
Time-Space-Technics:

An Evolutionary Model of Societies and World-views¹

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Time-Space-Technics (TST) applies evolutionary systems theory to the historical development of human societies. It 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. The model utilizes a number of integrative principles present throughout the phenomenal world; they interact with human agency in organizing all cultures and societies so as to result in a wide variety of conceptual and behavioural isomorphisms. Special attention is paid both to processes of equilibration between a system and its environment, and to factors responsible for fracturing a system's equilibrium, quantizing it to a different level of societal organization, accompanied by either the emergence of new properties or the loss of existing parameters. These major quantum shifts, which have appeared periodically in global history, are correlated with the emergence of new paradigms of reality, or world-views. Application of this systems model in our present transformative era makes it possible to foresee issues that constitute bifurcation points ahead. Those issues will challenge humanity to avoid environmental and societal crashes on a global scale. Conversely, proactive measures can attain a new level of planetary organization and integration, with its unique world-view.

NEEDED: A NEW PARADIGM FOR AN EPICYCLICAL AGE

Fashions in the philosophy of history alter with changing societal views of reality. Archaic riverine cultures abound in mythic histories in which gods and god-kings are glorified. To the ancient Greeks, for whom human reason is paramount, their word "history" means an enquiry or investigation, and its purpose is humanistic. A sea change occurs again with Christian historiography which perceived the historical process serving not human but divine purposes. Renaissance humanism brought to historical writing more of a cultural refinement than any progress in scientific rigour and method.

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The sixteenth and seventeenth centuries marked a broad expansion of Europe's physical and intellectual frontiers. A new search for knowledge focused on the phenomenal world, based on Galilean-Newtonian physics, not untestable metaphysics. No less absolute than its Christian predecessor, what has been described as the "heroic model of science" (Appleby, Hunt, and Jacob 1994) transformed western thought and values. Central to the West's dualistic tradition has been the antinomial relation separating nature and humankind. This fallacy endowed the physical sciences as the valid interpreters of the natural world, while relegating human-centred studies to the social sciences and humanities. The Galilean paradigm ascribed to physics an intellectual paramouncy, replete with quantifiable "primary qualities" for its practitioners to utilize, while assigning non-"heroic" disciplines a subordinate role marked by subjective "secondary qualities".²

This dualism had massive deleterious effects. Its reductionism divided nature and knowledge, and altered Homo's perceived status in the cosmos. "With the *De humani corporis fabrica* of Andreas Vesalius, man was conceived as a secularized object for investigation; man submitted himself for a study as a natural objective datum. And thus there was born within him that subject-object division in knowledge, that man versus nature separation that mirrored the basis of the humanistic prejudice. Man subjected himself to 'anatomical' study of himself in order to discover the possibilities of the 'human machine'" (Masulli 1990, 20). In this separation "history emerged as scientifically delegitimized", which for its part now acquired a "humanistic prejudice" so as to formulate "a conception of history in terms of a mere dominion of man over nature" (Masulli 1990, 49).

Meanwhile, the pervasive influence of the Galilean paradigm and its perception as the "heroic model" had provided an ideal prescription for nineteenth-century historians tired of subjective and romantic studies. Ranke's emphasis on a mastery of "facts" to record "exactly what had happened" (*wie es eigentlich gewesen*) served as the standard for a scientific, objective type of historical writing. Among like-minded scholars, history as science was the unassailable answer to history as philosophy. Let the historian use scientific methods and remove the personal equation from his work, and the result would be *true* history.

² See Galileo, *I Saggiatore* ("The Assayer"), published in 1623; "Galileo, more than any other man, had introduced the change in our manner of thinking that broke with ancient and led to modern science. Contributions had also been made by Copernicus, by Vesalius, by Harvey, by Tycho, and by Kepler and others. The share of Galileo is, however so overwhelming that it is not unfair to call it the 'Galilean Revolution'." Charles Singer, *A Short History of Scientific Ideas to 1900* (Clarendon Press: Oxford, 1959), 249.

But this “heroic model” turned out to be, in Beard’s phrase, “that noble dream”. Neither were “facts” neutral nor objective, but reflected biases of gender, class, and race (Beard et al. 1946). Beard (1943) showed the role of economic interests in making the U.S. Constitution, while social historians exposed the extent to which minorities – Jews, blacks, women, the poor – had been marginalized or ignored in traditional writings. Other specialists revealed that scientific research was not value-free, as when grants were provided by the American military-industrial complex. To the postmodernists, “since all historical inquiries grow out of the inquirer’s linguistic frame, the results follow all too predictably from the hegemonic Western white males initially responsible for the linguistic structure. The writing of history...is not about truth-seeking; it’s about the politics of historians. One man’s truth is another woman’s falsity” (Appleby, Hunt, and Jacob 1994, 244). And so the battle has raged.

We are all acquainted with the term “prehistory”, which covers the period in which no written records were kept – or more than 99 per cent of our species’ lifespan. But it has also implied that “history” per se begins with those records; in fact that term came into use when there was little knowledge or interest regarding lithic cultures. Anthropology has moved the historiographic boundaries back to include what is now called pre-literate history. But as a discipline, history remains anthropomorphic – it focuses on the past as perceived within a human perspective and self-serving bias.

A very different historiographic perspective is overdue, one extending our vision and concerns beyond chronological or traditional cognitive boundaries. The study of history needs to free itself from all anthropomorphic structures, and recognize at least three invariant factors:

1. Our species is an integral part of the entire natural order. Hence whatever has transpired in nature is *ipso facto* our own history. Anthropomorphic dualism has humans learning about nature, yet deprives nature itself of any capability to acquire knowledge. But it is fallacious to ascribe to ourselves a capability which is denied our originator.
2. Nature and knowledge are inseparable and form a nexus. This is persuasively articulated by Masulli, where he employs *form* as “the active synthesis presiding over the concrete unfolding of the nature-knowledge nexus at each degree and passage of the evolutionary process.” Because *form* expresses this nexus at every stage of evolution, “a systematic character” is found from the simplest manifestations to the most advanced degree of knowledge at the human level. But such an attainment is possible only because of the “systematicity of the nature-knowledge nexus”: otherwise knowledge could not be possible

since it would be abstract and “external”, i.e., “literally *placed outside*”. “*Form* is thus not the object of knowledge: it is itself logos, the language of nature, or nature-knowledge” (Masulli 1990, 17-18).

3. We exist in “a participatory universe” where Homo is both spectator and actor; and in rediscovering “a basic continuity in his relationship with nature, his historical dimension coincides with that of nature itself” (Masulli 1990, 83).

In western science are found major paradigms – including the Ptolemaic, Copernican, Galilean-Newtonian, Einsteinian – each embedded in a corpus of data coherently structured and interacting. These constructs often provide evidence of impending collapse, as with the Ptolemaic model of celestial mechanics, which employed epicycles to explain a planet’s retrograde motion (Kuhn 1966). Some 80 epicycles were required in Copernicus’ time to account for anomalies in planetary behaviour, but his heliocentric model, with planets revolving in circular orbits around the sun, reduced that number to 34 (Butterfield 1965, 28). The “Copernican Revolution” had been effected, yet Kepler with his fervent belief in the postulate of simplicity – *Natura simplicitatem amat* (Margenau 1950) – was not satisfied. By determining planetary orbits to be elliptical, he demonstrated the mathematical elegance of that Latin phrase by removing the need for epicycles entirely.

Our present sociocultural paradigm has any number of political, economic, juridical, and educational anomalies between traditional percepts and societal performance. They underscore a critical conceptual and epistemological lag in contemporary communities, contributing to a crisis of identity and a pervasive sense of alienation and malaise. Continuing attempts to shore up these anomalies by ad hoc remedies bear witness that ours is an epicyclical age. Hence the postulate of simplicity calls for constructing a new paradigm that can significantly diminish the number of contemporary conceptual epicycles (à la Copernicus), or (à la Kepler) remove them altogether.

UNIVERSAL PRINCIPLES OF ORGANIZATION AND INTEGRATION

Our new historiographical model is constructed on the rules of correspondence, thereby enabling it to be subjected to empirical verification. It also sets forth a number of constructs of fundamental ordering significance. These constructs (1) can satisfy epistemological requirements (logical fertility, multiple connections, extensibility, causality, and simplicity); and (2) are universal, i.e., they apply to physical, biological, and sociocultural phenomena alike. Being

omnipresent in time-space and having an ordering capability in the structure and behaviour of both natural and human-made systems, they are designated Integrative Principles.³

The first group of Integrative Principles, *individual constructs*, comprises the fundamental parameters of the phenomenal world, the *sine qua non* of physical, biological, and societal entities everywhere. The second group *regulates* structures and processes at successive levels of systemic organization. The third group comprises *epistemological relationships*; they have special relevance for how we perceive and construct the world about us. Without suggesting that the list is necessarily exhaustive, we itemize these Integrative Principles by category, then single out several to show their role in our model.

Individual Constructs

Time

Space

Force Fields

Motion/Energy

Boundaries

Principles of Regulation

Duality (Binary Principle)

Invariance under Transformation (Symmetry/Asymmetry)

Equilibration (Balance-Imbalance)

Quantization (Continuity-Discontinuity)

Levels of Organization and Integration (PIL)

Statistical Regularities (Probability Theory)

Action-Reaction (Cause-Effect)

Epistemological Principles

Mathematics (The Logic and Application of Numbers)

Protocol Plane - Construct Field Postulation

Figure-Ground (Gestalt) Perception

Propositional-Appositional Modes of Cognition

Form-Function Relationality

³ These ordering constructs are described at considerable length by the author and co-contributors to Henry Margenau (ed.), *Integrative Principles of Modern Thought*, a work to which the reader can turn for a detailed exposition of their presence and behaviour in physics, chemistry, biology, the social sciences, arts, logic, and the relation of science to religion.

Logic of Relations (Either-Or; Both-And Orientations)

Isomorphism and General Systems Theory

Time and *space* have long given rise to speculation and controversy; unlike physical properties such as mass and force, they cannot be directly perceived. Yet they affect everything in the phenomenal world (Margenau 1950, 129). Hence they are central to this thesis. Time is described by such terms as primitive, magical, biological, psychological, eschatological, and scientific. A major controversy over its nature occurred among physicists. For Einstein, the formulation of physics on the fundamental level permitted no reference to irreversible time; distinctions among past, present, future were outside its scope. But to Prigogine and Stengers there can be no scientific activity that is not time-oriented. Indeed, the irreversibility of time and its perception “increases as the level of biological organization increases and probably reaches its culminating point in human consciousness” (Prigogine and Stengers 1984, 298).

Numerous problems have also inhered in theories of space. What is its relation to place, to matter, to motion? Is it infinite or not, continuous or discrete, a void or plenum? What about space as a medium of physical action (such as action-at-a-distance). Is space laid out in straight lines in keeping with Euclid’s assumptions, or curved à la Riemann? How many dimensions does it comprise: One theory of statistical mechanics operates with phase spaces of 10^{24} dimensions or more (Gibbs 1902). Margenau states that “nowhere does the constructional character of physical concepts become more manifest than in the analysis of time and space.... For there is not one, there are many constructions called space, all of which correspond to different forms of immediate experience” (Margenau 1950, 128).

With space serving as a medium of physical action, “contact forces” operate in material fields such as the atmosphere or again the hydrodynamic field. In addition are *force fields* responsible for action-at-a-distance. Gravitation exemplifies the general nature of non-material force fields: their existence is observed only through some test object which experiences an effect when present, and the effect is a function of the place where the test object is put.⁴ Gravitation shares the characteristics of all known force fields: universality, internal consistency, virtual infinitude, causality, durability, suprasensibility, and continuity – so that a field may be called a continuum (the term Einstein employed in reference to space-time). Thus space-time is not a void but a plenum.

⁴ The intensity of the gravitational field is measurable: every particle in the universe attracts every other particle with a force directly proportional to the product of their masses and inversely proportional to the square of the distance between them. Hence gravitation acts at a distance without the benefit of any intervening substance.

The four known force fields are gravitation, electromagnetism, and the weak and strong nuclear forces. Laszlo has proposed a fifth force field that he terms the “quantum-vacuum interaction” (QVI), which produces “a self-referentially randomness-mitigating evolutionary process” (Laszlo 1995, 25). Here the universe is conceived as a holographic order where information from all physical, biological, and societal interaction is enfolded into the energy wave-forms of the “empty” space of the quantum vacuum. This “holofield” of potential energy interrelates all orders and scales of organization throughout the universe. Action in the material world is guided by a holographically generated “prompt” which contains information about a system’s past states as well as its position within a hierarchy of systems. “The prompt is the means by which novelty and change are generated so that self-organizing evolution results” (Love 1998, 118). And this self-organizing evolution includes “the thrust of human agency in all its many forms” – past, present, future. In Laszlo’s summation, the discovery of this interconnecting holofield “will make for a fundamental shift in the world picture projected by science,” one that enables us to “contemplate the cosmic dance of matter, life, and mind in the whispering pond: in our subtly interconnected universe” (Laszlo 1996, 190).

We have dealt with Laszlo’s QVI at some length because it can take its place with presently recognized force fields as a universal integrative principle. QVI has specific relevance for TST in being able to account for a variety of socio-historical factors which have hitherto eluded satisfactory explanation:

1. *Isomorphism* is at the heart of systems theory and its capability to provide one-to-one correspondences in pattern and process among seemingly disparate entities. Inherent in sociocultural no less than physical and biological systems, isomorphism is best comprehended by the presence and authoritative command of force fields, specifically QVI.
2. As part of this isomorphic patterning process, we find a *universal culture pattern* (UCP) to which all societies since lithic times have adhered. Discussed later, every UCP consists of the entire spectrum of a societal system’s activities, all of which are interconnected and interacting. Whatever their stage of societal development, people everywhere have followed this basic pattern of categorization of collective activities and behaviour.
3. Similar conceptual patterns among cultures widely scattered in time and place are found in such diverse spheres as tool-making, animal and plant domestication, settlement patterns, architectural structures, etc. Throughout TST, too, we find a common denominator in the progressive miniaturization and functional specialization of tools and technologies in all societies—from the hand-axe to today’s computers.

4. The non-linearization of this holographic process is dramatically exemplified by the evolution of societies in the Old and New Worlds. Separated by thousands of miles and years, the common denominators in their respective genesis and development have puzzled anthropologists and historians, a phenomenon described as “parallel invention”.⁵ Both major planetary segments experienced the same societal sequence: from food-gathering to food-producing economies, thence to the creation of urban polities and that stage of organization familiar as “civilization”.
5. Two other isomorphic expressions of evolutionary development are essential to our thesis, and these are also holographic principles. *Quantization* and the correlative *principle of integrative levels* (PIL) are fundamental attributes of the global evolutionary process. Because of quantization, within this overall processual continuum occur periodic structural and behavioural discontinuities which result in quantum leaps to different levels of systemic organization; because of PIL, these shifts are immediately transformed by the emergence (or loss) of properties peculiar to a given level of integration. Both principles function together throughout physical and biological evolution, and no less in the historical development of all human societies from the advent of the Palaeolithic stage.
6. As a capstone to the above, QVI/isomorphism can best account for the parallel evolution of particular *world-views*, which constitute overarching models of reality as perceived by disparate societies across all continents. As such they play a prominent role in this thesis.

All of the listed integrative Principles are logically compatible and synergistic in their multiple connections – otherwise the universe is massively schizophrenic. Here are several examples. In the first group, Individual Constructs, we find logical compatibility between time-space and force fields, and synergistic fusion in the phenomenon of action-at-a-distance. Again, time, space, and boundaries have together an indispensable connection with the entire patterning process in the phenomenal world. Turning to Principles of Regulation, given nature’s “love of pairs”, it would be strange not to find the binary principle accounting for paired structure and

⁵ For a detailed study of the parallel evolution of ancient Mesopotamia and prehispanic Mexico, for example, see Robert McC. Adams, *The Evolution of Urban Society* (Chicago: Aldine, 1966). Adams is reported as having become progressively impatient with the anthropologists’ gradualist approach to the evolution of civilization. “When he went out digging in Mesopotamia, he saw those ancient cultures undergoing chaotic oscillations and upheaval. Increasingly, he said, he was beginning to think of the rise and fall of civilizations as a kind of self-organizing phenomenon, in which human beings chose different clusters of cultural alternatives at different moments in response to different perceptions of environment.” M. Mitchell Waldrop, *Complexity: The Emerging Science at the Edge of Order and Chaos*, (New York: Simon & Schuster, 1992), 86.

behaviour among the Integrative Principles per se, i.e., symmetry/asymmetry, continuity/discontinuity, and equilibrium/disequilibrium.

At work throughout all stages of evolution is *equilibration* with its dual forms of feedback control: negative and positive, the first correcting, the second amplifying, deviations in a system or its environment. Central to TST is the presence of this principle, where the equilibrating process in human-constructed systems is intimately affected by material and societal technics (described below). When deviation in such a system is amplified to where its parameters are fractured, *quantization* occurs. At this point the societal system either shifts to an organizational level made more complex by emerging new properties or, conversely, quantizes “downward” to a previous level – or even destruction.

