

“Fifth structure”- emergence in economics: Observations through the thermodynamic lens of world history¹

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Gebser’s archeology of consciousness, augmented by its graciously nonpositivistic (open destiny) eschatology through archaic-originary projection, presumes the epiphenomenon of socioeconomic transformation. Since the history of consciousness is also a history of social consciousness, which is never without economic interpretations, it is mirrored by the history of economic thought.

The thermodynamic conceptualization of the human journey provides further warrant to Gebser’s *caveat* that the mutation of the prevalent mental-rational structure of consciousness into the integral-arational (“fifth”) constellation is a *sine qua non* for dignified survival. This crucial moment in collective psychohistory is inseparable from a change in the global socioeconomic system, which cannot occur without transcending mainstream orthodoxy in economic sciences.

Economics as the institutionalized ideology of mental-rational consciousness

Geographic globalization was complete by the end of the 15th century. The visualization of Earth as a three-dimensional object became a powerful catalyst to spatial thinking and the path was cleared for the gradual coming to dominance of mental-rational consciousness. The birth and development of economics as a specialized field of interest coincided with this process.

After the discovery of the Americas, increased agricultural productivity and the massive transatlantic flow of monetary metals facilitated the rapid growth of commerce, industry, and urbanization in Europe. The nation state revealed itself as the viable intermediary unit of organization between local socioeconomic milieus and the world at large -- tending toward an exhaustive distribution of the planet. Thinking about social conditions and history brought to life the motivation to quantify phenomena, to build comprehensive analytical models. The rationality of science and technology began to imbue individual behavior with the harsh directedness of cost-benefit calculus.

¹Gebser identified five structures of consciousness (archaic, magic, mythical, mental-rational, and integral-arational) and showed that mutation of the currently dominant mental-rational structure into the last, “fifth structure” gathered momentum at the turn of the last century. (For concise and enjoyable introductions to Jean Gebser’s oeuvre, see *Feuerstein, 1987* and *Combs, 1996*.) The present paper confirms that this transition has accelerated in recent times. *It does not necessarily reflect the editorial views of the Shenandoah Valley Research Press (SVRP) or those who provide financial support for its activities.*

Nakedly self-centered materialism was elevated to the foundational principle of a world-organizing socioeconomic model with the 1776 publication of Adam Smith's *The Wealth of Nations*. Many economic historians consider this work the true genesis of economics as an independent field of academic inquiry.

Laissez faire (classical) capitalism drew its ideological sustenance and prescriptions for individual and national conduct from *The Wealth of Nations*. An ideological conviction took root that blossomed into the following general view: Scientific progress and the magic power of the market are destined to make man (the subject) the master of nature (the object). The free market credo effectively locked the repertoire of socioeconomic behavior into the narrow closet of calculative, money-metric self-interest and turned the past into the prehistory of a rationally assessable, eternally valid, equilibrium-centric order.

Although *classical capitalism* went through a major transformation during 1914-1945 to become incorporated into our contemporary global system (*mixed economy/weak multilateralism* -- or *modern capitalism*); its hypostasized ideological core (demanding, thriving on, and conserving mental consciousness in its inflated rationalist mode) has survived to our epoch.

The following quote from the 1991 Nobel Prize lecture of Ronald H. Coase vividly avers this:

"During the two centuries since the publication of 'The Wealth of Nations' the main activity of economists, it seems to me, has been to fill the gaps in Adam Smith's system, to correct his errors and to make his analysis vastly more exact. A principal theme of 'The Wealth of Nations' was that government regulation or centralized planning were [sic] not necessary to make an economic system function in an orderly way. The economy could be coordinated by a system of prices (the "invisible hand") and, furthermore, with beneficial results."

Coase explains that a major task of economists has been to elaborate this proposition and to adapt it to new circumstances.

It is telling that contemporary economic orthodoxy identifies Adam Smith's complex social philosophy, which puts simple economics in a broad ethical context in ways that remain surprisingly relevant today, with the "invisible hand," an expression that occurs only once in Smith's 1000-page work.

If worshipful references to Adam Smith are the political rallying cries for market fundamentalism, the "theory of rational expectations" and the "efficient market hypothesis" remain caricature-like attachments to the deficient mode of mental-rational consciousness.

Originated by John Muth in the early 60s, the "theory of rational expectations" became influential in the 90s through the writings of Nobel Laureate Robert Lucas. It is based on the flattering proclamation that the individual is rational and therefore, preoccupation

with one's own welfare will alter expectations attached to government policy: Micro-level decisions alter macro-level policy measures. The dogmatic nature of this elegant theory is revealed only if one remembers that it takes extant conditions (the socioeconomic environment with its system and associated axiomatic assumptions about collectively instilled and fully internalized values and beliefs) for generally valid, elementary, and eternal facts.

Praised, criticized, extended (particularly into sociology through rational choice models), amended with psychological dimensions that remove the brutally "selfish" label from mini-max behavior, virtually disabled with damaging arguments and commentaries, the theory has survived as a powerful prop for neoliberal propaganda against the economic and social-welfare-promoting role of the government.

The "efficient market hypothesis" (made famous by Eugene Fama) divides information into the knowable and the unknowable. What is known is already incorporated in traded assets (real or paper). Thus, markets already know what can be known. Consequently, prices have very short memories or none at all. They do not remember where they were a few minutes ago on the floor of the New York Stock Exchange. Psychological-behavioral factors were stacked against it, alternative theories negated it completely, yet the "hypothesis" left an indelible mark on traditional economics to which pilgrims of rational purism regularly return.

