating globe. At long last, humans could determine with unprecedented precision where they were located anywhere on the planet.

But this creation of a two-dimensional spatio-temporal framework required to be further measured and perfected so as to serve a mechanically conditioned society. As technics acquired greater speed and mechanical dependability, they covered greater space in progressively less time – and with growing certainty moved from A to B within an ever-decreasing margin of temporal error. As the 19th century saw the globe girdled with steamship and railway "lines" (note how one visualizes and schematizes these technics in spatial patterns), this phenomenon is accompanied by elaboration of minutely-quantified time-space relationships in the form of schedules or "timetables" (another significant term with time being both quantified and its segments tabulated in vertical columns).

Throughout most of the 19th century, each locality marked noon when the sun was directly overhead – so that when Omaha was 11.27 a.m., St. Paul was 11.41, St. Louis 11.50, Louisville 12.09, Cincinnati 12.13, while Pittsburgh registered 12.31. The state of Wisconsin alone had 38 different local times. This confusion was ended with an achievement attributable especially to the Canadian engineer and scientist, Sandford Fleming: the adoption in 1883 of our present system of time zones and the principle of Standard Time. "Nature is uncharacteristically accommodating in matching a twenty-four thousand-mile circumference of the earth to a ready-made twenty-four-hour day. Each of twenty-four time zones, therefore occupies 15 degrees, or approximately a thousand miles of latitude." This standardization of time was "part of an even larger shift of consciousness, toward secular rationalism, and away from 'natural' authority." In short, "It converts celestial motion to civic time."

From Chapters 10, 11, and 12 (Holos)

Our previous examples of periodic societal mega-quantization were based on a systemic interpretation of existing historical evidence. But now TST focuses on time-present and extrapolates into time-future. Since historians are reluctant to leave time-past or speculate about events which have yet to be recorded, they may well dismiss our speculations as non-substantial. This reluctance to play the role of prophet is understandable, but the social scientist is prepared to act as forecaster, finding little difficulty in moving from diagnosis to prognosis. Our own approach is similar to that which meteorologists and climatologists use: analyses of previously acquired data synthesized with current behaviour patterns. If they can employ this methodology so as to predict warming of the global atmospheric system, we can employ a similar procedure to predict transformation of the global societal system.

The film has been recognized both as unique to our age and the first new art form created in centuries. As such it is "not only a new technique, but a new poetic mode." A striking characteristic of this new art is its marriage to motion, whether in its original form or adapted to television. Another dynamic characteristic is its totality, a wholeness capable of assimilating and integrating the most diverse materials – dancing, drama, panorama, cartooning, sports, music, montage, pantomime and voice – and transforming them into elements of its own. Film is the unique creation and expression of an organically oriented world-view, a superb example of systems theory and practice: a whole that is other and more than the sum of disparate parts since they cannot function except as an integrated system.

A novel and unique art form, the film has a type of presentation described as the "dream mode": it creates "a virtual present, an order of direct apparition". According to Langer, "The most noteworthy formal characteristic of dream is that the dreamer is always at the centre of it." Places shift, objects come into view with strange importance, persons act and speak, or change and fade, to be superseded by others that are related to them by feeling, not by natural proximity. "But the dreamer is always 'there', his relation is ... equidistant from all events.... the immediacy of everything in a dream is the same for him." Like dreams, the film commingles all senses, and the fact that it is not a plastic work but a poetic presentation accounts for its power to assimilate and transform the most diverse materials.

In the last stage of S4, national-industrial development, the paradigm is based on the premise of a positivistic ideology which, though professing to be value-free, possesses normative characteristics. One dominant value is “economic man” with his acquisitive motivation. Another is the parallel value of continuous economic growth, and the utilitarian justification for the search for knowledge. The concept of the separation of humans from nature provides a *raison d'être* for employing technology to exploit and "conquer" our environment. Individualism is yet another major value: every human is responsible for one's acts, is expected to be self-reliant, while society is regarded essentially as an aggregate of discrete individuals pursuing their respective concerns – with Adam Smith's “invisible hand” of self-interest in a free enterprise system acting to increase the wealth of nations. Similarly, in the political sphere, individualism envisages the independent nation-state maximizing its juridical claims, political authority, economic strength, and military might to pursue interests which are unilaterally defined – whereby the wealth of nations is set upon by Thomas Hobbes’ not so invisible hand.