What is the ontological status of these Integrative Principles? The following points might be considered. Constructs about space, say, vary according to humankind’s changing apperceptions and knowledge. But “space” as sensorially experienced appears to be invariant despite all conceptual transformations. This invariance is attested by evidence from all cultures and historical eras. It is one thing to consider ideas *in vacuo*, to create them apart from any linkage to protocol plane data, but altogether different when rules of correspondence enable constructs to be verified by empirical evidence. Newton may have “invented” a construct called gravitation, but the phenomenon itself derives not from his genius but the interplay of time, space, motion, and force fields. These are among the invariant ordering constituents of the universe. And inasmuch as such a universe created our species, not vice versa, our cognitive processes must derive from its parameters and processes.

Integrative Principles reinforce the concept of *telos*, or directionality, which for humankind transforms chaos into cosmos. Homo’s search for order and regularities has been the invariant concern and search of science and theology alike. In Henry Adams’ words: “The effort is as evident and quite as laborious in modern science, starting as it does from multiplicity, as in Thomas Aquinas, who started from unity; ... the assertion or assumption of ultimate unity has characterized the Laws of Energy as emphatically as it has characterized the definition of God in theology. If it is a reproach to Saint Thomas, it is equally a reproach to Clerk-Maxwell. In truth, it is what men most admired in both – the power of broad and lofty generalization” (Adams 1961, 365).

This is in keeping with Einstein’s lofty generalization: “The eternal mystery of the world is its comprehensibility.” As Laszlo points out, “coherent and systematic theories of the empirical world are based upon two ‘primary presuppositions’: (1) the world exists; and (2) the world is, at

least in some respects, intelligibly ordered (open to rational inquiry)” (Laszlo 1972). Our own enquiry is founded upon an epistemological framework incorporating Integrative Principles and their proven compatibility and synergies.

A GENERAL HISTORIOGRAPHIC SYSTEMS MODEL

Humankind’s model-making propensity displays itself by constructing specific cultures, each possessing its own world-view. This cognitive mode characterizes all social systems, one shared in common by most of its members. A culture pattern gives form to different aspects of a social system’s view of reality and makes them more concrete. In systems language, these gestalts comprise, along with codes of behaviour and institutions, societal technics which function primarily as negative feedback processes. They enable a specific culture to remain viable from one generation to another, so that it acts as a set of parametric constraints. In effect, the making of models, or paradigms, applies the principle of invariance to the study of societies.

So far as we know, TST is the first comprehensive attempt to employ a systems epistemology and methodology for the comparative analysis of societal evolution, and within a global context. It represents a feasibility study to ascertain what fresh insights can be gained by a comprehensive approach to societal structure and process. We begin by itemizing its fundamental requirements:

1. Recognition, 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 (Laszlo 1987).
2. This cosmic evolution is self-organizing, self-regulating, irreversible, and open-ended, comprising a seemingly limitless number of interacting superordinate and subordinate entities. Its overall movement has been towards progressively complex organizational states.
3. Complexification occurs in successive levels of systemic organization, accompanied by the creation of unique properties.
4. Three mega-levels of organization are identified: the physical (inorganic), followed by the biological (organic), and thence the sociocultural, with each successive mega-level

building upon a previously organized foundation. After this planetary processual overview, the thesis concentrates on the sociocultural stage and its emergent attributes.

5. 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.
6. Mega-quantum shifts are accompanied by the emergence of original world-views. This requires the interaction of all segments of the culture pattern in a given historical epoch. Key to the process of creating new paradigms of reality and forms of behaviour is the invention of new technics (material and societal). While recognizing the major contribution of material technics to paradigm construction, the thesis rejects technological determinism in any strong sense.

Systems comprise two organizational types: *allopoietic* and *autopoietic*. Realization of an allopoietic system is determined by external processes which do not enter into its organization. It is non-autonomous since its actualization and longevity are not related to its operation. An example is the spatially determined crystal. Autopoiesis is a network of interrelated component-producing processes such that the components generate recursively the *same* network of processes which produced them. Hence, autopoietic systems are self-renewing, self-repairing, and unity-maintaining autonomous organizations of components capable of interactive linkages. The simplest autopoietic organization is a cell of an organism. “*Autopoiesis*, or self-creation, characterizes all living organisms and their organizations, ranging from the macromolecular, unicellular and multicellular organism to differentiated, self-perpetuating animal and human groupings.”⁶

The quantum leap from allopoietic to autopoietic systems is accompanied by a veritable cornucopia of new properties and potentialities. We prefer not to term this sudden change a shift from “nonliving” to “living” phenomena. Within the overarching, ongoing evolutionary process there can be but one universal energy by which all phenomena are manifested. Hence it might be more precise to distinguish allopoietic and autopoietic states as an evolutionary process whose spectrum embraces all transitions from potential to kinetic states of energy, and from latent to actualized states of consciousness.

⁶ Milan Zelany and Norbert A. Pierre, “Simulation of Self-Renewing Systems,” in Erich Jantsch and Conrad H. Waddington (eds.), *Evolution and Consciousness: Human Systems in Transition* (Reading, Mass.: Addison-Wesley, 1976), 150. They refer to the work of F. G. Varela, H. R. Maturana, and R. Uribe, “Autopoiesis: The Organization of Living Systems, Its Characterization and a Model”, *Bio-Systems* 5 (1974): 187-196. See also Humberto R. Maturana and Francisco J. Varela, *The Tree of Knowledge: The Biological Roots of Human Understanding* (Boston: Shambhala, 1987).

The TST model employs structure and process as form-function key correlates. These key terms have respective affinities:

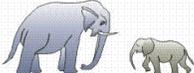
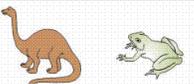
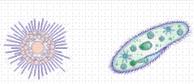
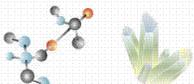
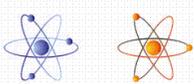
Structure and PIL (levels of systemic organization)

Process and Quantization (continuity-discontinuity)

Inherent in structural-processual dynamics is invariance under transformation; more precisely, a correlation of invariance with symmetry, and transformation with symmetry-breaking. We are dealing with systems which 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.

Let us now briefly “chart” our overview of systemic structural-processual dynamics up to the advent of humankind. Note the following in Figure 1:

1. It is divided into a sequence of organizational levels.
2. These form a sequence, starting from the simplest structures.
3. Quantization accounts for evolution on the grid’s vertical dimension; the levels have systemic boundaries which permit entities therein to be autonomous, yet sufficiently permeable to enable energy and information to oscillate across these boundaries.
4. PIL accounts for the emergence of new level properties; here the evolutionary process functions horizontally, proceeding “*from one type to another*” among organic as well as inorganic forms; and these types vary according to their own parameters, and are defined by physico-mathematical conditions of possibility” (Thompson 1942, vol. 2, 1094).
5. Since one level builds upon its predecessors, explication of the mechanics of quantization is continuous from L1 to L8, but emergent property “surprises” at each new level render the reverse direction one of discontinuity.
6. The levels below L4 comprise inorganic, closed systems and as such are allopoietic; conversely, those at L4 and above comprise organic, open systems, and therefore autopoietic.
7. The line between L7 and L8 marks a “Conceptual Rubicon”, and with it the emergence of culturally organized human societies that in turn display their own societal (S) levels of organization.

Level		System		Properties/Emergent qualities	
Open	L8 (S)	Animate (Organic)		Humans (symbolic co-ordination of societies)	<i>Below</i> + Symbolic thinking; tool-making; culturally organized societal systems; complex emotions; advanced neocortex
Open	L7	Animate (Organic)		Mammals (emotional co-ordination of groups)	<i>Below</i> + Emotions and rudimentary feelings; simple social behaviours; limbic brain
Open	L6	Animate (Organic)		Reptiles (complex physiological co-ordination)	<i>Below</i> + Impulses and instinctual behaviour; central nervous system
Open	L5	Animate (Organic)		Neuronal organisms (multi-organic)	<i>Below</i> + Sensation and perception; neurological codes; locomotion
Open	L4	Animate (Organic)		Cells (multi-molecular)	<i>Below</i> + Dynamic equilibration; prehension and irritability; biochemical codes; reproduction
Closed	L3	Inanimate (Inorganic)		Molecules (multi-atomic)	<i>Below</i> + Molecular properties and structures; replication
Closed	L2	Inanimate (Inorganic)		Atoms (multi-particle)	<i>Below</i> + Chemical and elemental properties; chemical reactivity
Closed	L1	Inanimate		Particles	Forces, positions, velocities interactions

Evolution / complexity

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Figure 1: Levels of Inorganic and Organic Organization

Physical Levels (L1 - L3)

During the first few milliseconds of the “singularity” – the instant of the Big Bang itself – the universe filled with a hot radiant plasma of fundamental particles. These were interconnected and integrated “so that certain properties such as spin or polarization remain correlated between the particles irrespective of how far they are apart in space... . Particles are not acted on by forces external to themselves; they are themselves aspects of a single process that is distributed in space and that changes in time according to defined rules – those of quantum mechanics” (Goodwin 1996, 173-174).

The mainstream version of the Big Bang cosmology specifies the sequence of successive events (Laszlo 1996). The first particles were synthesized as hadrons (heavy particles such as protons and neutrons) when the universe was less than one-thousandth of a second old.

Thence came the formation of photons and atoms, with hydrogen the first element to emerge. With field forces exerting command-power over all cosmological processes, hydrogen formed helium by means of nuclear fusion and transformation, and in turn other elements were created. This sequential formation of more than a hundred elements from hydrogen demonstrates that the phenomenal world in all its multiplicity derives from a single source. The elements – a comparative handful of “building blocks” (filling a role comparable to our alphabet of 26 letters) – would be arranged by Mendeleev in a periodic table, elegant in its simplicity and extensibility.

Quantization enables atoms to form multi-atomic molecules, accompanied by new properties. Thus, with their fusion into H_2O , the resulting molecule water is uniquely characterized by a rich abundance of hitherto non-perceivable properties. As a liquid it assumes a pentagonal structure; as a solid it becomes a hexagon (as every snowflake attests). Again, it can form hydrogen bonds in tetrahedral directions which can stretch or bend without breaking and absorb large amounts of energy. And it plays a fundamental role in the organization of giant molecules forming the basis of life. In the laboratory, “downward” quantization reduces the water molecule to its atomic parents, so that all emergent properties disappear. As we shall see, this phenomenon has its isomorphic counterpart in societal systems.

Atoms and molecules in a crystal are arrayed in orderly fashion in a three-dimensional lattice. Its strongly exhibited characteristic of symmetry results from atomic dynamics: if equal atoms exert forces upon each other so as to make possible a state of structural equilibrium, the atoms arrange themselves in a regular system of points (Weyl 1952, 126). Most crystal symmetries involve the bilateral principle. They are rigid and governed by field-forces ensuring that all crystals have plane faces, with the number of symmetry planes around a crystal axis limited to 2, 3, 4, or 6. The mineral kingdom’s internal architecture places a premium upon static balance and immobility, and a simple morphology based on three-dimensional, Euclidean models – the so-called Platonic solids. This type of symmetry in inorganic crystals contrasts markedly with the functioning of the radial symmetry principle in plant axes at the next level of organization.

Biological Levels (L4 – L7)

A remarkable clue to this quantum shift was discovered by Pasteur in his study of molecular structures. Whereas artificially produced substances are symmetric, natural bodies have

molecular asymmetry (left-handedness or enantiomorphism) – and he saw in this symmetry-breaking the very characteristic of life (Thompson 1942). And today we know “that DNA, the most basic nucleic acid, takes the form of a left-handed helix” (Prigogine and Stengers 1984, 163). Congruent with Integrative Principles, affinity inheres between symmetry and immotility, conversely, between asymmetry and motility, throughout the phenomenal world.

A quantum leap of extraordinary magnitude separates organic from inorganic entities. “In terms of ordered structure the distance between a bacterium and a man is much less than between a bacterium and, say, a giant electronic brain” (Quastler 1964, 1). Autopoietic systems share indispensable attributes: feedback and control, homeostasis, and reproduction. Such behaviour attests they are in continuous coupled sequence with their environments, and exhibit considerable autonomy in maintaining, repairing, and replicating themselves.

At some critical point in time-space, organic molecules transformed into a structure embodying characteristics associated with living matter. The cellular revolution had produced a new and single unit. Cells are made up of about 10^{14} atoms, and the average human body contains some 10^{14} cells, with almost all having 46 chromosomes. The cell’s complex organization, within an elegant orderliness, is observed in mitosis (from the Greek for thread), which provides a key to the symmetry of living forms and functions. The living cell advances from the inorganic crystal’s centrosymmetry to linear symmetry. Two polar bodies take up positions with their axial line the centre of a symmetry of forces. Chromosomes arrange themselves along this equatorial plane, while astral rays are anchored to the polar bodies. Wholeness is restored to the cell’s volume by dissolution of the nuclear membrane. “Thus the cell activates itself in the geometric sequence possible in our three-dimensional space: point, line, plane, and volume” (Kunz 1972, 322). (We shall see this geometric sequence repeated in the geomorphological evolution of sociocultural systems.)

For more than 4,000 million years – over five-sixth’s of the planet’s existence – only one-celled organisms had evolved. But now the evolutionary process accelerates. In the Cambrian period, continental land masses appear, while in shallow seas the pace of growth and adaptation result in the next quantum. Aggregated single cells are reconstituted as protozoa, comprising many cells differentiated into specific tissues and organs.

During the Cambrian and Ordovician periods, all basic types of animal structure appear in the fossil record; they can be classified into some 15 basic zoological branches, or phyla, each comprising a “fundamental anatomical plan”. Since then, some 400 million years ago, there has been no new major animal type, suggesting that all the fundamental possibilities of

animal structure had now evolved. Nor has any phylum become extinct. Each has tended to begin with relatively few forms and subsequently develop and diversify in both form and function,⁷ resulting in the creation of hundreds of millions of species since the advent of planetary life.

The phyla play out a contrapuntal theme of invariance under transformation – a form-and-function quantum within a phylogenetic continuum, and this harmonic composition occurs concurrently on the temporal and spatial dimensions. Duration of a phylum’s organizational pattern for hundreds of millions of years – despite environmental changes, often of a convulsive planetary magnitude – attests to the ordering capability of the principles of symmetry and equilibration, and no less to their constant presence.

By correlating symmetry, motion, and space, we see a major difference between flora and fauna. A tree is organized in radial symmetry, its growth along vertical axis. Planes of symmetry are clearly indicated in many plants, each passing through this vertical growth axis: Their motility is rooted to the earth and hence to a sedentary existence. They have no nervous system; interior communication is made possible by the manufacture and transport of hormones, called auxins.

Animals possess much greater spatial freedom. They can maximize motility because they possess only one symmetry plane, the bilateral. Moreover, the vertebrates experienced a quantum leap by acquiring two nervous systems, the autonomic and sympathetic. Yet these are only two of numerous emergent properties distinguishing the animal domain. A large variety of new species now inhabited the biosphere, with the lithosphere constituting the *aureo sectio* (since classes evolving in the adjoining hydrosphere and atmosphere became too specialized in form and function to acquire overall biospheric symbiosis).

But two classes adapted to exist simultaneously in all three life zones (a process called “adaptive radiation”): reptiles and mammals. The Mesozoic was a comparatively uneventful geological era, so that despite their proportionately small brains, the dinosaurs dominated the

⁷ “Of the lesser types within phyla many, indeed most, have become extinct, but the major grades of organization persist. This extraordinary fact bothered Sigmund Freud, who could not see why all ancient forms have not yielded to a death wish, and it has bothered some others who feel that progressive evolution should imply constant replacement of all lower forms by higher. The explanation is really quite simple. In the filling of the earth with life, some broad spaces were filled first, filled well and adequately, leaving neither reason nor possibility for refilling by types of later development. A protozoan...is a fully adequate answer to the problems of life in that particular sphere. ... Other phylas represent, not advances over protozoans for life as protozoans live it, but the development of other possibilities, other ways of life, and filling of other spheres in the economy of nature.” George Gaylord Simpson, *The Meaning of Evolution* (New York: New American Library, 1955), 19.

biosphere over a long lifespan. The Caenozoic was much more demanding, but its challenges were met by species equipped with uniquely developed nervous systems and brains. The Tertiary period proved critical for the evolution of the primates; the Quaternary, extending back some 1.5 to 2 million years, for the development of hominids in particular. Their acquisition of bipedal locomotion freed the forelimbs which henceforth became manually dexterous; it also rendered superfluous much of the neck muscle and so favoured physical expansion of the brain; while enhanced motility on the ground accelerated dispersion of hominid types in exploited space.

The Human Level (L8)

For at least two billion years, the environment acted to adapt the organism, the resulting symbiosis effected by what Herbert Spencer called “indirect equilibration”. Throughout the organic world, he said, life involves the maintenance of a “moving equilibrium” between the outer forces acting on an organism and its inner, evolved, forces. “The equilibration of organisms that are almost passive, is necessarily effected indirectly, by the action of incident forces on the species as a whole” – a process he equated with Darwin’s natural selection. “But along with the evolution of organisms having some activity, there grows up a kind of equilibration which is in part direct.” And “among the civilized [sic] human races, the equilibration becomes mainly direct” (Spencer 1898, 552-553).

In coping with the challenge of survival, then, organisms engage in *adaptive equilibration*. Stimulation of so-called passive animals involves a complex selection at both the receptor and effector levels and a patterning of inputs from the external environment as well as the organism’s response. At the human level of organic organization, this process of stimuli selection and integration is developed also to apprehend, understand, clarify, and conceptualize the complexities of our existence within the context of this external environment (Murphy and Spohn 1968). Hence; superimposed upon adaptive equilibration – a reality-coping orientation – is the stage of *manipulative equilibration*, a *reality-seeking*, i.e., *goal-directed* orientation. That humans can obtain a more comprehensive view of reality results from a perceived isomorphic relationship between the outer universe – the macrocosm – and our species’ inner world, the microcosm.