Nowhere is academic readiness to conserve values and expectations implicitly linked to mental-rational dominance more openly demonstrated than in awarding Nobel Prizes in economics. Ostensibly liberal as the annual selection of laureates may have appeared over the past four decades, "The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel" has always been awarded to those who could best improve and protect the prevalent socioeconomic world order dedicated to the basic notion that human beings are homogeneous entities with a "propensity to truck, barter, and exchange one thing for another" (the words of Adam Smith).

Foucault's complaint about a robust, yet flexible, reciprocity between knowledge and power comes to mind. Through technical jargon and phraseology, study programs, conferences, faculty appointments, prestige- and notoriety-promoting honors, the line of demarcation between "the well known" and "the generally valid" has become systematically blurred.

The conservative ideology of contemporary economics reinforces convictions that keep the potential of individual behavior in a thin enclosure. The maximization of consumption and the accumulation of monetarily measurable assets as the ultimate goals of life is its vehemently protected, enshrined centerpiece. At the bottom of this complicated dynamism silently lies the mistaken belief that humanity's psychohistory is complete and over.

Eppur si muove!

The present exercise is aimed at identifying integral-arational elements in economic theory since the beginning of the 20th century.

Signs of new mutation

In the concluding section (*Temporics*) of Chapter 4 (*The New Concepts*, pp. 361/362) of **The Ever-Present Origin** (referred henceforth with the abbreviation of *opus magnum*, O.M.), Gebser lists 19 criteria (“themes or motives”) that allow for the recognition of consciousness pressing toward its integral-arational stage in academic and artistic endeavors. Their relevance is transparently evident in the evolution of modern economic thought but with a word of caution.

Economics is the sociopolitical bulwark of the current state of consciousness, hence it does not lend itself to what may be considered an “aperspectival breakthrough.” A-waring or systatically perceiving the spiritual ought not to be expected even from the most heterodox theoreticians. Signs of preoccupation and discomfort with the inadequacy of rational purism and mental-rational egoity; longing for social and economic conditions commensurate with the “fifth structure” must suffice as evidence of mutation in this ensconced power-girding discipline. And such signs abound! A growing number of economists no longer feel entirely comfortable with the “fundamentals of maintained theory” and are becoming reluctantly “nonorthodox” in their gut-comprehension of socioeconomic realities.

World history as a thermodynamic process

The present analysis is interfused with the thermodynamic theory of world history, which is briefly summarized below.

Human population and produced artifacts together may be perceived as a material entity, an aggregation of atoms or, even more generally, that of subatomic particles. This entity, *culture*, has undergone exponential growth through human activity (extended reproduction both biologically and economically), a process called *cultural evolution*.

As elaborated by Ilya Prigogine, the father of modern disequilibrium thermodynamics, a material entity that gains in size while becoming increasingly complex (where complexification is defined as growing volumes of information generated and transmitted among the entity’s decision centers) must undergo an alternation between relative (dynamic) steady states and bifurcations (*chaotic transitions*).

By the end of the 18th century, *cultural evolution* demanded global-scale organization to maintain its accelerating mode. The *chaotic transition* that began with the French Revolution and ended in the early 1830s led to the establishment of the world’s first *global system* (GS1), characterized by *laissez faire* and *metal money*. It lasted from approximately 1834 (the “birthday of the industrial proletariat” [Polanyi], a year of intense legislation in Britain concerning the poor) until the outbreak of World War I in 1914.

The period 1914-1945 was another *chaotic transition* that brought the second and current *global system* (GS2) -- *mixed economy/weak multilateralism* -- into existence. (Until the end of the Cold War, socialism remained an unsuccessful alternative for global self-organization.)

At present, physical limits are beginning to slow *cultural evolution*. Its demand for free (accessible) energy (in the form of low entropy matter and energy carriers), and capacity to absorb pollution are coming into conflict with nonexpendable terrestrial constraints. As a consequence, the world has either entered or is on the verge of entering another period of *chaotic transition*.

A new *global system* (GS3), *two-level economy/strong multilateralism*, will be needed to create a sustainable balance between *culture* and humanity's ecological niche. Micro-activities will have to be made legally subject to globally-determined and nationally allocated macro-constraints. The required transformation of individual behavior and institutions will be vast.

Clarifications concerning the application of the thermodynamic theory to Gebser's eteology.

A. The use of consciousness as a term

The thermodynamic interpretation of world history recognizes GS1 and GS2 as substructures of the prevalent mental-rational structure. This approach is not without support from Gebser scholarship. In his critical exegesis, Feuerstein mentioned the need to search for more detailed mutations (sub-mutations) and temporal precisions within Gebserian basics (*Feuerstein, 1987, p. 44*). The thermodynamic theory equates the establishment of GS3 with mass mutation into integral-arational consciousness.

The inexorable link between the individual's internal world and the surrounding socioeconomic environment suggests that consciousness has a physically interpretable, perhaps even tractable, aspect. Indeed, imaging history as a physical process cannot do without neurobiological facticity and its rational extensions.

Being is (also) thinking in a particular form in which consciousness must take an active part. Therefore, consciousness is (also) directed, intention-laden, phenomenological awareness. Through education, social, political, and cultural conditioning, and a series of recollected experiences, the individual is anchored (also) to the socioeconomic environment. While the ever-pressing, originary impulse is lodged deep in consciousness and remains forever inexpressible in the language of cognitive neuroscience, it may be stated as a matter of confirming, rather than equivocating over Gebser's insight: Information required to solve individual problems of daily existence evolves with the constantly changing socioeconomic environment, a process that reveals thermodynamically equivalent macrohistoric stages *ex post*. That is, the structure of

consciousness between its mutational transformations is a *slow process* and is likely to contain distinct sub-periods.