This paradigm is now being critically questioned as to its relevance to the actualities of contemporary society. If the history of science is any indicator, the presence of anomalies which defy solution by logopoeic constructs call for construction of a new model. Global communications commingle the planet's peoples and hasten acceptance of a new perception: the progressive shift from national independence to international interdependence. The individual nation-state cannot cope with the daunting issues confronting global humankind – population, food, access to resources and their consumption, and resultant pollution. These issues pose questions for which there is no historical precedent.

The binary is an Integrative Principle ubiquitous throughout the natural order. As such it is fundamental to all structures and processes, whether physical, biological, or societal. Hence this binary principle is itself a universal bifurcation point in which all forms and functions can be created, transformed, or destroyed. Historically, it has lent itself to a bifurcated interpretation. In Western logopoeism, the dualistic tradition regards the perceived problem in antithetical, either/or terms, resolvable only by conflictual means. In non-Western thought with its monistic orientation, the binary principle regards process in complementary, both-and terms: with the bifurcation point itself the interface between positive and negative charges, male and female partners, the flash point of transformation and renewed creativity. In either perspective, bifurcations per se are morally neutral, but they can trigger ultimate expressions of systemic quantization.

In its penultimate stage, the Logos paradigm continued to pursue its antithetical forms of dualism *vis-à-vis* nature and human society alike into a two-valued, either/or cul-de-sac. Hence we are already being confronted with an interconnected series of critical challenges, coupled with diminishing alternatives of remedial action. These crises signal their approach and oppressive weight by massive systemic perturbations – and unchecked they must hasten arrival of irreversible bifurcation points. Together, they portend approach of "crunch time" for humankind and its fellow species.

Political structures can be divided into two broad categories: those that are national in size and behaviour, and those that are transnational in scope and purpose. And therein lies a paradox. Not only are the forces of nationalism and internationalism competing, but each is represented by more legal entities than ever before in history. In 1997 there were 191 nation-states, of which 185 were members of the United Nations – more than three and a half times the number when the Organization was created in 1945. Conversely, the forces of global integration cutting across national boundaries – and made up of transnational corporations (TNCs), intergovernmental organizations (IGOs) and nongovernmental organizations (NGOs) – have proliferated during the past hundred years until their numbers are now in the tens of thousands. From the standpoint of our systems thesis, the genesis and behaviour of the nation-state system is a logical manifestation of S4, while the emergence and role of international entities is an equally logical manifestation of S5. Given the strength of each category, this century faces an ongoing challenge. Can the two be reconciled so as to coexist and strengthen each other, or will they act at cross-purposes and exacerbate, rather than solve, global political issues which may well involve war-and-peace outcomes?

Those who follow the writings of natural-law thinkers such as Grotius describe international politics in terms of a society of states. In contradistinction to the Hobbesians, the Grotians contend that “states are not engaged in simple struggle, like gladiators in an arena, but are limited in their conflicts with one another by common rules and institutions.” Nonetheless, they accept the former's premise that sovereigns or states – not individual persons – are the subjects in international politics. Juridical imperatives call for accepting the requirements of coexistence and cooperation. In our metaphor, this tradition is analogous to the Copernican paradigm. All of the political actors are connected by their mutual relationships and institutions, and are bound by the imperatives of law and morality. Hence they revolve together within a political system that is not

international so much as inter-national – a co-existing society of states typified less by war than economic and social intercourse among themselves. In terms of the Copernican metaphor, this tradition is maintained not by political actors revolving around a central source of authority, but by their acceptance of the doctrine of natural law as the principal source of the law of nations. That natural law connection between all nations, "while it did not issue in any authority exercised by the Whole over its parts ... involved a system of mutual social rights and duties." The Grotian idea of a society of states does not call for their replacement but to abide by the requirements of co-existence and cooperation. Between them, the Hobbesian and Grotian traditions have guided the behaviour of politicians into this century.