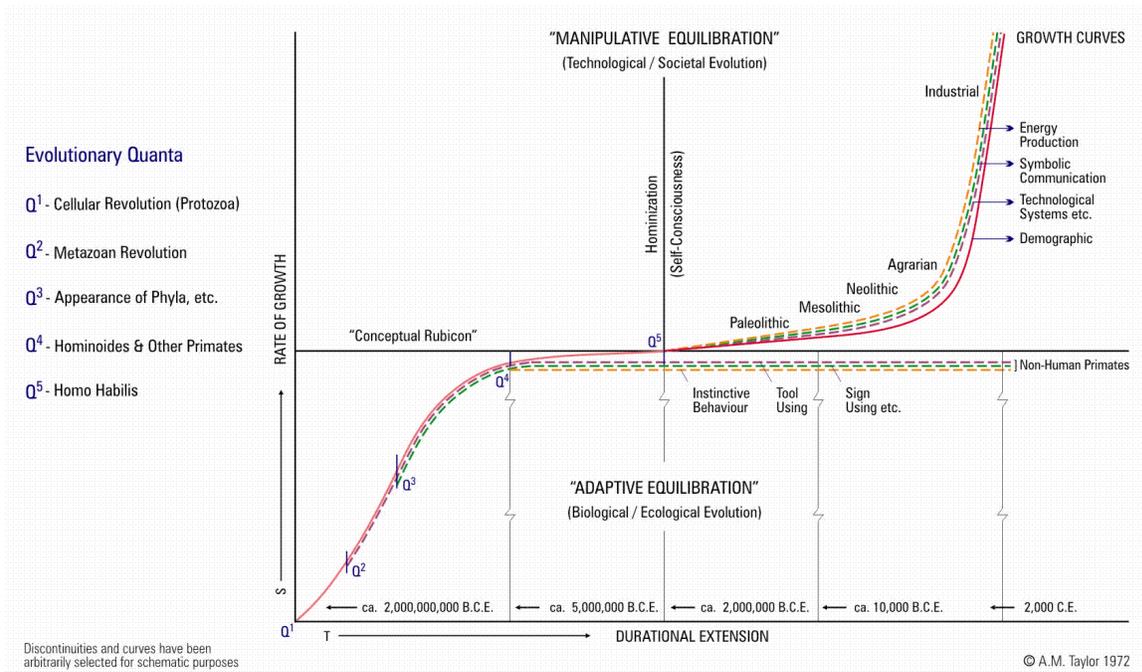


Figure 2: The Conceptual Rubicon

A small stream forming the boundary between Italy and Cisalpine Gaul, the Rubicon's crossing by Caesar in 49 BCE to attack Pompey marked a decisive and irrevocable step. Here the term is used to indicate a quantum evolutionary move, a point of no return. Since a marked characteristic of *Homo sapiens* is the relatively large size of its brain, the relationship of size or weight of brain to body weight would appear to be relevant to the "Conceptual Rubicon" that distinguishes our species from other primates. Yet while larger mammals have larger brains, those of elephants may reach 4000 c.c. and whales 6700 c.c. compared with *Homo sapiens*' range of 1000-2000 c.c. (Campbell 1966, 231-232). A more precise measurement relates an organism's size of brain to body to obtain an "index of cephalization". However, in both mice and men the weight of the brain is approximately one-fiftieth that of the body, yet "everyone agrees that these two types of brain do not accomplish the same work" (Portmann 1967, 59). The index of cephalization, invaluable in measuring the overall evolution of a primate continuum, cannot be expected to account for the qualitative discontinuities which occurred within that process.

In order to explain 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, 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. This capacity to abstract, and to universalize from particulars, lies at the heart of what Margenau calls the “rational and reflective”, in effect, to move from the protocol plane to the construct field. 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 humans and other primates is the time-span in which consciousness functions. In the latter this dimension is limited, extending but a short way into past and future, while in humans it grows both quantitatively and qualitatively. “The evolution of conceptual thought gives man greater power to live in the past and in the future by abstraction from the past” (Campbell 1966, 296) – which again attests to the centrality of time as an ordering principle.

Applying PIL, we can see why adaptive, i.e. instinctual, homeostatic equilibration is retained at the physiological level, thereby enabling advanced organisms at the same time to function consciously at the cognitive level – and, with *Homo*, engage in both adaptive and manipulative equilibration. Purposeful behaviour and maximal freedom of action is directly proportional to the number of feedback circuits (negative and positive) possessed by an organism – and our species possesses the greatest number.⁸

This aspect of PIL applies no less cogently to the structuring and behaviour of societal systems.⁹ At the lowest level, that of food-gathering, humankind has to devote a critical amount of its time and energies to physical subsistence. In effect, it remains for hundreds of thousands of years at a stage primarily of adaptive equilibration within a planetary ecology. However, as our species acquires new constructs of its relationship to the external environment, it develops *technics* to refashion the existing symbiosis. As it moves to a more

⁸ For a detailed analysis, see Ervin Laszlo, *The Structure of Human Experience: Outline of a Multi-Level Feedback Theory* (New York: Gordon and Breach, 1969).

⁹ There are of course many animal societies, each with its own attributes. This study is concerned with human societies, at the L8 level of organisms.

advanced level of societal organization, the initial stage now serves as “mechanism” – it shifts progressively from positive to negative feedback stabilization – while the succeeding level assumes overall societal responsibility and reconceptualizes its purpose and new direction. For example, the food-gathering stage becomes subordinate to the food-producing stage, while societies at this latter (Neolithic) level subsequently form part of the mechanism serving still more advanced societal systems in turn.

The significance of our Conceptual Rubicon is nowhere better illustrated than in the use of symbols for concepts (and in our time serving to initiate novel methods of calculation). A language is acquired by associating objects with names, enabling concepts to be distinguished and *standardized* – invariance’s indispensable role in the conceptualizing process. Names, as verbalized concepts, comprise the standards common to a group; hence they make possible symbolic communication, and with it the creation of sociocultural systems. By acquiring a “symbolic system”, our species exists “in a new *dimension* of reality.... No longer in a merely physical universe, [humankind] lives in a symbolic universe. Language, myth, art, and religion are parts of this universe. They are varied threads which weave the symbolic net, the tangled web of human experience. All human progress in thought and experience refines upon and strengthens this net” (Cassirer 1965, 4, 25).

Another emergent property separates our species from other primates: self-conscious actualization of the normative dimension, which in its exaltation and devastation alike defies quantification. A correlation of the cognitive and normative is found in the parable in *Genesis* where the first man and woman ate of the tree of knowledge. “And the Lord God said, ‘Behold, the man is become as one of us, to know good and evil’” – and promptly expelled the pair from Eden.

If we have “sinned” because from earliest times we have quested after knowledge, in that endeavour we learned that its fruits can be both beneficial and detrimental – at once life-giving and life-destroying as when physicists learned how to split the atom. To be human is to evaluate, to assign a value or worth to everything we perceive or do. We shall presently see that even the decision to make the simplest flint tool is inextricably tied up with its perceived value, as determined by the use to which it will be put, namely, its intention or purpose.

A SOCIOCULTURAL SYSTEMS METAMODEL

A so-called “primitive” human society is extraordinarily complex. “In culture ... we must imagine a great arc on which are ranged the possible interests provided either by the human age-cycle or by the environment or by man’s various activities.... Identity as a culture depends upon the selection of some segments of this arc” (Benedict 1946). A “culture” comprises “patterns, explicit and implicit, of and for behaviour acquired and transmitted by symbols, constituting the distinctive achievements of human groups, including embodiments in artifacts”; and its “essential core” consists of “traditional (i.e., historically derived and selected) ideas, and especially their attached values” (Kroeber and Kluckhohn 1952). Since each society is unique in both its location in time-space and its historical antecedents, its cultural distinctiveness has in turn to be recognized in terms of normative distinctiveness. Yet with the creation of societal systems over the inhabitable earth, it follows no less that every system will possess physical, biological, and cultural correspondences (isomorphisms) with all others. These correspondences arise from certain “inescapable problems” which humankind has always faced: such as obtaining food and shelter, coping with birth, illness, love, and death. Consequently, “all cultures are just so many different answers to identical questions, and the variations and similarities in these answers will never be understood until the primitive categories and distinctive postulates of each culture are perceived. The patterns of all cultures crystallize around certain invariant points of reference: the conditions given by biology, by the nature of the external world, and by the universalities of social interaction” (Kluckhohn 1950, 78).

Universal Culture Pattern (UCP)

These “invariant points of reference” and “inescapable problems” have everywhere been expressed by coping with a number of fundamental needs which form the basis of a *universal culture pattern*:

- a. *The need to survive (economic activities)* All members of the species must have food, clothing, shelter, and the means to provide for their offspring.
- b. *The need for social organization* For people to make a living and raise families, a social structure is essential. Ideologies can hold different views about the relative importance of the group and the individual within a given social structure.
- c. *The need for order* From earliest times, communities have had to keep peace among their members, defend themselves against external attack, and allocate resources in some authoritative manner.

- d. *The need for knowledge and learning* Humankind has always transmitted knowledge acquired from experience, first orally and then by means of writing systems. As societies grow more complex, the need increases to preserve knowledge and transmit it to as many persons as possible, and from one generation to another.
- e. *The need for self-expression* People have responded aesthetically to their environment even prior to decorating the walls of Palaeolithic caves with paintings of animals they hunted. The arts appear to have a lineage as old as humanity itself
- f. *The need for religious and philosophical expression* Equally ancient is humankind's attempt to answer the "why" of its existence. No less than in archaic ages, we continue to search for answers to the ultimate – or ontological – questions of life.

These six needs have been common to people at all times and in all places. The concept of UCP can be likened to a system in that all segments are interconnected and interacting. Persons born into a given society will derive from its version of the UCP their fundamental views of reality (*Weltanschauung*, or world-view), life-style, and standards of action and conduct. Some segments of the pattern may change more rapidly than others, so that activities or institutions become outmoded in relation to others. Here we encounter the phenomenon of "culture lag". This can reflect asymmetrical dysfunctionism and create disequilibria which, if not rebalanced, may lead to conceptual and societal quantization or "revolution".

Manipulative Equilibration: Material and Societal Technics

That Homo is a self-conscious goal-seeker is illustrated by examining ancient improvised tools, called "eoliths" (dawn stones). These are all but indistinguishable from stones fractured or shaped by natural agencies. But associated with *Homo habilis* in Tanzania's Oldoway Gorge in Tanzania are pebbles shaped "with increasing elaboration and clarity of purpose. By the latest Oldowan levels they are being chipped (though still roughly) from both sides into ovoid forms ... recognized as prototypes of the Abbevillian hand-axes which occur in the overlying beds" (Hawkes and Woolley 1963, vol. 1, 66). Whereas eoliths could have been shaped by random natural factors, when we encounter evidence of interconnected form and function – tools made "to a set and regular pattern" – there can be no doubt that our progenitors have crossed the Conceptual Rubicon, and entered the domain of "clarity of purpose" and goal-seeking, or manipulative equilibration.

With regard to the physical environment, men and women conceptualize and fabricate tools essentially to *attain* greater control. These can be designated *material technics* (T_M)¹⁰ and 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 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 tools or 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, ecclesiastical and military hierarchies, educational 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.

Manipulative Equilibration and Integrative Levels

We might next correlate the respective functions of T_M and T_S with the principle of integrative levels (PIL) and its emergent properties. 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.)

At this juncture, we can structure a complementary grid to Figure I to schematize broadly the evolution of sociocultural systems from the lithic (S1) to the emerging global (S5) stage of human evolution. 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

¹⁰ The term "technic" is defined here as "any branch or method of applied learning"; it is employed in preference to "technique" which has a more restrictive connotation, namely, "the details of procedure essential to expertness of execution in any art, science, etc."

“outspringing of something that had hitherto not been in being” (Morgan 1923, 111-112). Relating these to Figure 3, the “unfolding” process is horizontal inasmuch as sociocultural development calls for actualizing the potential of the transacting UCP components as enclosed by the boundaries or 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 uni-directional. True, biological information is genetically encoded and transmitted with a high degree of certainty in “impleted” (i.e., intra-dermal) space, so that the evolutionary process does point to progressive complexification. 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 forced to remain 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 technics can drastically alter or destroy the UCP of “simpler folk”; this is commensurate with the dynamics of PIL: the “higher” tends to dominate the “lower”.)

Levels	Worldview (Ts)	Environmental control Spatial expletion (Tm)	Population density Spatial impletion (Tm)	Social organization (Ts)	Science and technology (Tm)	Matter / energy use (Tm)
Mythos I (S1) <i>Old Stone Age</i>	Belonging  Animism	Undifferentiated  Nomadic	Transient control 	Clan  Communal	Multi-purpose tools  Hunter-gatherer	 Human power
Mythos II (S2) <i>New Stone Age</i>	Supporting  Ancestor worship	Random siting  Settlement	Immediate control  Village	Tribe  Collective	Specialized tools  Herder-cultivator	 Stored energy
Theos (S3) <i>Agrarian Age</i>	Obeying  Divine rule	One-dimensional control  Agrarian civilization	Local control  Town	Caste  Autocracy	Metal tools  Agrarian economy	 Harnesses energy
Logos (S4) <i>Industrial Age</i>	Acquiring  Rationalism	Two-dimensional control  Nation state	Regional control  City	Class  Meritocracy	Machines  Industrial economy	 Linked machines
Holos (S5) <i>Information Age</i>	Integrating  Holism	Three-dimensional control  Planetary system	Global control  Bioregion	Community  Holarchy	Electronic networks  Information economy	 Networked systems

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Figure 3: Levels of Societal Organization

MYTHOS – THE WORLD-VIEW OF LITHIC SOCIETIES (S1-S2)

Anthropologists distinguish between two levels of lithic societal organization. The first comprises the Old and Middle Stone Ages, characterized by food-gathering, hunting, fishing; the second, the New Stone Age, is marked by a food-producing economy. In terms of our model the Palaeolithic (Old Stone) and Mesolithic (Middle Stone) Ages are components of a single organizational level: S1. The Neolithic (New Stone) Age demonstrates properties sufficiently distinctive as to set it apart as a separate organizational level: S2. Because these were structurally simple systems with severely limited capacity to control or alter their environments, ecological factors loomed especially large in the early stages of societal development.

The first level is remarkable for its durational sweep, comprising more than 99 per cent of our species’ present life-span. This vast age/stage continuum is notable from the standpoint of two Integrative Principles. Given the correlation between durational continuity and the

dominance of negative feedback processes, it follows that Palaeolithic communities possess T_S emphasizing a primarily adaptive form of equilibration, with changes occurring gradually and with minimal perturbations. Conversely, this also attests to the manipulative weakness of T_M , with their control power restricted to the local habitat. In short, the Early Palaeolithic Age was *long on experienced time, and short on controlled space*. (This initial temporal-spatial relationship would be progressively reversed, with dramatic consequences in our time.)

Cultural evolution requires four major factors: contacts between groups resulting in the dissemination of ideas and information; technological advances; population growth; and political innovations, especially centralizing developments (Cohen 1968, 45). But because a food-gathering economy can sustain only a small population and low demographic densities, S1 societies were spread out so that external contacts were minimal compared with those at higher societal stages. Small populations required organizing people into small bands (20 to 50 persons); its few members had difficulty in functioning as a corporate unit, while in any normal distribution of ability there was small probability that many individuals of unusual talents would be born.

Palaeolithic T_M have significant implications for TST. With each tool serving as a specialized human forelimb, we have invented many thousand specific forms-and-functions. And it all begins with our Palaeolithic ancestors. This technological evolution leads to progressive specialization, as exemplified by the burin, a long, thin, symmetrical flint blade shaped much like the modern chisel. Of concern here was its use as a *tool to make other tools*, the stage of “secondary tools”. Instead of primary implements having to be fashioned *ab initio*, secondary tools speed up implement-making and with it progressive specialization. From the lowly burin technology would evolve to where, as Whitehead points out, the nineteenth century saw the invention of the method of invention – and today we are programming industrial methods to enable machines to invent other machines.

Prior to the Late Palaeolithic, all tools had been grasped in the hand. But now the first steps were taken to apply mechanical principles to the movement of tools and weapons. Handles were attached to pointed stones to make a spear, which in turn was launched more effectively by a thrower. This was a shaft with a hook-like projection fitting into the butt-end of spears and which, using the principle of the lever, increased the propelling power of the hunter’s arm. Late in this period, too, the bow was invented, which of course increased territorial control, as well as later providing the means for twirling a stick, thus leading to the invention of the rotary drill. In these ways humans set in motion the technology of missiles which in our day has reached intercontinental and interplanetary stages.

In humankind's unrelenting activities to shift from an adaptive to manipulative relationship with its environment, no greater breakthrough occurred than in learning how to make and control fire at its bidding. By Late Palaeolithic times fire-making was produced by the percussion method (using flint and pyrites to ignite tinder; and by three methods of wood friction). As a result, humankind's working and leisure hours were no longer limited to daylight, and activities and habitation could henceforth be extended to the higher latitudes.