The recognition of material-physical traces in the temporal unfolding of panhuman consciousness does not equate consciousness with the brain-mind. The approach forcefully disassociates itself from Cartesianesque dualisms and from all other closure-seeking, spirituality-belittling or -denying perspectivation.

B. Integral-arational consciousness is not prophetic utopianism, it has great practical significance.

Unless transformation from mental-rational into the “fifth structure” is accomplished in time, Gebser states, “an almost complete self-surrender of mankind” (O.M., p. 539) will occur.

Gebser considered technological development that pays no attention to broader and deeper human needs a byproduct of the deficient mode of mental-rational consciousness and argued forcefully against equating it with progress. “If the destructive forces of such ‘progress’ are not weakened, these developments, according to their degree of autonomy, will automatically fulfill the law of the earth” (O.M., p. 96).

Unfortunately, the belief that “R & D”-driven economic growth is the path to ever higher degrees of human welfare and happiness shows no credible signs of weakening. Despite counter indications to its wisdom and tenability, the maximization of GDP growth remains the single most important goal of national governments and international organizations and receives vital support from the economics profession, both in terms of practical policymaking and theoretical justification.

Hopefully, the realization of this error will occur before human civilization, as we understand it based on shared culture and traditions, suffers major, long lasting, if not irreparable damage.

If and when the decisive insight develops that, by the laws of thermodynamics, production (output) is a continuous throughput that never fails to affect humanity’s life-support system; that the planet is full, rather than empty (i.e., the human biomass and economy are expanding beyond sustainable limits), a profound change in self-understanding must also occur. The new persona (GS3 avatar) required to ensure humanity’s future could not be better characterized than by the attributes and behavioral manifestations imputed to the integral-arational structure of consciousness. (See, O.M., p. 141 and *Feuerstein, 1987*, p. 170.)

The growing anxiety about the failure to perceive the terrestrial sphere as *the* aggregate material constraint is, therefore, a sign of groping toward the “fifth structure.”

As far as economic activities are concerned, the world will eventually have to move from the “cowboy” to the “Dutch” mentality (Kenneth Boulding’s word play). I.e., it will have

to learn how to prosper subject to natural constraints as if they were protective levies and dunes. The cowboy in us will have to be reserved for the conquest of outer space to ensure the species' long-term survival. Multi-year cosmic travel (most immediately to Mars) will require an outlook on life and associated self-comportment that only integral consciousness can secure.

Back on Earth, increased leisure in the context of enhanced social protection and international security will open new vistas for individual creativity, which -- as Gebser told us -- is an evidence of the origin. The fear of not using our time wisely (the "time is money" *meme*) will dissipate. Angst about seeing one's life slip away will be mitigated by *teleia philia*, the Aristotelian idea about friendship based on the mutual recognition of complete, instinct-like selflessness. The dying individual, sharing ultimate desires and transgenerational goals with others, would have a firm sense of continuity. Unconditional compassion expressed through social institutions would remove concern about the welfare of those left behind.

Thus, if the objectification of humanity's material conditions and goals is necessary for survival, only integral-rational consciousness can perform the tasks implied. Ideally, the GS3 persona will integrate the rationality of the accomplished scientist with a magic-mythical "we" sense. Space-time freedom (the "conscious form of non-dimensionality") rather than ego-consciousness will dominate thought, behavior, and institutions.

C. Mutation as a process must be macromutation through chaotic transition.

"The new consciousness which was anticipated and first took shape in the creations of artists, thinkers, and scientists, will not be fully valid so long as it is not lived in daily life" (O.M., p. 530).

In the age of global-level self-organization, consciousness structures bear the typical traits that the *global system* imparts to innumerable, interlinked, and nationally compartmentalized socioeconomic milieus.

The inexorable mutuality between "interior" and "exterior" implies that the predicted transition cannot be the sole result of individual introspection spread far and wide. The following remark by Gebser helps comprehend the difficulty: "The adage that 'how we shout into the woods is how the echo will sound' is undoubtedly accurate -- and the woods are the world"(O.M., p. 141).

If we let the "woods" symbolize the socially-crafted framework (arrangements that follow from actual global-scale self-organization) and interpret "shouts" as socioeconomic behavior with its multifaceted and wide range of manifestations, the problem can be restated as trying to find a new harmony between the drastically changing "woods" and the myriads of passionately intense "shouts."

Since institutions cannot drastically change unless socioeconomic behavior is modified to a commensurate degree and since this cannot happen unless a profound institutional

transformation occurs, mutation into the new form of global self-organization must be accomplished through a quasi-simultaneous change of institutional design and a corresponding reorientation in thinking, attitudes, moral values, expectations, and intentionality. A period during which the world is out of control, drifting in search of new bearings is implied by both physics and history.

The initially large number of suggestions, plans, and blueprints need to distill into historically significant blocks that will subsequently clash until a new mold is forged from the molten amalgam of *ex ante* feasible solutions. This process led to GS1 through the *chaotic transition* (or macrohistoric leap) of “1789-1834” and to GS2 through “1914-1945.”²

The laws of disequilibrium thermodynamics, as applied to self-organization amidst growth and complexification, render the above-capsulated history an epiphenomenon of a physical process, provided, of course, that we regard the web of interpersonal relations in the socioeconomic sphere as a materially-conceivable entity; that is, if we accept with proper qualifications that social history is part of natural history.