The Universalist ("Force Field") Tradition. In striking contrast is the third tradition, enunciated by Kant. Here the central reality in international politics is not the system of states but their supersession by a "community of humankind" sustained by moral imperatives. These call for limiting actions by nations and introducing a truly cosmopolitan society. To this end, a higher morality requires subordinating the pretensions and interests of states, including their claims to unfettered sovereignty and unilateral pursuit of self-avowed objectives. The Kantian tradition goes beyond enjoining states to coexist and cooperate; it envisages their progressive replacement by a global society. Here our astronomical metaphor is best expressed as a force field paradigm. Not only existing states but all entities in the global environment – individual persons, organizations, corporations, and institutions alike – function in a reciprocating dynamism, with none of them superordinate. And this "community of humankind" in turn continually reciprocates with that "community of ecosystems" which energizes and sustains the planet.

The war-and-peace equation. These three traditions have a direct bearing on the modalities and ramifications of this equation – especially as the 20th century had to endure two global conflicts and a protracted cold war which threatened to explode with thermonuclear fireballs in a world gone MAD – mutual assured destruction. The realist tradition continues to advocate war in terms of winner-take-all. The inter-nationalist tradition still seeks to regulate, but not abolish, war since an alliance strategy may bring a victorious outcome. But the universalist tradition perceives the war-peace equation in non-zero-sum terms. Because a quantum shift has taken place in military technology, its destructive potency is such that any major conflict can only have lose-lose results for belligerents and non-belligerents alike within a biosphere which could become radioactively contaminated beyond repair. In moving from S4 independence to S5 interdependence, we can no longer tolerate the old claim to settle disputes by recourse to the ultima ratio, the final argument of force. Conflict must be approached, contained, and hopefully

defused by an appropriate S5 dual modality, peacemaking/peacekeeping by agents of a global community possessing superordinate authority. Is there a viable alternative?

The scenario of ecosystemic collapse is certain to wreak havoc with the mindset responsible for the mechanistic version of the Industrial Age paradigm: equating "progress" with material growth. Pushing growth beyond the planet's ecological limits or resource sustainability can only drive humanity's social, political, and economic behaviour to a new conceptual and behavioural bifurcation: unrestricted competition to obtain and exploit what is left of a plundered planet, or belated collective action for common survival.

Is collapse inevitable, or is it to be dismissed as far-fetched and scaremongering? Neither the one nor the other, according to the Club of Rome's studies of our increasing planetary predicament. The first, based on a computerized world model, argued that even under the most optimistic assumptions about advances in technology, the world cannot support present rates of economic and population growth for more than several decades hence. The second, more comprehensive, added a large number of new factual inputs and computer linkages, assessed its outputs and conclusions by specific regions (in response to the criticism of generality levied against the first report), and indicated the immense costs in money and human suffering by delays in taking remedial action. The next study focused on the plight of the world's poor and marginalized, and the measures essential for creating a more just and equitable global community. The fourth report examined the options from the optimal use of science and technology to help society extricate itself from its self-imposed problematique.

The animosities let loose on September 11, 2001 between the Theistic and Humanistic world-views justify the preposition "versus" to underscore a head-on clash of "either/or". But in our second set of competing world-views, let us correlate the Industrial Age Humanistic and Information Age Holistic world-views in terms of "vis-à-vis" to denote a quite different situation. As we have seen, in systems theory every new level of organization involves a quantum shift of existing parameters, coupled with emergence of new systemic attributes or qualities. In other words, the successor level builds upon the attributes of its predecessor – and so it is with the emerging new societal paradigm. This new model of world order continues to make use of, and build upon, the view of reality initiated by the Greeks and further elaborated by their successors in the West. But in doing so, the new actualities of our ever-growing societal interdependence will require us to take account, as never before, of the holonic interactivity of the whole and its

parts, the One and the Many – and to do so we shall have to forgo our traditional two-valued orientations in favour of multi-valued relational logic. Only by replacing either/or with both-and can we hope to embrace not only all human communities but all of Gaia's species, floral and faunal alike. And in the coming decades of what present-day portents suggest could be a planetary transformation without precedent, zero-sum game theory must be replaced with non-zero-sum: all of this planet's inhabitants will share a collective triumph or defeat in response to evolution's open-ended, creative challenge.