Palaeolithic T_M exhibited two phenomena which would remain invariant throughout the history of technology. The first was the drive of a given technology towards maximizing the efficient use of available materials – in the case of lithic technology, maximizing the ratio of function to a flint's mass. In pebble tool cultures a pound of flint provided about 5 centimetres of cutting edge; in the hand-axe industries it amounted to 20 centimetres; in the Middle Palaeolithic 100 centimetres; while in the Late Palaeolithic the figure rises to 300-1200 centimetres (Eiseley 1955, 1-11). With the invention of microliths and other stone implements, S1/S2 all but exhausted the potential of flint; it would be for S3 societies to move from flint to metal implements.

The second Palaeolithic technological invariant was a correlate of the first: the phenomenon of miniaturization – “doing more with less”. This is illustrated by comparing the size and weight of the massive all-purpose hand-axe with microliths. From this we can generalize that the sophistication and efficiency of a given tool or machine industry relates directly to its miniaturization (as attested in our day by the evolution of the computer).

As Figure 3 indicates, societal constructs were based on a biological nexus-family, extended family, clan, tribe – and negative feedback predominates in biological systems. In lower-level societies, blood-ties in the family and larger related groupings act as potent social pressures to ensure conformity and, where deviant action has occurred, to enforce again the traditional order. For example, stealing and other offences call for restitution so as to restore or approximate the *status quo ante*. Still another form of potent collective pressure is the use of *tabus*, prohibitions that custom (the socio-temporal continuum) has placed on various actions or words so as not to break the “cake of custom”. The appropriate conceptual *gestalt* for lithic societies is the circle, whether one thinks of a negative feedback (closed) circuit, the use of spatial perimeters in which to obtain food, conceptualization of time as cyclical, or of architectural and sculptural forms, with their emphasis upon cellular forms and enclosures.

Climatic changes ending the fourth glacial phase initiated the Holocene, or Recent, geological epoch. As vast ice sheets melted, sea level changes greatly altered coastlines. Dense forests replaced large regions in Europe formerly marked by sparse vegetation, or tundra, while

mammoth and other animals hunted by Late Palaeolithic peoples became extinct. Our species adjusted to postglacial conditions by developing Mesolithic cultures. As an “age” they were very much shorter than their predecessors; as a “stage” they comprised a more specialized response to the changing landscape.

Despite technological advances, Mesolithic peoples remained food-gatherers, still forced to migrate by environmental demands. Many groups lived along seacoasts, fishing, sealing, gathering shellfish. Their semi-sedentary existence is attested by large mounds of debris, known as kitchen middens, found in Denmark and along the Baltic coast. Other Mesolithic groups lived inland in the now plentiful forests where they chopped wood with stone axes equipped with handles, hunted with improved bows and arrows, and devised such transport as skis, sleds, and dugout canoes.

While climatic changes are clearly associated with northern Europe, the Mesolithic stage was worldwide. In central Africa the Acheulian tool tradition was gradually supplanted, and South Africa’s Mesolithic cultures continued until recent times. In Palestine, the Natufian culture, composed of micolith-producing hunter-fishers who frequented caves, hammered out circular basins with raised rims which might have been used for pounding grass seeds (as Palestine is a likely habitat for wild barley and emmer). In China stone working techniques took the same general trend as farther west, with Mesolithic cultures and microlithic technology found together in widely diffused areas. The Mesolithic stage was strongly entrenched in the steppe and desert North, so that Mesolithic hunters of the Gobi remained to become contemporaries of the Neolithic farmers who came to cultivate the lands “south of the mountain line” in the Yellow River valley – a cleavage marked historically by the Great Wall. Like European Mesolithic cultures, in North America the Inuit made microliths, were semi-sedentary (attested by kitchen middens), and employed the dog-sled. Specialized T_M included traps and weirs, harpoons, bows and arrows, and kayaks.

The Mesolithic represents an ultimate stage in one form of biosocial evolution. By then our ancestors had maximized their own muscles and natural leverage as a prime mover, supplemented by external leverage attachments. To quantize beyond this plateau, humans must henceforth acquire non-human prime mover sources. These can take the form of water or wind, or other biological systems: animals inhabiting the same ecology. Mesolithic folk made this conceptual breakthrough by domesticating the dog to propel sleds, concomitantly increasing controllable space, and thereby also initiating a permanent symbiosis with other species. Yet domestication would have to await full expression in the next stage of societal evolution.

The Neolithic Quantum (S2)

What many scholars believe the most revolutionary alteration of the Homo-environment nexus can be envisaged by the transformation of the societal landscape. Now it has arable plots of land with women and children tending them; a nearby village structure, its oval enclosure protecting round thatched houses; men and women outside engaged in weaving and making clay pots; an elder instructing boys in tool-making; beyond the cultivated plots pastoralists with herds; in the near distance a megalith, the burial site of perhaps a chieftain; and trackways through the forest leading to other settlements.

To generate a major quantum shift, a corpus of systemic innovations is required, one capable of impacting upon all segments of the UCE Based on empirical analysis, TST has identified this corpus of innovations. They are responsible not only for the emergence of the *Mythos* of lithic societies, but every succeeding mega-quantum shift: for the *Theos* of archaic civilizations; the *Logos* of classical civilizations and Western societies until modern times; and for the transition to *Holos*, the harbinger of global civilization.

The factors identified as responsible for societal mega-quantization are:

1. Technological-scientific innovations
2. Increased production and consumption of energy
3. Increased environmental control capability
4. Increase of information systems
5. Exponential growth of population
6. Economic growth and social complexification
7. New aesthetic canons and modes of expression
8. Unique 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 originates with technological innovation which in turn results in a logical sequence of increases in energy, environmental control, information, population, economic activities and social complexification, and in aesthetic experimentation, culminating in a new world-view. In this linear construct, the whole is the sum of its parts.

But historical evidence does not support a linear approach. As in the case of the UCP segments, 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 entity. Can this transformed cultural landscape not be regarded as an emergent societal holofield, made possible by what Laszlo elucidates as “the unified interactive dynamics (UID) through which the facts investigated in physics, biology, and the sciences of mind and consciousness could be simply and coherently bound together” (Laszlo 1993, 134) – and to which we would add the facts investigated in history and the social sciences. In our second, non-linear construct, the whole is both greater and other than the sum of its parts.

The TST Metamodel

We are now in a position to construct and diagram our meta-model. This (a) accounts for (i) biospheric and (ii) sociocultural inputs from the external environment; (b) recognizes the given socio-cultural system as (i) converter, (ii) withinputs-generator (i.e., inputs produced within the system itself); iii) the numerous subsystems comprising UCP segments; and (c) relates its outputs – as T_M and T_S – to positive and negative forms of feedback (Taylor 1976, 174-176).

The feedback loop is bifurcated: the metamodel shows how T_M and T_S interact upon the state of the system vis-à-vis its environment. They can combine so as to result in systemic self-stabilization; alternatively, in systemic transformation. We can designate the first process “Cybernetics I”; the second “Cybernetics II”. The first, comprising net negative feedback processes, acts to stabilize a given sociocultural system within its environment. In contradistinction, dominant positive feedback processes comprising Cybernetics II can take one of two courses. They may increase the system’s negentropy and information gain – and thereby also increase its environmental control capability – so as to actualize the existing potential within the system-environment nexus. Or more dramatically, Cybernetics II enables the system’s outputs (in the form of T_M and T_S) to cross the diagram’s permeable frontiers separating one environment from another, and so quantize to a new level of societal organization.

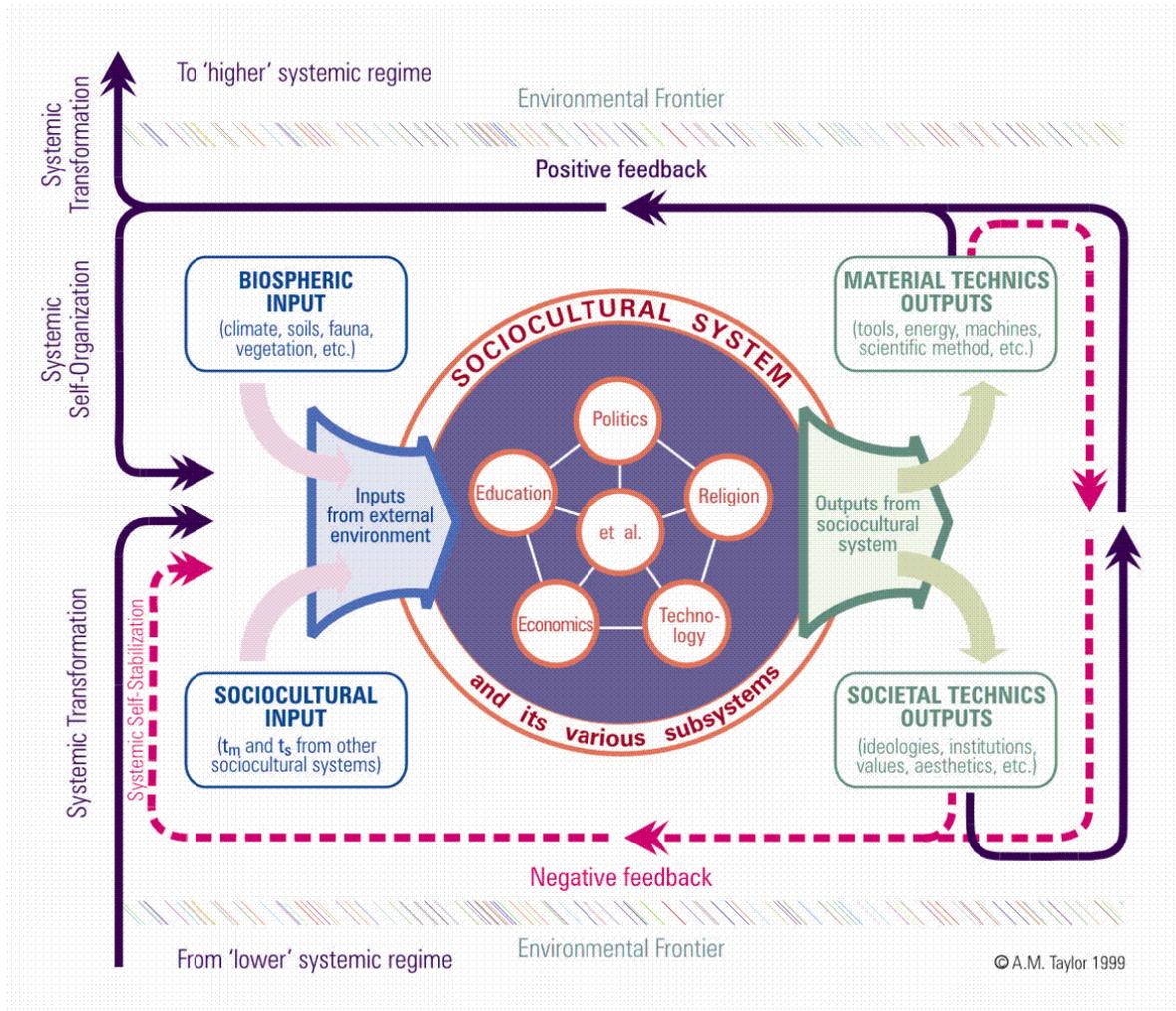


Figure 4: Positive and Negative Feedback

Examples of Cybernetics I are found in subhominid societies where Darwinian mechanisms are fully operative; again in mature or senescent cultures whose available T_M have achieved their maximal alternative capacity and reached self-stabilization. Cybernetics II, exemplified by advancement into the high latitudes with control of fire and invention of appropriate T_M , enabled the Inuit to survive and live symbiotically with other species in a low-energy environment. But since the latter sets constraints on biospheric control, negative feedback mechanisms remained dominant, resulting in overall systemic self-stabilization (Cybernetics I); hence the Inuit remained at S1 pending intrusion of more advanced technics from external systems. Greater systemic self-organization and manipulative equilibration (Cybernetics II) quickened in the late Palaeolithic and Mesolithic stages, but their peoples did not cross the conceptual-environmental frontier so as to

quantize to S2. Which brings us to the factors responsible for the Neolithic Quantum.

1. Technological Innovations These can be briefly itemized:

(a) *Domestication of plants*: Emmer wheat and two types of barley were found at Jarmo about 5000 BCE, and spread to Europe. Rice cultivation in China may date from the second millennium BCE. In 2000 BCE corn, beans, squash, pumpkins, avocados were being raised in parts of Mexico. In short, humans on all the continents were domesticating native plants.

(b) *Domestication of animals*: Again there was more than one independent hearth of domestication: Mesoamerica, the Andean highlands, Southwest Asia, and Southeast Asia. Single species were possibly domesticated before an agricultural economy was introduced in North China, Ethiopia, and West Africa (Butzer 1964, 417). The agricultural stage was responsible for domesticating animals for whose maintenance a settled life is a prerequisite (such as cattle), and for animals used primarily as beasts of burden, for riding, and for traction (Zeuner 1956, vol. 1, 349-352).

(c) *Domestic crafts*: Pottery's association with the Neolithic stage is logical since the medium's fragility does not lend itself to a nomadic existence. Crude attempts at pottery-making had occurred in Mesolithic semi-sedentary cultures, while materials in their natural state were employed as containers: such as gourds, skins, and shells. Now in a set and regular fashion, new materials resulted from a chemical change produced by firing the clay. Pottery reached outstanding quality independently in the Old and New Worlds.

In addition to basket-making, all Neolithic societies appear to have woven fabrics from spun threads, especially wool and flax. Examination of the origins of pottery, basketry, and spinning shows a marked emphasis upon motion that is rotary, continuous, and unidirectional. Meanwhile, the new farming life was responsible for significant dietary innovations, including alcoholic beverages (another technological "first" in altering natural materials by human-generated processes).

As we might expect, climate and local materials were determining factors in planning and constructing domestic buildings: a common denominator was their adaptability to different environments, and their functional character. In the Orkney Islands, the hamlet of Skara Brae was compact, its substantial stone-built houses – each with its own hearth for a peat fire – protected against the tireless winds by being grouped into clusters connected by paved roofed-over alleys, and the settlement drained by a system of stone-lined sewers running under the huts.

(d) *Transport, roads, sea migrations*: Human mobility increased with domestication of burden-carrying animals and the invention of vehicles – such as the slide car and travois – and boats for both rivers and larger water bodies. These inventions opened up communications and stimulated the interchange of goods, ideas, and the spread of T_M and T_S . The movement of wares and the migration of peoples was greatly accelerated throughout the world. By hugging the Mediterranean and Atlantic coasts, as well as striking up river valleys into central and western Europe from the southeast (the Danube being an important artery), our Neolithic forebears searched out virgin farming land on which to site new village communities. Independently, the most spectacular Neolithic maritime migrations were conducted by the Polynesian and Micronesian peoples. By inventing novel ocean-going craft and remarkably innovative navigational skills, they explored and settled a vast and almost empty triangle formed by New Zealand, Hawaii, and Easter Island.

2. *Increased Production and Consumption of Energy*: A direct correlation exists between the organizational level of a societal system and the amount of energy generated and consumed. The daily per-capita energy consumption about 1,000,000 years ago among small bands of primitive food-gatherers in East Africa – who were without fire and had only the energy of the food they ate – was some 2,000 kilocalories.¹¹ Among European hunting groups some 100,000 years ago the figure would have doubled since it included use of fire. In primitive agricultural societies the rate rose to perhaps 12,000 kilocalories (*Scientific American* 1971). The Neolithic quantum was generated physically by the greater energy derived from increased food supplies, and from use of domesticated draft animals.

3. *Increased Environmental Control Capability*: Like Palaeolithic folk, Neolithic migrants dispersed from their various heartlands into new territory. But for the first time, the anthroposphere was transformed in terms of a new ecological dimension: settled existence. This phenomenon of *localization* can be likened to the proliferation of “societal protozoa” since the typical node on the human landscape is the simplest of fixed-site organisms, the hamlet or village. Some nodes are large, as in Southwest Asia or the Huang-ho flood plain; others small, as in Western Europe. This site-situation innovation is acceleratively adopted wherever possible throughout the anthroposphere.

4. *Increased Information Flows*: When Europeans explored Australia, they found some 500 Palaeolithic tribes and as many languages, attesting to both spatial and cultural-linguistic fragmentation. These ancient linguistic systems, in use for hundreds of thousands of years,

seem to have undergone no fundamental change of character before the Neolithic revolution (Sommerfelt 1956, vol. 1, 101). The advent of the village node and demographic densification resulted in a new level of interpersonal communication. Neolithic pictographs reducing humans and objects to simple diagrammatic forms represented the dawn of ideographs, and have survived from pre-dynastic Egypt. Very early pictographs have survived both from pre-dynastic Egypt and from Mesopotamia's earliest civilization – the beginning of hieroglyphic writing (Hooke 1956, vol. 1, 744).

5. *Exponential Growth of Population:* Where Palaeolithic nomadic foragers lived in bands ranging from one to five families, even the crudest form of food production – slash-and-burn agriculture – represented a large increase of people. A modern study of tropical forest society in central Brazil examined a Kuikuri village made up of 9 large, well-built thatched houses, with a population of 145, and garden clearings planted in 11 varieties of manioc along with maize. Other villages in Amazonia exceeded 1,000 inhabitants, while among modern cultivators in Nigeria is Umor, a village of some 11,000 in a territory of 47 square miles, or 230 persons per square mile.