A new period of macrohistoric turbulence is on the horizon.

Living within the limits of renewable natural resources and being directly concerned with the imperatives of environmental sustainability implies a more cooperative and less competitive civilization than the current one. However, since personal traits and self-conduct associated with integral consciousness in the socioeconomic realm can become general only under propitious external conditions created by matching institutions; while the development of such institutions presupposes the presence of behavioral characteristic imputed to integral consciousness, global-scale mutation into the “fifth structure” will have to occur through a new *chaotic transition*.

D. The efficaciously rational way to supersede (“dequantify”) time is to consider it a manifestation of energy, and world history a thermodynamic process.

When Gebser declared “time is energy” (O.M., p. 137), he may have recognized that the second subsumes the first, thereby making the mental-rationally perceived quantitative time dimension into an indeterminate potential, a quality and intensity -- attributes summarized by the symbol *amension*. The production of unpredictable novelties is the hallmark of a unidirectional thermodynamic unfolding. It is the criterion that separates time as *amension* from clock time, duration that accompanies and characterizes the causal, the mechanical, the calculable.

Early 20th century breakthroughs in physics (i.e., relativity and quantum mechanics) made it amply clear that “time” is not a scientifically provable, autonomous phenomenon of nature. It is our own creation whereby we can recognize, measure, and, to some extent,

² Gebser attributed great importance to the “mutational principle” in events that may be characterized as politico-economic. New qualities emerge through disruptions when indeterminate forces of high intensity dominate “antithetic, dualistic, rational, linear, and casual thinking” (O.M., p. 430).

predict transition and changes in structures (*Gebser, 1975*). But, by considering structures “material” to some extent and by recalling the Einsteinian equivalence between matter and energy, structures may be considered energy states or configurations. Thus, socioeconomic Gestalts, products of global-scale self-organization (never at rest) are also energy processes (again at least to some minimal extent that does not shut out eidetic sciences and the “spiritual”) and are, therefore, subject to the laws of thermodynamics.

This generalization dissolves dichotomous observations about the nature of time; i.e., that it is continuous and discontinuous, unidirectional and cyclical. The second dualism is of particular importance in the present context because *cultural evolution* implies both. The accumulation of entropy in the terrestrial sphere (i.e., increase in the ratio of inaccessible [latent] to accessible [free] energy in our thermodynamically closed space), which accompanies it, is an irreversible, and therefore unidirectional process, while human survival under conditions so created presumes the mutation of consciousness toward the origin, as if completing a cycle.

Time drained of all of its attributes is potential intensity, energy, indeed. It is the “fourth” dimension that calls for the integration of ecology (material resources and the environment) with spatially-oriented, mental-rational economic goals, thereby stimulating the birth of *achronon and diaphainon as a way of life*.

The Gebserian proposition that the present is the aggregation of the past and contains the future corresponds to the thermodynamic perception of history. The latter underscores the need to make time transparent and supersede it through the arational mode of (*synairetic*) “understanding.” It puts in relief the vexing problem of Becoming versus Being, because the first is never conceivable without the laws of thermodynamics (in particular the “entropy law”), whereas the second must be conceived without them through a thought process that leaves the shores of rational, language-based analysis and leads to the arational, subject-object transcending, ever-present non-material.

E. The *thermodynamic theory is not a form of “vitalism.”*

Both the underlying vitalist concept of *élan vital* and the thermodynamic theory’s inexorable direction and accumulation identify elementary forces that defy human control, “voluntarism” in the service of “progress.” But unlike vitalism, which expanded and extrapolated Henri Bergson’s idea, the thermodynamic take on world history does not even attempt to answer the question made famous by Erwin Schrödinger “What is Life?” It admits to an unfilled explanatory gap between ontic drives and the mental-rational modeling of history.

Thermodynamic historiography does not consider the individual “a molecule in Volk organism or an index card in the overarching etatique system” (*Gebser, 1975, p. 252*) as a vitalist doctrine may be wont to do. Rather, it regards without exception all social organizations as material states in a rationally comprehensible physical process.

Gebser called vitalist ideas, theories, and political doctrines “deficiently magical” and considered them dangerous. He particularly feared an arbitrary politico-ideologically purposeful usurpation of the elementary (“irrational”) life force admittedly beyond logical cognizance. In vitalism, he asserted,

“. . . *the qualitative accentuation replaced a merely energy-laden evolutionistic or functional-vital emphasis, and also endeavored to encompass integrality or the whole rather than the reductive manifestational form of a totality*” (O.M. p. 386).

Gebser’s 19 criteria to appraise aperspectival movements and tendencies

Criteria 1, 2, 3, 4, 5, 10, 13, 17 and 18 [henceforth, *Composite Criterion 1*, abbreviated as CC1] are abstract allusions to post-transformation integral consciousness and socio-economic-cultural-political conditions required for its existence. CC1 may be called the *General Criterion*.

Criteria 6, 7, 8, 9, 11, 12, 14, and 19 [henceforth, *Composite Criterion 2*, abbreviated as CC2] refer to the same “self-world” state by invoking time either directly or indirectly through its equivalence with energy. CC2 is the *Time-Energy Criterion*.

Criteria 15 and 16 [henceforth, *Composite Criterion 3*, abbreviated as CC3] deal with specific attributes of post-transformation interpersonal equilibrium. CC3 is the *Socioeconomic Equality Criterion*.

(See Appendix for definitions of these criteria developed with strong reliance on Feuerstein.)