Multi-relational logic functions in much the same way as a "system". Every system functions in some sort of context – either as a "super" or "sub"-ordinate system. And as the deconstructionists remind us, text (or again logic) has to be related to a context of some kind. This is in contrast to the previous homogenistic logic with its emphasis upon the discrete, and the either-or of reductionism and positivism In Logos's societal technics, note how either-or dominates: in theology, either salvation or damnation; in jurisprudence either innocent or guilty; in economics, either profit or loss; in politics, either government or opposition, loyal or traitor, etc. etc. The shift in logics from Logos to Holos is the shift from the adversarial to the consensual; again, from the dominance of discrete static structure to interconnected dynamic process that is ongoing and open-ended.

We might regard the quantum shifts in humankind's occupation of space in terms of the following sequence: point-line-plane-volume. As we saw, Palaeolithic peoples' environmental control was limited to an ill-defined hunting territory or, with simple horticulturists to the village node and its immediate surroundings. With fluvial archaic civilizations, this control was extended to include at least the lower lengths of river valleys, accompanied by emergence of a more complex and densely populated society and the appearance of urban nodes. The thalassic-continental stages of environmental expansion together comprised the exploring, mapping, and controlling of "flat earth", i.e., a two-dimensional plane extending from the equator to the poles and including all the continents. Now, in our era, we arrive at a three-dimensional quantum: ascent into the atmosphere and beyond to Outer Space, and, concurrently, descent into the hydrosphere and Inner Space of ocean beds and continental shelves.

This terrestrial-cum-extraterrestrial "volume" cannot be regarded simply as a container of disparate, independent objects occupying otherwise empty space, with communities evolving, existing, and perishing apart from, and largely unknown to, one another as in the past. Instead, we must now conceive of the environment as a gigantic unified electromagnetic field, and space not

as a void but a plenum, in which telecommunications bombard all points in this time-space continuum at the speed of light. In short, our newfound control capability has irreversibly altered the boundaries of our global environment, while new inventions and institutions have created a transnational and transcontinental state of societal interdependence.

At the same time, these developments pose massive political and juridical questions which the traditional nation-state system appears unable to answer. Who "owns" the resources of the oceans and sea beds, the minerals on the continental shelves? "How high is up?" – in other words, where does a state's sovereignty end on the third dimension which extends vertically beyond the range of the Hubble telescope? Has any country some inherent "right" to set the stage for "star wars"? These are problems that never arose when the nation-state system matured in two-dimensional space in early modern times, and territorial waters could be controlled by the three-mile trajectory of a cannon ball. To cope with an environmental control capability at once global and extra-terrestrial we need to forge a new sociopolitical model no less planetary in both scope and authority.

In Holos, we are looking at a world-view that is innately *systemic.* And a system, be it physical, biological, or again societal, cannot divorce the entirety of its whole – the One – from the inseparability and indispensability of its component parts – the Many. In this sense, because of their holonic constitution, all systems and their components are normatively equal in status and stature alike. From this it follows that we are enjoined to conceive of a world-view in which hierarchy is replaced by holarchy.

Unlike the Industrial Age paradigm which was based on dualism, positivism, and reductionism, this emerging world-view perceives the universe as a unitary organic system, with all entities – from sub-atomic particles to galaxies - interconnected and mutually essential. And contrary to its predecessor's adherence to a purported value-free mechanicalism, Holos restores *aretê* to both the natural order and human equation. More than traditional mores are now being challenged. An ever-increasing number of people, the young especially, reject traditional mechanistic postulates, and are searching for different metaphysical foundations. (Hence the interest in Eastern philosophies, parapsychology, mysticism and meditation, and occult studies.) For many, the search for a new vision of reality calls for replacing the anomaly-ridden paradigm of the national-industrial stage of Logos with one directed by an ecological ethic – recognition of our species as an integral part of the natural order, and the need to foster a sense of human community and its responsibility for the stewardship of the planet. Concomitantly, this search

also calls for a new form of self-actualization – in which individual and collective experiences serve to help develop every person's inherited potential, and that to foster this process is recognized as an appropriate function of societal mores and institutions.