6. *Economic Growth and Social Complexification:* A correlation exists among increased utilization of natural resources, population growth, and two basic types of socio-economic organization among the earliest food-producing societies: horticultural (cultivating plants) and pastoral (caring for domesticated animals). Like hunters and foragers, horticulturists relied on their own muscles to obtain food, but now controlled the source of much of the food on which they subsisted. Yet this control was much less than with farmers in the fully agricultural stage because they did not turn over the topsoil, which required the plough, often pulled by draft animals. Pastoralism involves transhumance, the seasonal movement of livestock between lowland and highland pastures. As it still called for fixed settlements, it differs from nomadism which, moreover, exercises no control over either domestication or migration of animals.

The basic social unit was now the clan, and the village the basic residential unit. A horticultural society consists of a number of villages linked by means of clans, with all members held to descend from a common ancestor. A negative feedback innovation to provide stability, it assists the transition from a biological-nomadic to a biological-territorial nexus. Clans in turn are subsumed within the tribe, a congeries of equal kin groups. Societal activities are still organized at the local level; there is no superordinate, centralizing agency.

¹¹ Kilocalorie is the amount of heat required to raise the temperature of one kilogram of water one degree centigrade.

7. *Transformation in Aesthetic Expression*: The Neolithic quantum brought profound changes in art forms. The Palaeolithic artist depicted with vital realism the animals he hunted; the Neolithic artist led a sedentary existence, and turned to new subject-matter and new techniques of expression – the most striking feature being a shift from naturalism to geometric art and abstraction (Read 1955). And in contrast to later epochs, notably absent from Neolithic art is imagery idealizing violence, battle scenes or warriors. “And in marked contrast to later male-dominated civilizations ... there is here no sign of mighty rulers who take with them into the afterlife less powerful humans sacrificed at their death” (Eisler 1987, 17).

Mythos: the Lithic/Mythic World-view

World-views are unique: each depicts a comprehensive model of reality held by members of a given culture; and it does not evolve serially but *ab initio* constitutes a systemic construct comprising all of the interconnected, interacting UCP segments. Mythos, the first universal world-view, ruled for hundreds of thousands of years in all inhabited continents and continued to infuse the ontologies of their lithic descendants into modern times. For example, among the Plains Indians the Sioux “arranged their knowledge in a circular format ... there were no ultimate terms or constituents of their universe, only sets of relationships which sought to describe phenomena.... All concepts not only had content but were themselves composed of the elements of other ideas to which they were related” (Deloria 1994, 294). This “circle of knowledge” has the following major elements:

1. The universe is alive: life’s continuum is in all things.
2. Everything is related: and has a moral content.
3. All relationships are historical: all entities have some memory, and any occurring changes were already inherent in the entity, or its potentiality for change.
4. Space determines the nature of relationships: these have space/time relevance; the three major manifestations of space are: the four ceremonial directions: sacred places; particular places.
5. Time determines the meaning of relationships: all entities are regulated by the amount of time to complete a step in maturation; their interaction has its own season which encompasses their relationship, and has a moral purpose.

Western science perceives alterations in plants and animals as responding to time’s passage and environmental changes, and they are regarded as permanent. In the Sioux tradition, what is

important “is the spirit of the creature; ... it can and does change aspects of its physical shape in order to deal with change, but ... it remains the same entity” (Deloria 1994, 306).

The Sioux ontology harmonizes with the lithic/mythic world-view. Like Palaeolithic food-collectors, Neolithic food-producers believed that the earth generated life. Palaeolithic man revered the spirits of the animals he hunted as well as the spirit of fertility upon which human and animal life depended. This led to totemism and the worship of a fertility goddess known to us from the many carved female figurines with markedly exaggerated sexual features. In Neolithic societies the most clearly defined cult objects are again the Mother Goddess figures and carved phalli. Effigies in clay, stone, and bone have been discovered in widely scattered cultural regions in the Old and New Worlds. Some of the finest examples of the cult of the earth goddess are found in the megalithic tombs of Malta. These were also associated with the belief in rebirth, a concept compatible with life in a horticultural or farming society in which a dormant seed is buried only to reappear in a new living form.

As Joseph Campbell points out, “The material of myth is the material of our life, ... of our body, ... and of our environment, and a vital mythology deals with these in terms that are appropriate to the nature of knowledge of the time.” A woman with her baby is the basic image of mythology. What Le Debleu called *participation mystique* between the mother and child is ultimate happiness. The earth and whole universe, as our mother, carries this experience into the larger adult sphere. “Getting into harmony and tune with the universe is the principal function of mythology” (Campbell 1990, 1-2).

Myth has been defined as “a form of poetry which transcends poetry in that it proclaims a truth; a form of reasoning which transcends reasoning in that it wants to bring about the truth it proclaims; a form of action, of ritual behavior, which does not find its fulfillment in the act but must proclaim and elaborate a poetic form of truth” (Frankfort 1946, 16). In proclaiming its concept of reality, a mythopoeic construct possesses an inner logic and coherence within that construct’s parameters. Primitive peoples lived on a number of levels of reality; they sought to validate consciousness in all its manifestations: the waking and dream states, fantasies and mental aberrations. In passing from the waking to dream state, one passed from one type of reality to another. “Much the same happened when one passed from the direct and immediate relationship to men and objects, to the symbolical one” (Radin 1960, 233).

While entertaining no Cartesian dichotomy between matter and spirit, aboriginal peoples were acutely aware of their distinctive relationship to the physical environment. They became the first technologists and domesticators by functionally separating themselves from extra-

dermal objects, while their acquisition of zoological and botanical knowledge extended far beyond economic necessity. As Levi-Strauss proves with his study of the Hanunóo in the Philippines, to the modern scientist and aboriginal alike “The universe is an object of thought at least as much as it is a means of satisfying needs.” (Levy-Strauss 1970, 3) Since their concept of reality placed no barriers between the physical and psychical, the material and non-material, they predicated a unity underlying all forms and processes. This exists because of the power and moral authority of nature’s elemental forces as embodied in all persons and objects – what the Melanesians call “mana” – so that the entire phenomenal world possesses a divine essence. As a corollary are two other universal aboriginal beliefs: in a soul or souls, and in immortality.

We can summarize essential interconnected elements in the mythic paradigm: (1) the central role of religion in the UCP which has remained invariant from lithic times to the present day; (2) animism, described as the “attribution of conscious life to nature or natural things”; (3) totemism, described as “a mystical relationship between a group or an individual and a totem”, perceived as dependent on a totemic ancestor, in fact as identical with it (Cassirer 1964); (4) magic, the use of spells or charms believed to possess supernatural power over natural forces; central to this trait in mythic thinking is the concept of *pars pro toto* – because the whole and its parts are interwoven, their destinies are inextricably linked.

As humans are integral members of society which is in turn embedded in nature, and governed by cosmic forces, the mythic organizing principle is based upon direct one-to-one relationships. Since nature and humans do not exist in opposition, there is no need for them to be apprehended by different modes of cognition. The world-view is felt by the individual existing in a state of continuous *empathy* with everything encountered.

This concept of felt wholeness is expressed in the Earth-Mother telluric cultus. The male and female principles are always present in any sociocultural paradigm as indispensable complementary components. At the food-gathering stage the male principle would have made itself strongly felt in keeping with socio-economic priorities in hunting and fishing communities. But a marked upsurge in the status of women and significance of the female principle occurs with the shift to the food-producing stage. Hence the emergence all over the world of cults conceiving the earth as the embodiment of female fecundity and sustainer of all terrestrial life. Comparison of cosmogonic myths makes clear the conceptual invariance of telluric fruitfulness with its accompanying sexual symbols and

rites among agrarian cultures. Thus, the woman is homologized as the field, or again as the furrow, even as the male bestows the seed making the field fertile.

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 under given circumstances is predictable. But because “That am I” utilizes the intransitive verb “to be” and takes no *object*, we are dealing not with subject-object but subject-subject. Whereas “it” can be conceived in discrete terms, as an entity to which the subject is not emotionally linked, “Thou” – be it human, beast, plant, lightning and thunder – is replete with empathetic life. The whole world was animate and personal to our lithic forbears. Faithful to a monadic and internally consistent world-view, their investigations of the phenomenal world proceeded on the “Thou am I” premise. And these investigations 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.

To recognize this relationship is fundamental to our overview of science and causality. 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, this third stage – with its dualistic, two-valued (either/or) orientations – is in turn yielding to multi-relational forms of logic and orientation (both-and) which go far to identify the world-view of Holos.)

***THEOS* – THE WORLD-VIEW OF ARCHAIC CIVILIZATIONS (S3)**

Again the anthroposphere is transformed: specifically, in a number of major river valleys in Africa and Asia-and much later, on the other side of the world, in the Americas. In the lower reaches of the Euphrates, for example, by the third millennium BCE towns stand in a largely manmade landscape of fields and pastures created out of reed swamp by dike-builders and canal-diggers. While farmers work their plots with wheeled carts and ploughs drawn by oxen, the river is dotted by boats bringing merchandise from afar to the town’s quays, while the canals

provide urban-dwellers with water and fish. Dominating the flat landscape is a terraced ziggurat, crowned by a sanctuary, or “high place”. Here we have visual evidence of the Urban Quantum: the appearance of strategically located cities dominating the flood plain and its Neolithic-constructed villages. PIL with its emergent attributes has now reached that societal level termed “civilization”: “a culture which has attained a degree of complexity usually characterized by urban life” (Taylor 1996, 9).

A. The Old World

S3’s attainment occurred in Afro-Asia in the valleys of the Tigris-Euphrates, Nile, Ganges and Indus, and Yangtze-kiang and Huangho. In terms of our societal taxonomy, quantization results in all these regions from a linkage of transformations in physical location, generation of energy, economic activities, size of population, 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, such as occurred in the Fertile Crescent between Egypt and Mesopotamia.

Factors Responsible for Mega-Quantization (S2 → S3)

We can again utilize the same list of T_M and T_S that had earlier collectively accounted for the advent of Mythos:

1. *Technological/Scientific Innovations*

Advent of hydrology (irrigation systems, etc.)

Use of metals (copper, bronze)

New forms of time-reckoning (calendars)

Advances in astronomy, mathematics, and advent of “proto-scientific” method

Greater diversification and use of prime movers (energy)

Invention of writing materials and systems

2. *Increased production/consumption of energy*

An exponential increase derived largely from mechanization of water resources, including the water-lifting wheel (*noria*) and water-driven mill; use of sails on river craft

Estimated per capita energy use reaches some 24,000 kilocalories (including use of animal transport and charcoal for heating)

3. *Expanded Environmental Control Capability*

A new spatial control denominator for hydraulic civilizations: river systems sustain new societal level

One-dimensional control, extending several thousand kilometres

Rivers exhibit the “central place” ordering principle

4. *Exponential Increase of Population*

Demographic expansion in both expleted and impleted space

Tenfold population increase in central Euphrates floodplain within two centuries

Exponential increase in other three hydraulic civilizations

“Urban Quantum”: rapidity and size proportional to positive feedback strength of T_M ; longevity proportional to new T_S

5. *Increased Information Systems and Flows*

Invention of syllabic script (cuneiform) in Sumeria

Invention of hieroglyphic writing in Egypt

Writing based on 3 types of characters in Shang China

Chinese invention of paper and block printing

6. *Exponential Societal Complexification*

New emphasis on male dominance in social structures and rights

Advent of new religious and political strata

Increased social stratification

Greater concern for property rights

Large increase of specialists in all segments of UCP

7. *Aesthetic Quantum*

Creation of “vertical axis” – ontological and aesthetic significance

New architectural and sculptural forms

Monumentality of expression

Shift from curvilinear to greater emphasis on rectilinear and rectangular structures

Advent of Theocratic Polities

As we saw, 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 different gestalt, the stratified pyramid: one that is theocratic. Each S3 society develops its own paradigm with unique features, but all 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 has its earthly counterpart in kingship.

In various archaic civilizations, the ruler himself is considered divine; in others he represents a deity. But in all cases, the human polity could not be considered by itself. Human life was regarded as part of a widely spreading network of connections which reached beyond manmade communities into the hidden depths of nature itself. “The purely secular...was the purely trivial. Whatever was significant was embodied in the life of the cosmos, and it was precisely the king’s function to maintain the harmony of that integration” (Frankfort 1948, 3). In effect, the state was an earthly extension of the cosmic state which alone was truly sovereign.

B. The New World

The role of Integrative Principles is indispensable to account for parallel systemic evolution in the New World. Again we encounter S3 cultural systems, but attained independently thousands of miles distant from Afro-Asia, and millennia after the Old World’s four hydraulic civilizations originated and evolved with their panoply of crafts and arts, and their shared theocratic view of reality. In effect, we discern the presence of an evolutionary symmetry, i.e., conceptual and processual invariance under far-removed environmental transformations. And these systemic constants exhibit the same dynamics of quantization, accompanied by successive levels of societal organization with their novel emergent properties and forms of collective behaviour.

The phenomenon of “parallel invention” was mentioned earlier when we suggested that the command behaviour of force fields, and especially the character of QVI, could go far to explain it. All cultures in the New World began with nomadic migrations from Asia over the Bering Strait land bridge, enabling Palaeolithic hunters to pursue their quarry into Alaska. Thence countless generations of early Amerinds moved east and south, reaching southern Mexico by 20,000 years ago, Chile some 2,500 years after, and the tip of South America by about 7000 BCE. During this protracted period they split into eight major ethnic-linguistic groups, plus hundreds of sub-groups, and adapted to numerous geographic environments (Taylor 1996, 249).

Migrants from the Old World brought their $S1$ T_M and T_S with them so that the same sociocultural level existed concomitantly in both major global segments. But thereafter the ongoing human drama was played on two separated stages, with their respective casts adapting the same evolutionary script to different continental conditions and challenges. For example, 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.

We are dealing here with parallel evolution and invention – independent societal systems with basic similarities in structure and behaviour, and which can be described as “variants of a single processual pattern” – one that is linear in its sequential explication, but non-linear in its implicate conception. In his examination of the parallel evolution of early Mesopotamia and Prehispanic Mexico, Adams concludes that for comparing their largely independent processes of growth, the concept of major, successive levels of organization now seems the single most indispensable one. These levels are “broadly integrative patterns whose basic functional relationships tend to remain fixed..., while their formal, superficial features vary widely from example to example” (Adams 1966, 7). What we regard as a combination of conceptual invariance, evolution-cum-quantization, and PIL with its emergent properties enables us “to proceed beyond the acknowledgment of diversity to the recognition of genuine evolutionary parallelisms” (Adams 1966, 8) – which occurred in the millennia following the inundation of the Bering Strait land bridge.

This “processual pattern” further substantiates the relevance of our TST meta-model. As in the Old World, the Amerinds 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 which had marked the hydraulic civilizations in Afro-Asia. With precipitation no less at a premium in Mesoamerica and Peru, and each of their civilizations severely circumscribed in cultivable land, they met the challenge by inventing highly sophisticated irrigation systems capable of supporting large urban populations in the Valley of Mexico and elsewhere. As in the Old World tool-making sequence, implements evolved from flint and wood to copper, and metallurgy came to include alloying platinum and gold. These developments occurred in Peru and Ecuador in the last centuries BCE, but metallurgy's diffusion to other parts of the New World was slow.

Omission of a major Old World invention, the wheel, has often been remarked. Actually, the principle was discovered in Prehispanic America, but was applied only to toys. That no economic use had been made can be ascribed to two facts, one biological, the other geographical. Domesticable transport animals did not exist in aboriginal Mesoamerica, and while llamas inhabited the Andean highlands, extremely rugged terrain hardly suited wheeled vehicles. Instead, the systematic use of trains of pack llamas provided Andean society with a substitute so effective that it has been said that no other at a comparable stage of development ever succeeded in amassing the immense centralized stores of foodstuffs, textiles and other supplies on the scale of the Inca empire.

The Urban Quantum and Theocratic Polities

As autonomously as in the Old World, urbanization made its dramatic appearance in Mesoamerica and Peru. The parallel's validation is found in Childe's list of characteristics defining cities and civilizations: 1. extensive and densely populated settlements; 2. specialization of crafts and labour; 3. concentration of capital wealth; 4. monumental public architecture; 5. a class-structured society; 6. writing and systems of notation; 7. beginnings of true science; 8. great art styles; 9. long-distance trade; 10. formation of the state (Childe 1950, 1963). Childe was focusing on characteristics in the Old World, but they also appear in the Americas. Most have been found in Teotihuacan; it lacks evidence of writing, astronomical science, and calendrics, but these occur elsewhere in Mesoamerica, notably in Mayan urban settlements.

Theocratic states emerged much later than across the Atlantic, and their life-spans were shorter, with the Aztecs' and Incas' tragically truncated. Yet we find convincing parallels in their genesis and early formation, maturation, and decline/demise. *Mutatis mutandis*, these

stages (1) begin with affirmation of a theocratic world-view and the devising of T_M and T_S to create a divinely-ordained polity, including recognition of ruling elites, and a pyramidal governmental structure; (2) mature with progressive secularization of the state, accompanied by growing power of bureaucratic and military regimes; and (3) enter in the case of certain polities into institutional decline and progressive vulnerability to internal perturbations and external invasion, while later polities emerge as conquest states (to be in turn conquered by a transatlantic S4 polity). Yet throughout these chronological sequences, the New World polities retain their theocratic world-view, which commanded all aspects of their respective culture patterns.