Satisfaction of CC1 is registered when mankind is considered an *integrum* with a singular, common past and future, when institutions and matching individual behavior conducive to a physically, socially, and economically sustainable and dignified life for the entire global population are invoked. All explicit thoughts with such contents or implicit (perhaps concealed) *tâtonnement* in the same direction tend to diminish the pervasive role the prevailing, deficient mode of mental-rational structure imputes to “egoity.”

Therefore, CC1 is met by theoretical work that treats the world economy as a single unit of analysis. It is met to an even greater extent when our culturally inculcated so-called “rational behavior” is unmasked and challenged by showing that consumption-metric utility maximization and the pursuit of corresponding micro- and macroeconomic objectives is a losing, dead-end ideology.

CC2 mirrors the apprehension of humanity’s thermodynamic context. The “efficient” absorption of time into consciousness presupposes a scientific recognition of the equivalence between time and energy, as made explicit by criterion 12.

Therefore, CC2 is fulfilled by theories that treat the economy as a substratum of nature rather than vice versa; incorporate time (dynamics, inter-temporal analysis, hysteresis) and energy; show awareness of environmental and resource constraints.³

It is fulfilled even more by theories that expose the nonsensical proposition of eternal economic growth in our thermodynamically closed terrestrial sphere, that surmount overconfidence in the totality of mechanical-rationalist, selectively causal explanations and, consequently, abandon belief in the unfailing recurrence of cycles and the exclusive validity of equilibrium-trending dynamic models in the spirit of Newtonian physics.

Economic thought that fosters the supersession of patriarchy (no. 15) and renunciation of dominance and power (no. 16), the two criteria that comprise CC3, is the easiest to recognize. By various degrees, CC3 is also satisfied by calls to complete and expand the social safety net, by the promotion of distributive justice, international and inter-generational solidarity, and by criticizing the notion that self- and national interests are the only human aspirations that any organization of global polity can consider axiomatic.

Since CC3 is the most directly applicable to movements and tendencies in economic theorizing, and since the application of CC1 requires more intense conceptual distillation than CC2, composite criteria represent a descending order of demand for reductive adjustment in the process of making them practicable for the task at hand.

Theories considered

Economics is cultivated with passionate intensity over an ever more expansive domain. The problem of which theories to consider from the multiplicity of endeavors cannot be solved without coarse-graining and compressing. The following is a whirlwind survey of contemporary economics, inclusive of neighboring and interacting fields, such as political economy.

Mainstream (orthodox) economics is rooted in “neoclassical synthesis,” which combines neoclassical micro foundations with the Keynesian perspective on macroeconomic conditions and corresponding policy space.

Neoclassical microeconomics is a conceptual framework for analyzing how and why the interplay of supply and demand on input and output markets determines what business firms produce and individuals consume. Motivated by *greed* (profit and utility maximization), modulated and mediated by *rationality* (unceasing cost-benefit calculations), the interaction among all agents participating in economic decisions will yield *equilibrium* in all (input and output) markets and for society as a whole; i.e., will

³ The second law of thermodynamics allows the joint consideration of the environment and natural resources as energy constraints. Whereas liquidating pristine environmental conditions and filling sinks beyond the possibility of recovery increases entropy, i.e., irreversibly destroying initial order and using up exhaustible natural resources through the degradation of matter, e.g., turning copper into ash, gasoline into fumes. The total energy available for humans in the terrestrial sphere is made up of the exhaustive sum of free and latent energy. The diminution of orderliness and the reduction of usable matter increase the proportion of latent (unavailable) energy within this total. (See, *Jing Chen, 2005* and *Pogany, 2006*.)

lead to equilibrium. *Greed, rationality, and equilibrium* constitute the “holy trinity” of “maintained theory’s” micro foundations.

The Keynesian approach, which was developed during America’s New Deal and has been built into Western economic institutions since World War II, is predicated on the conviction that micro activities need the government’s guidance through fiscal and monetary policies to keep national economies on an even keel; i.e., to prevent high levels of unemployment and debilitating rates of inflation.

Mainstream economics is “normal science” (Kuhn). Its main “paradigm” (Kuhn) is market-driven economic growth with the government playing a minimal role. Thoughts that fit the mainstream may also be regarded as the “hard core” (Lakatos), which defends itself from “scientific revolution” (Kuhn) (or from “falsification” in Popperian terms) by developing “auxiliary hypotheses” (Lakatos) and flexibly deploying them through “research programs” (Lakatos). If ideation in economics is a response to changes in the socioeconomic environment and if “normal science” or “the hard core” succeeds in defending itself through absorbing, shunting off, or discrediting competing theories, which aspire for the status of new “paradigm” or “hard core,” received wisdom survives by adaptation in a generalized Darwinian sense.

The ideological struggle, which erupted during the 1970s when environmental problems began to penetrate public consciousness and discourse, is perhaps the best example.

New ideas surfaced concerning the relationship between society and the planet’s ecosystem-dictated carrying capacity. Some of these ideas were “revolutionary.” They advocated zero population and/or zero economic growth through extreme preservation and minimum resource take. This was a clear challenge to the “hard core,” namely the possibility of its central thesis: *ad infinitum* economic growth. The “research program” that developed in order to preserve the “hard core” is known as *Natural Resource and Environmental Economics*. It examines resource and environmental problems in the framework of neoclassical economics, offering market-driven solutions such as emission trading (“cap and trade”) and “baseline and credit” programs, which allow polluters in industries not currently subject to controls to obtain certificates attesting to the right to pollute by voluntarily reducing emissions and selling these certificates to firms subject to regulations.

Whereas *Natural Resource and Environmental Economics* treats nature as part of the economic process, *Ecological Economics* considers human activities to be embedded in nature and subject to physical constraints. Thus, *Ecological Economics* remains outside of the mainstream and occupies a marginal position in academic life and public policymaking.

The growing dissatisfaction with the limited and limiting perspective built into the “hard core” -- bogged down by atomizing hyper differentiation of subjects and mutually refuted econometric quantifications -- has illuminated the unsatisfying reduction of humans to

homo oeconomicus -- transparently programmed philosophical zombies with pocket calculator-simple, mechanical brains.⁴

The "holy trinity" described above is metamorphosing into a new incarnation in which enlightened self-interest squeezes out spatial rationality unfit to address the problematic of sustainability with the intensity it merits.

In general, one may expect fulfillment of the three composite criteria through changes in mainstream economics and the appearance of new, heterodox branches of economic inquiry.⁵ Whereas the first signals the inadequacy of regarding the pursuit of self-interest as the sole basis of realistic economic theorizing, the second, by being community-oriented and multidisciplinary, represents groping toward integral comprehension.

Research programs that do not depart sufficiently from mainstream to be considered heterodox:

Natural Resource and Environmental Economics began in the early 1970s. While its central subject is the failure of the market to solve natural resource and environmental problems (still an irritation to many traditional economists), this branch remains firmly within the institutional framework of the prevailing economic doctrine.

New Institutional Economics obtained its name from Oliver Williamson who initiated research under this heading in 1975. NIE analyzes the ways in which rules and norms shape the socioeconomic sphere. It departs from "old" institutional economics (Thorstein Veblen, Wesley Mitchell, John R. Commons) by widening its circle of interest and by using more complex methodologies.

Bona fide heterodoxy:

Truly heterodox orientation wants to get rid of the conceptual universe of "infinite wants" economics. It proposes to replace mainstream's preoccupation with market equilibrium, debt money, and interest with empirical energy accounting and nonmarket economic approaches. Some heterodox scholarship proclaims its origin in the adaptation of new theories that have developed outside economics and have affected diverse scientific fields.

⁴ For a collection of studies refuting *homo oeconomicus* as the conceptual basis of neoclassical economics, see *Dopfer, 2005*.

⁵ A practical, although not hundred percent accurate, way to separate mainstream (orthodox) from nonmainstream (heterodox) economics is to look at topics covered at the past few annual conferences of the American Economic Association (AEA), the most prestigious gathering of professionals in the field. Whatever is not offered there but is available through the activities (including regular conferences and symposia) and publications of accomplished academics with international renown may be considered heterodox in nature. It is a testimony to established academia's openness that heterodox subjects may surface in mainstream conferences, and overlaps in the activities of individuals between these competing orientations are regularly encountered.

Technocracy was born during the New Deal with the establishment of “Technocracy Incorporated,” an organization that has remained active to present day.

Sustainable material wealth production in harmony with the long-run availability of physical resources is the fundamental tenet of a technocratic future. Economic growth in industrialized countries is possible through enhancing the efficiency of the current level of capital stock. Technocracy advocates a radical new approach to controlling the evolution of technology.

Dependency Theory developed in the 1950s under the guidance of Raul Prebisch (Director of the United Nations Economic Commission for Latin America). It set forth the notion that resources tend to flow from poor and underdeveloped states ("periphery") to wealthy states ("core"), enriching the latter at the expense of the former.

Despite losing most of its heterodox edge over the decades, Dependency Theory keeps resurfacing in new forms and remains a constant reference in economic development literature.

Structuralist Economics emerged also in the 1950s through the activities of the Economic Commission for Latin America and it is closely related to Dependency Theory. Adherents contend that structural and institutional rigidities retard and otherwise negatively influence economic development in the Third World. The discipline has gone through several renewals but retained its critical spirit.

Thermoeconomics dates to the early 1960s. Myron Tribus (MIT, Nobel Laureate) and Nicholas Georgescu-Roegen played crucial roles in its development.

The *Encyclopedia of Human Thermodynamics* links economists to other scholars in a broader field dedicated to the energy-based analysis of social issues, including the relationship between economic activities and the ecological order (i.e., sustainability).

Neo-Ricardism (“sraffian economics”) promulgates insight into the economic process based on a new, closer reading of David Ricardo’s (as well as Marx’s) labor theory of value by Piero Sraffa during the 1960s. The critique originally leveled at the classics turned into an attack on the marginal school.

While the dispute over whether or not “sraffian economics” can be made compatible with the prevailing doctrine of time-resistant, equilibrium-bound economic order has remained inconclusive, the strand has inspired much heterodox research and exposed the fruitlessness of building ever more sophisticated and extensive mathematical models around unquestioned neoclassical axioms.

World Systems Theory crystallized around the writings of Immanuel Wallerstein, particularly since the 1974 publication of his “The Modern World-System.” Despite its failed prediction that the Cold War would end through rapprochement and integration

between what was believed to be two separate world systems, the theory is still considered relevant in exploring the development and current problems of capitalism.

Bioeconomics began its career in the 1980s. It unites biology and economics in order to develop comprehensive theories about the relationship between the economy and the environment; to apply the concepts and methodologies of life sciences to economics. Practitioners of the field make a point of exposing the lacuna between academic economics and lived reality.

Ecological Economics entered the scene with the 1987 publication of the like-named book by Spanish economist Juan Martinez-Alier (Universitat Autònoma de Barcelona, Spain). Nicholas Georgescu-Roegen, Kenneth E. Boulding, and Herman E. Daly are among the many prominent figures with foundational significance in this branch.