Theos: The “Celestial Paradigm”

The world-view of these archaic civilizations might be termed the “celestial paradigm”:

- (a) In each of these societies a well-defined concept of “world order” has evolved so as to provide that society with a conceptual model capable of explaining its historical origins and justifying its continued existence.
- (b) The view of reality begins with the emergence of cosmos – or order – out of chaos; this process begins *ab initio* with each culture.
- (c) Primacy of the male principle is shown in the cosmogonic creation myths; it explains why these cosmogonies could not build upon lithic foundations, which emphasized the paramountcy of the *Magna Mater* principle.
- (d) The female principle has of course to be recognized for its indispensable generative role; however, it is now subordinated to male dominance (and embodied in minor atmospheric and terrestrial goddesses or, gain, consorts of major gods – such as the relation of Isis to Osiris in the Egyptian pantheon).
- (e) As we saw, the cosmos is viewed as an organic polity possessing the sovereignty and power to maintain order and harmony throughout the universe. These attributes were created by a supreme being.
- (f) The cosmos is hierarchical in structure and behaviour, with the supreme being assisted by a pantheon of lesser deities.
- (g) 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 power; and with it to maintain “right order” and justice – such as expressed in the Egyptian concept of *maat*.

(h) The ruler’s exercise of authority is absolute and uni-directional, that is, it derives “from on high” with no provision for any alternative source from “from below”.

(i) The theocratic model is polytheistic; in India there is widespread recognition that all deities are manifestations of a supreme being, Brahma; in Egypt and among the Aztecs and Incas certain rulers seek to move towards a monotheistic world-view. But these attempts are regarded as abnormal, and fail to alter the prevailing cosmogonic paradigm.

Like their lithic predecessors, S3 peoples drew no hard and fast distinction between subject and object, animate and inanimate, myth and other forms of epistemological validation. Again we perceive an integrated and holistic type of thinking and logic. An entity in the material world is experienced as life confronting life – as “Thou” within a reciprocal relationship. “Thoughts, no less than acts and feelings, are subordinated to this experience” (Frankfort 1946, 6).

Again in theopoetic¹² view of reality we encounter *pars pro toto*. Where we differentiate between an act and a ritual or symbolical performance, among the ancients a symbol and the thing it stands for are coalesced. “It would be meaningless to ask a Babylonian whether the success of the harvest depended on the skill of the farmers or on the correct performance of the New Year’s festival. Both were essential to success” (Frankfort 1946, 13). Rituals and ceremonies enacted a reciprocal relationship with the cosmic powers of creation. In both the Old and New Worlds, the Urban Quantum was marked by the creation of “ceremonial centres”, replete with great temple or pyramidal structures and broad axes for the ongoing performance of rites proclaiming the immanence of the theopoetic world-view (Robertson 1963; Mann 1993).

Like their lithic forbears, S3 peoples recognized that cause and effect were related – else why make tools? But they would not recognize our mind-set of an impersonal and mechanical causality. Instead of an impersonal law regulating a process, they sought a purposeful will who commits the act. 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

¹² “Mythopoetic” refers to myth-making; “theopoetic” is a neologism, a complementary term to designate the role of “theos” in the conceptualizing process. In connection with the succeeding world-views, two additional neologisms have been created: “logopoetic” and “holopoetic”.

balance. In systems terms, such action ensures the dominance of negative feedback processes – and with it the unwavering assurance of cosmos triumphing over chaos.

Recalling our metaphor that the lithic world-view recognized the presence and generative power of the female principle, it can now be extended to recognize in archaic civilizations the primacy of the male principle. We can further refine this metaphor by a tripartite subdivision of male causality in a form familiar to Western theology, by invoking the construct of the Three Persons of the Trinity. Here we are concerned with the First Person, the father figure who acts by fiat, by authoritative command that is not subject to human reason or logic but manifests divine *will*, which need never justify itself. “And God said to Moses: I AM THAT I AM” (*Exodus* 3:14).

LOGOS – THE WORLD-VIEW OF WESTERN CIVILIZATIONS (S3)

How to introduce this third world-view? Let us leave the pyramids at Gaza, cross the Mediterranean to Athens, and climb an outcrop to the Acropolis, associated with the genesis of our Western cultural heritage. Its structures are not skyward-pointing but rectangular, with the Parthenon’s geometry incorporating the Golden Mean ($\Phi = 1:1.618$). The statuary is not mammoth and godlike, but human in dimension and aspect. And down from the Acropolis is the Agora, or meeting place, where Athenians discussed and argued issues, and took decisions according to the will of the people – the advent of democracy.

A. The Classical World

The second millennium BCE witnessed large-scale migrations into India, or westward into Iran, and beyond as far as the Atlantic. Equipped with an iron technology, Indo-European speaking newcomers interbred with the Neolithic indigenes, settled along the coasts of the Black and Mediterranean Seas, and eventually spread throughout Europe to create new cultural and linguistic regions. These emergent societies acquired various technics from the riverine civilizations, but a mixture of environmental and self-generated responses resulted in new societal structures and belief and normative systems. These expressed their own perception of reality.

Factors Responsible for Mega-Quantization (S3 → S4)

While history texts almost invariably deal with the Hellenic and Hellenistic Greeks before tackling the Romans, these classical cultures were contemporaneous and interacting. Together they contributed so rich a treasure trove of T_M and T_S to the creation of a new Western civilization that its legacy continues to shape our lives today. Space limitations permit only a cursory presentation of the interconnected factors responsible for this systemic transformation.

1. Scientific/Technological innovations

“Greek miracle”: development of the Western scientific method Hellenistic contributions in mathematics, applied science: Euclidean geometry, Ptolemaic astronomy; geography Roman technological innovations:

- a. Military and naval technics
- b. Roads, bridges, aqueducts, vehicles, harness
- c. New building methods and machines

2. Increased Production/Consumption of Energy

New prime mover: water-mill (Vitruvian mill)

Introduction of this new prime mover “means a more concentrated form of energy, a new level at which things can be made and produced” (Forbes 1965, 80)

Water-mill initiates advance from tool to machine technology

3. Increased Environmental Control

Quantum shift from S3 one-dimensional fluvial control to S4 two-dimensional control over large maritime and land surfaces

Control capability takes two forms:

- a. Spatial expletion: conceptualized and mapped in terms of Euclidean grid (genesis of scientific cartography)

Roman application of grid: centuriated land patterns

- b. Spatial impletion: Hellenistic Greeks employ geometrical principles in city planning; streets laid out in grids

Use in Roman Empire: “vast city-building enterprise”; new towns constructed to specific pattern (Mumford 1961, 205-213)

4. *Exponential Increase in Population*

Classical World demographic growth exponential compared with S2 societies in regions where S4 societies originated

Ca. 1 CE global population estimated at some 300 million; in 14 CE, the Roman world-state had perhaps as many as 90 million people

The Pax Romana marked by rapid increase of towns; in 100 CE had five of the world's largest cities (Chandler and Fox 1974)

5. *Increased Communications, Information Flows*

Roman societal system based on unmatched communications sub-system: shipping, roads, bridges, aqueducts, courier services

Imperial road-building on immense scale: 6,500 miles built in Britain alone within century of conquest

Information flows: Galba in Spain, 332 miles from Rome, received news of Nero's death in 36 hours

Inter-continental communications network linked Graeco-Roman world with fluvial empires of India and China

6. *Societal Complexification: New Political Institutions*

Graeco-Roman world-state an urbanized societal system; strong correlation between a "densely populated" and close-packed environment and the explosion and rapid dissemination of ideas and innovations (Jacobs 1969).

Societal specialization and innovation:

Greek political philosophy and creation of polis

Roman governmental structures and administration, from city-state to imperium

Legal theory and law codes

Education: training for imperial governance

7. *The Aesthetic Quantum*

Gombrich describes the Greek "miracle, the uniqueness of Greek art" as the shift from schemata to naturalism and asymmetrical portrayal of humans in the phenomenal world – a shift from "the symmetrical frontal figure conceived for one aspect only", an aspect depicted in terms of a supra-natural or mythic purpose (Gombrich 1962, 100-101).

Graeco-Roman architecture is also human in scale, based on visual and structural balance, open to the elements; introduced stadia theatres, gymnasia to give expression to classical way of life.

Logos: The Classical S4 World-View

We have need of a further neologism – “logopoeic” – to focus on the unique reason-infused approach of the Greeks and their post-classical beneficiaries as they perceived their place in the cosmos. The Hellenes’ mythological antecedents included Hesiod’s *Theogony* and later cosmogonies. The relevance of these myths to the creation of the Greek world-view lies in their developing into a culture in which philosophy became a dominant element – a shift occurring between Homer’s time and that of Plato and Aristotle. One authority has identified four stages in the Hellenes’ conceptual evolution (Finley 1966). The Heroic Mind is the stage of Homer and epics in a world made bright by sensory perceptions, with men portrayed at hand-grips with destiny. The Visionary Mind is associated with the establishment of city-states and reflects a more complex society – the mind suffused with the full play of the senses and the interplay of the mythic and rational, an outlook speaking through Pindar’s poetry and the dramas of Aeschylus and Sophocles. After the Persian Wars, Athens transforms from a market-town to metropolis with new social attitudes and ways of thought, the stage of the Theoretical Mind. This transformation represented “the change from verse to prose, from shape to concept, from story to analysis, from mythological to conceptual ways of thinking.... Athenian life no longer seemed comprehensible through inherited percept and tried example but called for analytical powers that looked beneath the visible surface” (Finley 1966, 58-59). The Theoretical Mind is exemplified by Herodotus and Thucydides whose histories have a mode of enquiry described as scientific, humanistic, rational, and self-revelatory “in order to tell man what man is by telling him what man has done” (Collingwood 1949, 19-20).

The Hellenic conceptual evolution culminates in the Rational Mind with Plato and Aristotle in the fourth century BCE. It enthrones order at the centre of things and makes the mind’s task one of discerning it by dialectic, confident that what the mind perceives will further clarify any given situation. To further our understanding of this world-view, we have singled out three terms: *logos*, *metron*, and *aretê*. *Logos* has been described as “the most characteristic word in the Greek language”; not only does it mean *word* or *reason*, and from which we obtain logic, but was the Greeks’ instrument for finding out what is true and just. “It lies at the heart of philosophy, science, religion. Everything in the world has a *Logos*, it says something, means

something; God himself is saying something. If we listen carefully we can understand” (Murray 1953, 28).

The second term *metron*, means “measure”. It is central to a paradigm that calls for comprehending the world as perceived through our senses. In combining *logos* and *metron*, we obtain a basic key to Greek, and subsequently Western thinking: apply reason to a cosmos that is largely measurable. Hence the emphasis upon logic, quantification, and the scientific method bequeathed to post-classical societies. This conceptual approach “heralded the beginning of the great European adventure which, within the next two thousand years, was to transform the human species more radically than the previous two hundred thousand had done” (Koestler 1961, 283).

The Greek world-view also emphasized the normative dimension. Humans are not only reasoning creatures, but possess worth or virtue (*aretê*) as an inherent attribute. So that human nature can be fulfilled, one’s *aretê*, or inborn capabilities, should be actualized as much as possible. In similarly recognizing other persons’ worth, *aretê* calls into play concepts of equity and social recognition. Combining *logos* and *aretê*, we obtain a reliance on reason and discourse among equals in resolving problems-concepts forming the basis of democracy (*demos* + *kratia*, rule). The combination of *logos*, *aretê*, and *metron* validates education as a T_s , since it recognizes the innate worth of knowledge by applying reason to the study of our world in terms of democratic discourse. Finally, this tripartite fusion culminates in the goal of the Hellenic world-view: *sophia* or wisdom.

As our Western world-view has been erected upon Hellenic conceptual foundations, it is important to understand a significant divergence that took place between the Greek and previous world-views. During the final stage in the evolution of the Rational Mind the subjective knower is fundamentally separated from the objective known. Such are the implications of Ionian science on the Greek mind that: “There is no longer a supernatural background... intelligence is cut off from action, thought is left confronting nature, an impersonal world of things.... The detachment of self from object is now complete” (Cornford 1978, 17).

The implications of this split between subject and object, knower and known, were to affect profoundly the later development of Western thought. 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: as I/It. Yet for the Greeks nature was not a machine, but was both alive and permeated by mind (*logos*), which was the source of its orderliness. “They conceived

mind, in all its manifestations, whether in human affairs or elsewhere, as a ruler, a dominating or regulating element, imposing order first upon itself and then upon everything belonging to it, primarily its own body and secondarily that body's environment" (Collingwood 1945, 3). The world exhibited ceaseless change, but change that occurred according to universal laws.

B. Medieval and Early Modern Times

We can recall Gibbon's final reflection in his *Decline and Fall of the Roman Empire*: "the greatest, perhaps, and most awful scene in the history of mankind". Be that as it may, this historical phenomenon attests dramatically that societal systems can also quantize in a direction counter to the actualization of a given society's potential with its emergent attributes. Just as inexorably, downward quantization represents the fracturing of systemic organization, loss of its earlier attained properties, and a far-reaching reversal of those specific factors responsible for attainment of the *status quo ante*.

What Pliny the Elder called "the immense majesty of the Roman peace" had been subjected to a combination of massive blows from both within and outside the world-state. These included decline in economic productivity, progressive loss of administrative efficiency, mounting social dislocation and psychological tensions, and destabilizing pressures exerted by peoples pressing on the imperial perimeter – until, overwhelmed by the Germanic *Volkerwanderung*, the western half of the socio-cultural system was shattered, and "fell" to a subsistence level. The advent of the so-called "Dark Ages" was marked by loss of population, breakdown of the Roman road and communication systems, decline and often disappearance of towns and commerce, and an end of imperial administration of an intercontinental polity. The societal centre of gravity shifted from the city to the countryside, and the geographical centre from the Mediterranean and its littoral northward across the Alps into major river systems in western and central Europe.

The cultural landscape had been transformed. The disappearance of a unified political system resulted in geopolitical fragmentation and the eventual emergence of feudalism, with power exercised locally. This characteristic political system in the ninth to eleventh centuries had its economic counterpart in manorialism. The feudal castle afforded protection for a fragmented, agrarian society; the manor, or large estate, provided the necessary foodstuffs for its members. The early Middle Ages had reached a new equilibrating level, marked by dominance of the one universal institution, the Church, which alone penetrated every parish and whose teachings and mission gave meaning and direction to every medieval man and woman.

The Medieval World-View: “The City of God”

The S4 logopoetic view of reality had been retained, but its expression and direction were now transformed. The opening line of the Fourth Gospel announces both its invariance and transformation: “In the beginning was the Word (*Logos*), and the Word was with God, and the Word was God.” And now “the Word became flesh.” Many early Church fathers had come to Christianity from Neo-Platonism and Stoicism, and perceived them as compatible. Because reason and truth originated from God, “philosophy was a preparation,” wrote Clement of Alexandria (d. 215), “paving the way towards perfection in Christ.” In keeping with S4’s overarching world-view, the individual’s dignity, uniqueness, and intimate relationship to the cosmos were fully recognized, but history’s purpose was now seen to be human salvation. In Augustine’s metaphor, a profound dualism divided the pagan earthly city from the City of God, as proclaimed by the Church and defended by its theologians. *Logos* was interpreted so as to (a) apply logic and new meaning both to “it” (the phenomenal world) and to “thou” (the supraphenomenal world); and (b) synthesize knowledge and faith, as propounded later by Aquinas and other scholastics. In that synthesis, reason served to justify revelation. *Credo ut intelligam* – but in that order.

Certain T_S assisted in a sociocultural regression to the S3 level in the ensuing Age of faith. The Western world was subject to a father figure – the Pope (Gr *pappas*) – who claimed to have divine infallibility when he pronounced ex *cathedra*, and through the Petrine doctrine to be the Vicar of Christ within a theocracy. Hence the medieval struggle between Church and emerging nation-states over rival powers and pretensions, inasmuch as the secular monarchs in turn claimed to rule by divine right. (This eventually led to outright conflict between an S3-oriented Crown and an S4 Parliament in seventeenth-century England, and their counterparts in the French Revolution.)

During the millennium, ca. 400 to ca. 1400 CE, when theology was “Queen of the Sciences”, while classical knowledge was largely retained in the Byzantine Empire, much of science and technology was lost or abandoned in the West. A case in point is classical cartography, in which Ptolemy employed a grid to construct a map of the known world. But medieval world-maps (*mappae mundi*) were not scientific but edificatory. With a T dividing the habitable earth into three segments, Europe, Africa, and Asia, these maps placed Jerusalem in the centre – logical in eschatological if not terrestrial terms. *Metron* was again absent in the use to which the temporal dimension was put. Historical accounts included hagiographic tales,

fables, and chronological fallacies: a medieval version of the aphorism (ascribed to Ranke) that all epochs are immediate (*unmittelbar*) to God.

Throughout the Middle Ages the Church functioned as an all-pervading negative feedback force, maintaining societal balance in a turbulent environment in which some regions had quantized downward to S2. Yet as from the eleventh century Europe was in resurgence, marked by the revitalization of urban life and commerce. A large number of inventions spread from eastern Asia to western Europe, including the wheelbarrow, iron-casting methods, paper, printing, gunpowder, the stern-post rudder, and magnetic compass. Another major advance occurred in the use of prime movers. Our medieval ancestors maximized the muscle power of draft animals by improving their harness and traction, the latter by means of a new type of horseshoe. They also developed horizontal and vertical watermills as well as windmills with rotating turrets to catch the variable westerly winds. These developments have been described as the “eotechnic” or “dawn” stage required to initiate the later Industrial Revolution. This eotechnic stage involved both a progressive exploitation of water and wind and a shift to crude machines (which involve repetition of function without necessarily requiring human manipulation of power).