In contradistinction to mainstream economics, which considers nature part of the economic process (i.e., the provider of agricultural and mining products), the starting point of Ecological Economics is that the satisfaction of material needs is forever and unchangeably constrained by physical conditions. At least at the global level, output should be considered a throughput that society must bring in line with a judicious use of exhaustible natural resources and with the ecosystem's absorptive and regenerative capacity.

By combining social and natural sciences, Ecological Economics is interdisciplinary in both its conceptualization and methodology. It places a heavy emphasis on the laws of thermodynamics.

Ecofeminism is a program within Ecological Economics that emphasizes the feminine perspective over environmental and resource problems. Its beginning is dated to 1974 and is closely related to the work of Françoise d'Eaubonne.

Evolutionary Economics has its roots in the works of Marx and Engels, particularly their Darwinian perspective on social evolution. The "American Pragmatic School" (Peirce and Dewey), and the institutionalists, e.g., Veblen, have been cited as early predecessors.

Its modern version began during the early 1980s with the works of Richard Nelson (Columbia University) and Sydney Winter (University of Pennsylvania). The compendium entitled *The Evolutionary Foundation of Economics* (2005), edited by Kurt Dopfer, brought together related research activities in a shared framework.

Evolutionary Economics discards *homo oeconomicus*, the rational optimizer, as the cornerstone of theorizing. Its suggested approach renders the concept of "object of choice" multifaceted and, by taking biological evolution as its model, it finds market-historically established eternal returns without irreversibility wholly inadequate for the purpose of understanding economic problems.

Econophysics dates back to the beginnings of general equilibrium analysis (in particular to Walrasian modeling) in the early 20th century. It reemerged in the mid-1990s, thanks to the work of Jing Chen (University of Northern British Columbia) and Yi-Cheng Zhang (Institut de Physique Theorique, Fribourg, Switzerland)

Econophysics as we know today first focused on financial data, trying to apply statistical physics to stock market fluctuations. Later, the interest expanded to general economics. The field is interdisciplinary by design and retains a critical perspective on mainstream economics.

Feminist Economics assumed its current scope in 1990 with the establishment of the “International Association for Feminist Economics,” later recognized by the United Nations as an NGO.

Feminist Economics cultivates “gender aware theory and analysis” and has become an outspoken critic of traditional academe’s limited views on the individual, the household, labor issues, and international economic relations.

Post-autistic Economics (a purposefully caustic term) sprang from student disenchantment with the limited and limiting nature of mainstream economic instruction and scholarship in the year 2000. It enjoys top quality professional support and is openly hostile to the neoclassical capture and domination of academic institutions and government positions.

Green Economics began in 2004 with the founding of the Green Economics Institute in the UK. By appending the discoveries and concerns of Ecological Economics to a social agenda, the adherents of the discipline have created a political lobby. *The International Journal of Green Economics* is the main outlet for research produced in the field.

The four Cs -- Catastrophe, Chaos, Complexity, and Cybernetics in economic literature developed around mathematical discoveries in nonlinear dynamics. Taken together, they are an important sign that economics is fatigued by the sterility of overdriven mental-rational consciousness and that it wants to supersede its current dead-end by opening up to interdisciplinary approaches in a quest for deeper, more satisfying, all-embracing insights.

The four Cs are introduced in an ascending sequence of the respectability they have retained, from almost complete obliteration to survival on the margin through tolerant indifference. Understandably, Catastrophe and Chaos fared the worst. By their very nature, they do not accept models of smooth cyclical and eternal life imputed to economic institutions.

Catastrophe came into vogue during the 1970s as Rene Thom’s discoveries about discontinuities in dynamic systems appeared to be highly relevant to economists stunned by dramatic developments in energy markets and by “stagflation.” Criticism, which began in 1977 when Catastrophe Theory appeared to have reached the status of full-

blown paradigm, turned into outright ridicule during the 1980s. Neoclassical convictions leave no space for idle, pessimistic chat about singularities (bifurcations, macro-mutations, phase transitions) disrupting the economy's built-in rational tendency to return to growth and equilibrium.

From a Gebserian standpoint it is noteworthy that Catastrophe Theory was criticized for being too qualitative and for not including time as an explicit independent variable in the analysis; i.e., not considering time a spatially-interpretable dimension, a "geometricized magnitude."

Chaos penetrated economic thought during the 1980s. Its first application to financial data and stock market fluctuations conveyed a general criticism of the simplistic modeling and statistical data-smoothing deployed in the mathematical analysis of social phenomena.

Complexity Economics began in 1984 with the establishment of "The Santa Fe Institute" (SFI) in New Mexico. SFI is dedicated to the study of complex systems in general. Complexity Economics starts out by considering productive activities an endogenously evolving, adaptive aggregate.

Cybernetics first saw daylight in centrally planned countries in the 1960s. Economists, deprived of signals inherent in market prices, tried to comprehend the broader meaning of system and structure and to quantify interactions between the part (e.g., enterprise) and the whole (e.g., an industry or the national economy). The branch has retained relevance in the post-communist epoch as science -- insufficiently informed about the ecological impact of human activities -- tries to render feedback loops and circular causality between the economy and the environment more concrete.

1973 -- Year of natural separation

These are the streams and currents in the vast and troubled waters of economic theorizing that we shall subject to examination with regard to their relation to the three composite criteria. We divide the time from the turn of the last century (the period for which Gebser already noted signs of mutation in social sciences) to the present into the period before and after 1973.