The Renaissance

Proof that the S4 level of logopoeic thought and behaviour continued to undergird the Western world-view is found in the next stage of societal evolution, with the rebirth of the “City of Man” among the Italian city-states. The Renaissance paradigm consciously identifies itself with the classical world-view, while also conditioned by the medieval apperception of reality. Reconciliation of the Church’s dogmas with the classical outlook was expressed in fifteenth-century Florence with Christian Platonism. Pico della Mirandola assigns to humankind a special place in God’s creation, to whom is attributed these words: “The other creatures have a defined nature which is fixed within limits prescribed by me I have set you in the centre of the world; from there ... like a free and sovereign artificer, you can fashion your own form out of your own substance.”

Logos is now interpreted to repudiate the “Age of Faith” with a rational status for humans, once more endowed with a new intrinsic worth (*aretê*). In turn *logos* and *metron* combine to explore the terrestrial environment – with the Age of Discovery – by measuring it by the compass and other new navigational aids, and mapping it with new cartographic projections. Similarly, invention of the telescope and microscope would explore and measure the largest

and smallest phenomena in early modern times. And in the aesthetic sphere, principles of perspective and proportion are given formal status in Renaissance art and architecture.

A shift from the medieval to the Renaissance paradigm is illustrated by replacement of the Gothic cathedral, based upon the Latin cross, with the centrally planned church erected on the Greek cross. In the first plan, “to demonstrate God’s infinite distance from us the altar should be placed as far as possible from the main door....” But (like Pico who set mankind “in the centre of the world”) advocates of the second perspective conceived the centre as “one and absolute”; therefore, like God who alone truly is, and who is omnipresent, “the Sacrament should be in the centre upon which all the lines of the building converge” (Wittkower 1988, 22). For Vitruvius, the human figure’s proportions called for being reflected in those of sacred buildings. “As a proof of the human harmony and perfection of the human body he described how a well-built man fits with extended hands and feet exactly into the most perfect geometrical figures, circle and square. This simple picture seemed to reveal a deep and fundamental truth about man and the world, and its importance for Renaissance architects can hardly be overestimated” (Wittkower 1988, 22).

C. The Modern World

In early modern times, however, events set in motion the scientific model of a mechanistic universe, devoid of intrinsic values or worth. We can virtually pinpoint how and when that process began. In 1623 Galileo published *Il Saggiatore* (“The Assayer”), which distinguished between those qualities of an object that can be measured in numerical terms, and those which cannot be so treated. These latter qualities, such as “whiteness or redness, bitterness or sweetness”, were “secondary”, while “primary qualities” comprised “size, shape, quantity, and motion”. Galileo has been called the prime mover in the development summed up in the phrase *Science is Measurement*. He had produced a conception of the world based on mechanical principles, and helped set in motion a “new determinism ... which concerned the stars no less than men, and men no more than mice” (Singer 1959, 252).

This mechanistic paradigm, brought to a definitive synthesis by Newton, employs *logos* to demonstrate the potency of *metron*. But it has nothing to say about those “secondary qualities” which Galileo could not measure or quantify, and which include not only “whiteness” and “well-smelling” but the normative characteristic of the original Greek paradigm: *aretê* and *sophia*, and such other qualities as justice and love. Here is the beginning of what scientists believed the only valid paradigm: value-free science (except to make that claim is itself a value judgment).

From this beginning can be traced the evolution of modern science. With its dualistic foundation, it is based on a body of metaphysical assumptions, including:

1. Objectivism: the assumption of an objective world which the observer can hold at a distance and study separately from himself
2. Positivism: the assumption that the real world is what is physically measurable;
3. Reductionism: the assumption that we come to understand really a phenomenon through studying the behaviour of its elemental parts (for example, fundamental particles).

“Underlying [these] classical assumptions is *an ontological assumption of separateness*: separateness of observer from observed, subjective from objective, causes from effects; separateness of organism from environment, man from nature, mind from matter, science from religion; separateness of ‘fundamental particles’ from one another, of things in general unless there is some ‘mechanism’ to connect them ... separability of the parts of a system or organism to understand how it ‘really’ works; separateness of scientific disciplines, of investigators, competing over who was first discoverer” (Harman 1994, 8).

Industrial Revolution

This “value-free” subject/object paradigm accelerated exploitation of the environment and advent of the “palaeotechnic” phase (Mumford 1963). It was marked by a shift from previous “eotechnical”, tool-centred enterprises to machine-sited facilities. The resulting Industrial Revolution employed steam as the new prime mover, with the factory the new structure for organizing production.

This technology had massive implications for spatial impletion and expletion alike. It operated most efficiently in large, concentrated work places, maximized in the vertical factory. Coal for furnaces came via newly dug canals and newly laid railroad tracks. The urban landscape was transformed by expanding demographic concentrations which had the effect of demolishing the old city walls and laying out suburbs in grids serviced by street transport. Meanwhile the palaeotechnic quantum ushered in the final stage of two-dimensional environmental control, which had been thalassic in classical times and, as from the fifteenth century, had become oceanic in scope. Now, while steamships plied all the planet’s waters, railroads crisscrossed its continents, with the entire world progressively bound telegraphically by suboceanic cables and overland wires. The telegraph, operating at 186,272 miles a second, was but one expression of the palaeotechnic temporal revolution. Steamships and railways required “timetables”, and to make sense of them it was now necessary to divide the planet into time zones of equal measurement.

This palaeotechnic triumph, with its mechanistic mind-set, had fundamentally altered societal structures and values. Migrants from the countryside sought work in the mines, where girls as young as six hauled carts of coal in Lancashire pits, while similar aged children untangled jammed machines in the textile mills of new factory towns devoid of sanitary, water, or medical services for working families crammed into damp cellars. In time conditions improved for this new industrial class with its reduced life span, but meanwhile the work force had been depersonalized – as by the term “hand” to designate a worker, since that body part served as an extension of the machine.

What had happened to Homo as envisaged by Protagoras – “Man is the measure” (*metron*) – and Pico della Mirandola? Three theories had stripped humankind progressively of its unique place accorded by Hellenism and Christianity. First, Copernicus’ heliocentric theory had already robbed our terrestrial home of its fixed centrality in the universe. Then, Darwin’s hypothesis divested us of our traditional heritage of creation by a special divine act. Finally, Freud’s plumbing of our unconscious mental processes seemed to shatter our cherished belief in our own logos, or power of reason. The nineteenth century invented a paradigm that mechanized the world and conceived our species as a stimulus-response machine: to be conditioned, controlled, and manipulated by a science that purported to be objective and value-free, and by a society that embraced Social Darwinism, which justified competition and conflict in the name of survival of the fittest. (Taylor 1979, 329-330)

HOLOS – THE EMERGING GLOBAL WORLD-VIEW (S5)

As with its predecessors, let us introduce Holos with another visual image, this time propelling our conceptualizing process some 22,000 miles overhead into Outer Space. There satellites revolve freed from our earth’s gravitation, yet their functions are commanded by electromagnetic force fields. Though none of these fields can be perceived by the physical senses, their commands are universal and invariant. Without them there could be no satellites, interacting with coordinated communication centres on earth, and sending electronic messages both there and to other satellites at the speed of light. To continue with our visual image: from any one of these satellites we can view our serene planetary mother, an indivisible, beautiful *rondure* swimming in seemingly infinite space – her seas, mountains, deserts, and rivers outlined by physiographical features, but marked by no political boundaries to separate humankind.

During the twentieth century, changes on a planetary scale accelerated. What kind of outcome does this portend? Again let us apply our eight critical factors to ascertain their impact on the UCE. By doing so we shall see that their combined synergistic functioning provides empirical data to justify the claim that no less than in earlier transformative eras, societies are once more undergoing mega-quantization, but now played out for the first time on a global stage.

Factors Converging towards Mega-Quantization (S4 → S5)

1. Scientific/Technological Innovations

More scientists and technologists worked in the twentieth century than all previous eras combined. Early major discoveries: relativity theory, quantum mechanics, uncertainty principle; later decades: development of systems, catastrophe, chaos theories. Revolution in molecular biology, DNA code and application to genetic engineering in plants, animals, human diseases.

Advent of Neotechnic era, marked by additional prime movers: petroleum and natural gas, electricity, nuclear, solar, tidal, wind power. Invention of radio, radar, sonar, computer, etc.

2. Increased Production and Consumption of Energy

Exploitation of fossil and non-fossil resources on unprecedented global scale; “Nuclear Age” releases vast new energy sources for civilian and military purposes.

Automation and electronic control devices usher in “silent factories” with unforeseeable potential.

Continuous record-breaking increases in agricultural and industrial production, and concomitant new consumption levels.

3. Increased Environmental Control Capability

Movement in third (vertical) dimension – unique in history – ushers in Space Age, enabling astronauts to walk on the Moon and capsules to photograph the most distant planets, and a permanent space station to be constructed. Three-dimensional environmental control opens up Inner Space of ocean beds and continental shelves. Query: who “owns” oceanic mineral and other resources? How far, if at all, does national sovereignty extend in Outer Space? Implications for nation-state system.

4. *Exponential Increase in Global Population*

Greatest population increase in history; virtually quadrupled in one century. Urban explosion; in 1900, 16 cities with more than one million each, four with more than 2 million; by 2000, 90 with more than 3 million and 19 exceeding 10 million. Urban dynamics stimulate invention and societal transformations on unprecedented scale.

5. *Increased Communication Flows and Information Systems*

Globalization of communications, commerce, technology, and electronic movement of ideas on Internet.

Result: “information revolution”, bringing the world to home video screen at the speed of light.

This global communications/ information phenomenon is certain to have incalculable results in breaking down historic national and cultural boundaries.

6. *Complexification of Social and Economic Systems:*

We live in the largest, most complex societies in history, marked by two major social movements: universal public education, and universal suffrage. Governments, corporations, and unions have become larger, more complex in structure and functions.

Query: can systems become over-complex and dysfunctional? Exponential increase in scientific and learned journals, and in international organizations to deal with societal issues. Dynamics of social change marked by increased volatility, and “counter culture” movements and challenges to *status quo ante*.

7. *New Aesthetic Canons and Modes of Expression:*

Breaking with S4 norms and fixed perspectives, artists experiment with myriad new forms of depiction, including impressionism, expressionism, cubism, involving i.a., a conceptual shift from representation of the surface world to the “constant elements of form” and “supporting geometry” of nature.¹³ Artists embrace non-representational painting and sculpture, while composers experiment with atonality and electronic music. Paralleling our breakthrough into Space Age verticality, every continent has “skyscrapers” or high-rise structures.

The aesthetic quest: to discover and develop forms of expression reflecting a broad societal move to new models of reality.

¹³ See, for example, Herbert Read’s analysis of the works of Cezanne, Gris, and Mondrian in *Icon and Idea*, ch. 7, “The Constructive Image”.

8. *Towards a New and Unique World-View:*

Marked by a jettisoning of traditional religious belief and value systems, and the S4 paradigm based on dualism, positivism, and reductionism. The emerging new world-view perceives the universe as a unified system, with all parts interconnected, and restores *aretê* to both the natural order and human equation. (See below)

Perturbations and Bifurcations en route to S5

Yet there is no assurance that we shall achieve a new level of systemic organization. As catastrophe theory and Prigogine's "order through fluctuations" attest, even a small perturbation at the bifurcation point can swiftly translate into a massive shift towards either a more advanced systemic level of organization or to destruction of the existing stage. When confronted with this critical situation, available systemic actions can be limited to one of two forms of behaviour: either/or. It is as though society has to shift from probability theory's many tossings of the coin to a heads *or* tails outcome prescribed by a single throw. At that stage desperation can replace freedom of choice. Key issues confronting the world include:

1. *Sustainability of the Natural Environment.* This has to be our starting point since the physical environment undergirds each of the UCP's segments, and ultimately controls its sustainability. The portents of downward quantization are omnipresent: destabilization of physical and biological ecosystems; loss of floral and faunal species; global climatic warming, etc. In event of environmental collapse – a worst-case scenario: "nuclear winter" – here the evolutionary process is reduced to regeneration of life: phyla, genera, species. A more probable scenario: a critically-flawed global eco-societal system unable to support human population in pre-collapse numbers.
2. *Societal Segment: How far are demographic growth and densities sustainable?* By 2050 CE the global population could be some 10 billions, with nine-tenths in the currently underdeveloped "South"; population constraints are so far inadequate because of traditional beliefs and mores. This may be our greatest single danger. Depending on the severity of a possible socio-ecological collapse, quantization could shift to S1/S2 levels; gains from subsequent societal evolution might be lost for many generations. Should the S4 level be salvaged, challenges to survive could create a new bifurcation point: competition (Social Darwinism) versus cooperation (mutual aid à la Kropotkin). A critical factor: subordination of moral values to the requirements of Ellul's "technique".
3. *Economic Segment: Can exponential growth be sustained?* The S4 paradigm emphasized economic and political growth, presupposing inexhaustible resources and frontiers. Hence

“progress” was equated with GNP increases. The present century will test the sustainability of such growth at a time when the South’s economies are industrializing with unprecedented drainage of the planet’s resource reservoir.

4. *Political Segment: What is the future of “sovereignty”?* Ours is a paradoxical political world, marked by two antithetical forces. Nationalism, recognized in the Peace of Westphalia (1648), validated the nation-state system which has now more sovereign states than ever before. Meanwhile, internationalism, with its multiplication of IGOs and NGOs, attests to the genesis of a “global village”. Strengthening this development are covenants on genocide and human rights, and creation of the UN and its Specialized Agencies, functioning in every segment of the UCP. On what viable terms can “independence” and “interdependence” co-exist? The first is the product and ideational validation of S4; the second, the empirical emergence of S5 societal collaboration, based on the maxim “diversity within unity”. The foreseeable future will be fraught with danger: ethnic and tribal “cleansing”; continued *realpolitik* based on paramouncy of national self-interest at the expense of international modalities; the power equation controlled by nuclear-equipped powerful polities. As a politico-economic alternative, their geopolitical strategies could be usurped by a global corporatism in which transnational actors set geo-economic agendas in terms of regional trading blocs – thereby eliminating “sovereignty” as heretofore practised, and dismembering the nation-state system as known today.

5. *Is the Current North-South Relationship Sustainable?* Traditionally the North’s and South’s societies have known a zero-sum, win-lose relationship – the former on top, the latter subjected to colonial status. Since the North can no longer insulate itself from the South’s problems, the situation has become one of mutual vulnerability. Hence the challenge is to transfer to non-zero-sum – to win-win (Taylor and Taylor 1992). But massive changes will have to be instituted to assist the South’s environment, economy, social culture. Will the North forgo its historic exploitative growth ethos – its S4 legacy – to help foster a new global societal partnership? Meanwhile, we must expect continued survival struggles both within and between poverty-stricken societies to acquire existing resources.

6. *The Individual in a Mass Society: A Humane Human Condition?* Does progressive mechanization and automation inevitably create social “automatons” in turn? What promises and perils accompany technology’s triumphs? How to balance societal excesses and wrongs with human rights and freedom? What safeguards can be put in place on behalf of marginalized racial, ethnic, cultural minorities, and reduce the increasing disparities in living standards and

opportunities between the affluent and poorest in all societies? Contemporary humankind exists in an age of anxiety and tranquilizers.

7. Religion and Philosophy: Fundamentalism versus Universalism. We see the erosion of traditional religious and normative beliefs; and their replacement by secular forms of conformity in an era of mass entertainment and consumerism. S4 dualism fragmented Christendom into two rival segments in the Reformation, and divided religious communities throughout the world into “believers” and “non-believers” who in turn had to be proselytized, and their indigenous culture patterns made to conform to an alien-imported “true” doctrine. An S5 ethos espouses an ecumenicism that seeks commonalities among all religions, while also recognizing the emergence of new forms of truth-seeking and ideational validation. But its universalism is contested by resurgence in recent decades of militant forms of fundamentalism found in Christianity and other major religions, and which can translate also into rightwing political and ideological strategies.

Given these salient bifurcation threats, can the emerging paradigm be secured? At this juncture, while important changes in the traditional world-view are occurring in all societies, the S4 mindset appears to be still dominant. Yet the portents warn that unless paradigmatic transformation is achieved, the prevailing world-view could continue on its unsustainable course of behaviour and action until the global eco-societal system collapses. We shall need concerted action in all segments of the UCP to shift from downward to upward bifurcation if we are to attain S5. And it will call for broad trans-societal consensus coupled with unprecedented political will.

Operation Crossover: Reversing Systemic Roles

As this monograph has demonstrated, science and technology – material technics – have been positive feedback factors largely responsible for actualizing a system’s existing potential or quantizing it to a new organizational level. Material technics are change-and-growth-oriented, and their potency has resulted in a serious culture lag vis-à-vis other segments of the UCP. For their part, institutions, law codes, and religious mores comprising societal technics have historically acted as negative feedback mechanisms to maintain *or* restore overall societal equilibrium. But their conserving and conservative role has become a critical encumbrance in today’s global evolutionary acceleration.

At this juncture, our thesis calls for a crossover in the roles traditionally played by T_M and T_S . It is now essential that science and technology assume a new, long overdue responsibility:

(1) to focus on innovative ways to maintain or restore environmental balance and longevity; and (2) to invent new technologies *appropriate* in their use of energy and material resources so as to enable physical growth to be synchronized with a correlative strategy of societal sustainability.

As the complementary strand of Operation Crossover, let us give our T_S a new and liberating role as positive feedback agents. This new kind of growth will be qualitative and normative (inter alia ensuring that *areté* is again a central element in the emerging paradigm). It will stress the creativity that inheres in our collective and individual skills and imagination. There is an enormous, and largely untapped, growth potential in what Maslow and others call “self-actualization”: the ongoing exploration of our own personality and psyche, and realizing their potential.

The Holopoeic World-View (S5)

We are speaking here of a paradigm proclaiming that we exist in one planet, in one solar system, in one galaxy, in one universe, created and sustained by one life force. Described as a single, all-encompassing holofield “that makes us, and all things in nature, organic parts in a subtly interlinked cosmos”, it is “omnipresent throughout space and time” (Laszlo 1996, 220). Our present era is the staircase to a new plateau with its own unique world-view, which we call “Holos” because it embraces all peoples co-existing with all forms of life at all stages in the evolution of cosmic consciousness.

The new paradigm requires a different metaphysical foundation for science. In place of the S4 model of objectivism, positivism, and reductionism, this “wholeness science” is based on two overarching assumptions: *ontological*: the oneness, unity, and interconnectedness of everything; *epistemological*: there are two available “windows” onto reality: the objective by means of the physical senses; the subjective by means of the intuitive and aesthetic faculties (Harman 1994, 379-380). As a consequence, this extension of scientific enquiry recognizes the experiential validity of all the interlinked segments of the UCP, and accords them equal significance in the new worldview. In Goodwin’s words: a “science of qualities” enables us to “return to the vision of the Renaissance magi, in which subject and object, known and unknown, can relate and participate in an appropriate unity, made possible by the fact that reality is a single coordinated domain” (Goodwin 1987).

The Logopoeic perception of reality has been called the *Expansionist* world-view, based upon a firmly-held belief in the efficacy of unlimited *growth* and its accompanying “rights” of

environmental and societal exploitation. The Holopoeic paradigm replaces that concept of growth and quantitative, GNP-based criteria and values with a “quality of life” ethos. This alternative model can be described as a systems-embedded Ecological world-view. Inasmuch as humans are inseparable components of a universal ecosystem, it follows ineluctably that they can never “conquer” their environment but have to live or die with it. The needs common to all humankind – basic standards of nutrition, shelter, health, education – must be met on a global scale, and the resources required to meet them call in turn for broad international allocation. At the same time, the specific uses to which they are put warrant devolution of the decision-making process to regional, national, and local levels so as to take account of cultural and communal diversity and uniqueness. Hence the ecologists’ aphorism: “Think globally, act locally.”

The Ecological World-view has its own strategy. Unlike some gloom-and-doom scenarios, it does not call for total zero growth – nor does it countenance continued exponential growth, which it considers impossible to maintain. It recognizes the ills of arbitrary and sudden cut-offs, which must mean loss of the social and psychological momentum that has sustained Western societies over the past several centuries, and also the need of developing regions to increase productivity and improve living standards. Growth, however, must be much more selective in order to strike a viable balance between consumption for today and conservation for tomorrow. The desired objective would be a multi-variable overall balance, one recognizing flexibility of approach and methods among the world’s major regions. It envisages also another kind of shift, from a consuming emphasis upon material goods towards a new life-style, stressing new qualitative factors.

Concluding Observations

At this juncture, the TST thesis has reached a point where in S5 the dynamics of Time and Space have been reversed. At its S1 stage, humankind was short on controllable space while long on experienced intervals of time. Now it has extended our movement into space beyond the solar system, while temporal intervals are being acceleratively diminished until we seem to find ourselves in a state of almost continuous quantization, especially in science and technology. Can this pace of change continue indefinitely? What happens to the traditional equilibrating role of societal technics, given the fact that the temporal factor in past societies appeared essential for the articulation and consolidation of collective mores and institutional activities?

This question suggests that we apply a central component in systems theory: advances and transformations in a given system also make use of properties already found therein. TST as a

systemic interpretation of the evolution of societies from ancient times emphasizes that mega-quantization to a new level of organization does not abandon previous stages. On the contrary, it builds upon them, since now they serve as foundations for the new edifice. Without S1 there could have been no S2 – and without Mythos no Theos, thence no Logos, and now no Holos. Far from ignoring the past, Holos can be expected with its fresh insights to reinterpret and revalidate the combined experiences of Mythos, Theos, and Logos. Our TST exercise enables us to understand better the insights provided by the dynamics found in earlier socio-systemic stages, and to profit therefrom. (As Santayana points out, those who forget their history are condemned to repeat it.) In our current critical global transition, we need to begin putting in place societal technics that can provide optimal equilibration, because we do not have the luxury of long time-frames accorded previous societies in evolving viable behavioural codes and institutions.

Finally, in seeking a symbol to define the character of our emerging world-view, let us complete our earlier-expressed metaphor when we identified Mythos with a telluric female principle, as embodied in the Earth Mother, and the next two paradigms with the male principle. Specifically, our metaphor perceived a conceptual isomorphism of Theos with a celestial Father figure acting by volition and fiat, and Logos with the Word made flesh, the Son incarnating among humankind. These first and second Persons lent themselves, as had the female principle, to identifiable representation in painting and sculpture alike. But how to depict the Holy Spirit? It is neither male nor female – or, rather, both – but pure energy, universal and omnipresent in all representations, yet in itself non-representational. formless, and limitless – as in so much of contemporary art. It is at once the cosmic holofield and Laszlo’s “whispering pond”.

Yet as it continues to emerge, Holos is but the most recent paradigmatic construct seeking to understand and explain where humanity finds itself in time-space in an ongoing quest and adventure. For as the poet reminds us:

I am a part of all that I have met;
 Yet all experience is an arch where through
 Gleams that untravelled world whose margin fades
 Forever and forever when I move.

Tennyson (*Ulysses*)

References

- Adams, Henry. 1961. *Mont-Saint-Michel and Chartres*. New York: New American Library.
- Adams, Robert McC. 1966. *The Evolution of Urban Society: Early Mesopotamia and Prehispanic Mexico*. Chicago: Aldine.
- Appleby, Joyce, Lynn Hunt, and Margaret Jacob. 1994. *Telling the Truth about History*. New York: Norton.
- Beard, Charles A. 1943. *An Economic Interpretation of the Constitution of the United States*. Macmillan: New York.
- Beard, Charles A., et al. 1946. *Theory and Practice in Historical Study: A Report of the Committee on Historiography*. Social Science Research Council Bulletin 54.
- Benedict, Ruth. 1946. *Patterns of Culture*. New York: Penguin.
- Butterfield, Herbert. 1965. *The Origins of Modern Science, 1300-1800*, revised and enlarged edition. London: G. Bell and Sons.
- Butzer, Karl W. 1964. *Environment and Archeology: An Introduction to Pleistocene Geography*. Chicago: Aldine.
- Campbell, Bernard G. 1966. *Human Evolution: An Introduction to Man's Adaptations*. Chicago: Aldine.
- Campbell, Joseph. 1990. *Transformations of Myth Through Time*. New York: Harper and Row.
- Cassirer, Ernst. 1963. *The Individual and the Cosmos in Renaissance Philosophy*. New York: Harper and Row.
- _____. 1964. *The Philosophy of Symbolic Forms*, vol. 2: *Mythical Thought*. New Haven: Yale University Press.
- _____. 1965. *An Essay on Man: An Introduction to a Philosophy of Human Culture*. New Haven: Yale University Press.
- Chandler, Tertius and Gerald Fox (eds.). 1974. *3000 Years of Urban Growth*. New York: Academic Press.
- Childe, V Gordon. 1950. "The Urban Revolution". *Town Planning Review* 21: 3-17.
- _____. 1963. *Social Evolution*. London: Collins.
- Cohen, Yehudi A. 1968. "Culture as Adaptation", in Yehudi A. Cohen (ed.), *Man in Adaptation: The Cultural Present*. Chicago: Aldine.

- Collingwood, R. G. 1945. *The Idea of Nature*. Oxford: Clarendon Press.
- _____. 1949. *The Idea of History*. Oxford: Clarendon Press.
- Cornford, E. M. 1978. *Before and After Socrates*. Cambridge: Cambridge University Press.
- Deloria, Vine, Jr. 1994. "If You Think about It, You Will See That It Is True", in Willis Harman (ed.), *New Metaphysical Foundations of Modern Science*. Sausalito: Institute of Noetic Sciences.
- Eiseley, L. C. 1955. "The Paleo Indians: Their Survival and Diffusion", in *New Interpretations of Aboriginal American Culture History*, 75th Anniversary vol. of the Anthropological Society of Washington.
- Eisler, Riane. 1987. *The Chalice and the Blade: Our History, Our Future*. San Francisco: Harper and Row.
- Finley, John H. 1966. *Four Stages of Greek Thought*. London: Oxford University Press.
- Forbes, R. J. 1965. *Studies in Ancient Technology*, vol. 2. Leiden: E. J. Brill.
- Frankfort, Henri. 1948. *Kingship and the Gods: A Study of Ancient Near Eastern Religion as the Integration of Society and Nature*. Chicago: University of Chicago Press.
- Frankfort, H., and H.A. Frankfort. 1946. "Myth and Reality", in H. Frankfort et al., *The Intellectual Adventure of Ancient Man: An Essay on Speculative Thought in the Ancient Near East*. Chicago: University of Chicago Press.
- Gibbs, J. W. 1902. *Statistical Mechanics*. New York: Charles Scribner's Sons. For a briefer exposition of Gibbs' theory, see R. B. Lindsay and H. Margenau, *Foundations of Physics*. New York: John Wiley and Sons, 1936.
- Gleick, James. 1988. *Chaos: Making a New Science*. New York: Penguin.
- Gombrich, E. H. 1962. *Art and Illusion: A Study in the Psychology of Pictorial Representation*. London: Phaidon Press.
- Goodwin, Brian. 1987. "A Science of Qualities", in B. T. Hilary and E. D. Peat (eds.), *Quantum Implications: Festschrift for David Bohm*. London: Routledge and Kegan Paul.
- _____. 1996. *How the Leopard Changed Its Spots: The Evolution of Complexity*. New York: Touchstone/Simon & Schuster.
- Harman, Willis. 1994. *New Metaphysical Foundations of Modern Science*. Sausalito: Institute of Noetic Sciences.

- Hawkes, Jacquetta, and Sir Leonard Woolley. 1963. *Prehistory and the Beginnings of Civilization (History of Mankind: Cultural and Scientific Development)*. UNESCO, London: George Allen & Unwin, vol. 1.
- Hooke, S. H. 1956. "Recording and Writing", *A History of Technology*, vol. 1. Oxford: Clarendon Press.
- Jacobs, Jane. 1970. *The Economy of Cities*. New York: Vintage.
- Jantsch, Erich, and Conrad H. Waddington (eds.). 1976. *Evolution and Human Consciousness: Human Systems in Transition*. Reading, Mass.: Addison-Wesley.
- Kluckhohn, Clyde K. 1950. "The Special Character of Integration in an Individual Culture", in *The Nature of Concepts, Their Inter-relation and Role in Social Structure: Proceedings of the Stillwater Conference*. Stillwater: Oklahoma A. & M. College.
- Koestler, Arthur. 1961. *The Lotus and the Robot*. New York: Macmillan.
- Kroeber, Alfred L., and Clyde K. Kluckhohn. 1952. "Culture: A Critical Review of Concepts and Definitions", in *Papers of the Peabody Museum of American Archeology and Ethnology*, vol. 47, no. 1. Cambridge, Mass.: Harvard University.
- Kuhn, Thomas S. 1966. *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought*. Cambridge, Mass.: Harvard University Press. See chs. 1-4.
- Kunz, F. L. 1972. "The Metric of the Living Orders", in Henry Margenau (ed.), *Integrative Principles of Modern Thought*. New York: Gordon and Breach.
- Laszlo, Ervin. 1969. *The Structure of Human Experience: Outline of a Multi-Level Feedback Theory*. New York: Gordon and Breach.
- _____. 1972. *Introduction to Systems Philosophy: Toward a New Paradigm of Contemporary Thought*. New York: Gordon and Breach.
- _____. 1987. *Evolution: The Grand Synthesis*. Boston: New Science Library.
- _____. 1993. *The Creative Cosmos: A Unified Science of Matter, Life and Mind*. Edinburgh: Floris.
- _____. 1995. *The Interconnected Universe*. Singapore: World Scientific.
- _____. 1996. *The Whispering Pond*. Rockport, Mass.: Element.
- Le Gros Clark, W. E. 1964. *The Fossil Evidence for Human Evolution*. Chicago: University of Chicago Press.
- Lévi-Strauss, Claude. 1970. *The Savage Mind*. Chicago: University of Chicago Press.

- Loye, David (ed.). 1998. *The Evolutionary Outrider: The Impact of the Human Agent on Evolution*. Westport, Conn.: Praeger.
- Mann, A. T. 1993. *Sacred Architecture*. Rockport, Mass.: Element.
- Margenau, Henry. 1950. *The Nature of Physical Reality: A Philosophy of Modern Physics*. New York: McGraw-Hill.
- Margenau, Henry (ed.). 1972. *Integrative Principles of Modern Thought*. New York: Gordon and Breach.
- Masulli, Ignazio. 1990. *Nature and History: The Evolutionary Approach for Social Scientists*. New York: Gordon and Breach.
- Morgan, C. Lloyd. 1923. *Emergent Evolution*. New York: Henry Holt.
- Mumford, Lewis. 1961. *The City in History: Its Origins, Its Transformations, and Its Prospects*. New York: Harcourt, Brace and World.
- _____. 1963. *Technics and Civilization*. New York: Harcourt, Brace & World.
- Murphy, Gardner, and Herbert E. Spohn. 1968. *Encounter with Reality*. Boston: Houghton Mifflin.
- Murray, Gilbert, 1953. *Hellenism and the Modern World*. London: George Allen and Unwin.
- Portmann, Adolf. 1967. *Animal Forms and Patterns: A Study of the Appearance of Animals*. New York: Schocken.
- Prigogine, Ilya, and Isabelle Stengers. 1984. *Order Out of Chaos: Man's New Dialogue with Nature*. New York: Bantam.
- Quastler, Henry. 1964. *The Emergence of Biological Organization*. New Haven: Yale University Press.
- Radin, Paul. 1960. *The World of Primitive Man*. New York: Grove Press.
- Read, Herbert. 1955. *Icon and Idea: The Function of Art in the Development of Human Consciousness*. London: Faber and Faber.
- Robertson, Donald. 1963. *Pre-Columbian Architecture*. London: Prentice-Hall International.
- _____. 1971. Vol. 225, no. 3. *Scientific American*.
- Simpson, George Gaylord. 1955. *The Meaning of Evolution*. New York: New American Library.
- Simonds, Roger. 1972. "Integrative Concepts in the Logic of Relations", in Henry Margenau (ed.), *Integrative Principles of Modern thought*. New York: Gordon and Breach.

- Singer, Charles. 1959. *A Short History of Scientific Ideas to 1900*. Oxford: Clarendon Press.
- Sommerfelt, A. 1956. "Speech and Language", *A History of Technology*, vol. 1. Oxford: Clarendon Press.
- Spencer, Herbert. 1898. *The Principles of Biology*, vol. 1. London: Williams and Norgate.
- Taylor, Alastair M. 1972. "Integrative Principles in Human Society", in Henry Margenau (ed.), *Integrative Principles in Modern Thought*. New York: Gordon and Breach.
- _____. 1976. "Process and Structure in Sociocultural Systems", in Erich Jantsch and Conrad H. Waddington (eds.), *Evolution and Human Consciousness: Human Systems in Transition*. Reading, Mass.: Addison-Wesley.
- _____. 1979. "Historical Aspects of the Development of Civilization and the Changing Self-Conception of Man". *The Responsibility of the Academic Community in the Search for Absolute Values: Proceedings of the Eighth International Conference on the Unity of the Sciences*, vol. 1. New York: International Cultural Foundation Press.
- Taylor, Alastair M. (co-author). 1996. *Civilization, Past and Present*, 8th edition. New York: HarperCollins.
- Taylor, Alastair M., and Angus M. Taylor. 1992. *Poles Apart: Winners and Losers in the History of Human Development*. Ottawa: International Development Research Centre.
- _____. 1993. *Science and Causality: A Historical Perspective*. Sausalito: Institute of Noetic Sciences.
- Thompson, D'Arcy Wentworth. 1942. *On Growth and Form*, 2nd edition, 2 vols. Cambridge: Cambridge University Press.
- Ubbelohde, A. R. 1963. *Man and Energy*. Harmondsworth: Penguin.
- Waldrop, M. Mitchell. 1992. *Complexity: The Emerging Science at the Edge of Order and Chaos*. New York: Simon & Schuster.
- Weyl, Hermann. 1952. *Symmetry*. Princeton: Princeton University Press.
- Whitehead, Alfred North. 1957. *Process and Reality: An Essay in Cosmology*. New York: Harper and Row.
- Wittkower, Rudolf. 1988. *Architectural Principles in the Age of Humanism*. London: Academy.

Zeleny, Milan, and Norbert A. Pierre. 1976. "Simulation of Self-Renewing Systems", in Erich Jantsch and Conrad H. Waddington (eds.), *Evolution and Human Consciousness: Human Systems in Transition*. Reading, Mass.: Addison-Wesley.

Zeuner, Frederick E. 1956. "Domestication of Animals", *A History of Technology*, vol. 1. Oxford: Clarendon Press.