This division is doubly appropriate. Not only is 1973 remembered as the year Gebser died but it also ushered in a new chapter in economic problems, international economic and financial relations, and, consequently, in economic thought. The year marked global society's first encounter with material-physical limits barring the unhampered expansion of consumption/production through what has become known as the first "oil shock" or "energy crisis." Since then, the world has been revolving around oil, its availability and price. Wars have been fought over ensuring its supplies and recessions were triggered by sudden jumps in its exchange value.

What follows is not intended to be a proof. Rather it is a demonstration of what may appear obvious to anyone with an eye for global affairs: As the planet moves from being “empty” to “full” in terms of population (i.e., pushing the extraction of resources and the insertion of pollutants into the environment beyond sustainable limits), it may be expected that new ideas concerning the need for global unity, for curbing economic growth, and; hence, for a more equitable distribution of material goods (to head off civil strife and war) must emerge. This conviction is the starting point. It is clearly acknowledged in order to head off any charge of “question begging” in the expression’s original sense of fallacious circularity -- *petitio principii*.⁶

The score denoted by “+” or “0” or “--“and called RELATIVE INTENSITY gauges the level of fulfilling the criteria relative to the previous period. Positive means increase; zero, no change; and negative, decline. Doubling the positive or the negative sign indicates enhanced intensity in the respective direction.

“Pre-1973” refers to meeting the criteria from the turn of the last century to 1973, compared to the 19th century (and before). “Post-1973” refers to fulfillment compared to the “from-the-turn-of- the-20th-century-to-1973” period.

CC1

Pre-1973

Since its 1776 birth (the year Adam Smith published *The Wealth of Nations*), economics has treated the world as a whole.⁷ This tradition was significantly deepened by 19th century classics, Malthus, Ricardo, Marx, and Mill; and by Keynes, Schumpeter, and Friedman during the 20th century.

The change at the turn of the last century that Gebser was looking for in economics -- and addressed only in abstract terms (O.M., Chapter 7) -- may be detected in the coming of age of the marginal school and in the emergence of general equilibrium analysis.

The marginal revolution that began in the 1870s with the work of Jevons and continued with Menger and Bohm-Bawerk (both straddling the turn of the last century) leaned on multivariate calculus and ordered arrays of “n” numbers (n-tuples), where each could be represented along a linearly independent axis.

⁶ Premise: “The world’s condition has changed.” Principal proposition: “Economic theory has evolved in such a way as to prove Gebser’s contention concerning signs of emergent aperspectivity.” The premise is partially implicit in the proposition because changed conditions must prompt evolution in economic theory. The remainder of the proposition may also be suspected of pseudo-induction. One might argue that theoretical evolution could have taken several directions other than being supportive of Gebser. A “question-begging” criticism would claim that Gebserian convictions inspired the abstractions that linked themes and motives to the theories considered in the preparatory premise-proposition round, subtly eliminating non-Gebser-supportive alternatives to the principal proposition.

⁷ The 1752 publication of David Hume’s *price-specie flow* may provide an alternative date for the beginning of academic concern with global-scale economic self-organization.

General equilibrium analysis, founded by Walras and Marshall (both also important in the “marginal revolution”) is based on multi-dimensionality and preoccupation with time (“temporics”). As Gebser noted, such Gestalt-mathematical approach is an early sign of transcending time.

Rebellion against the legacy of exaggerated rationality was carried on by liberally-inspired 20th century Marxist economic philosophers, particularly in post-World War II France (e.g., Althusser) and in Germany (e.g., third generation Frankfurt School). From the contemporary realm, “Natural Resource and Environmental Economics” (in the mainstream), “Technocracy,” “Neo-Ricardism,” “Cybernetics,” and “Catastrophe Theory” (among heterodox schools and theories) may be counted.

RELATIVE INTENSITY: +

Post-1973

More intense cultivation of worldwide, global-unity-assuming issues in the mainstream; continued flourishing of “Technocracy,” “Neo-Ricardism,” and “Cybernetics;” new heterodox subfields and paradigms openly challenging conventional (“deficient”) economic rationality: The emergence of “World Systems Theory,” “Econophysics,” “Post-autistic Economics,” “Chaos,” and “Complexity Economics.”

RELATIVE INTENSITY: ++

CC2

Pre-1973

Political economy that overlapped with 19th century economics was conscious of time. Ricardo, Malthus, and J.S. Mill believed that diminishing returns to resources will exhaust the global economy’s growth potential. They were disequilibrium theoreticians. For very different reasons, Marx also belongs to this category. The classical tradition of political economy-style big picture analysis was carried on in the 20th century by latter day Marxists; by Keynes and Schumpeter.

In the early 20th century, interest in the long run shifted to the foreseeable future and mathematical formalism in general equilibrium analysis moved to center stage. This trend received quantum boost with the invention of dynamic optimization techniques and programming. In the heterodox vein, “Thermoeconomics” began to unmask the limited validity of equilibrium-tending, market-historical explanations.

RELATIVE INTENSITY: ++

Post-1973

As public consciousness began to discern environmental and resource problems, orthodox academe had to defend the position according to which material obstacles to endless economic growth do not exist.

Long-run disequilibrium as a concern reappeared. Dynamic analysis penetrated formal equilibrium analysis (i.e., development of dynamic “Computable General Equilibrium” models); comparative statics was replaced by endogenous models on the cutting edge; dynamic econometrics, nonlinear mathematical concepts, and intertemporal analysis earned their places in the toolbox of economics graduates.

Hysteresis (“time path dependence”) became an acceptable reference in general economics. It was applied to a variety of phenomena in which after an external shock, the variable may fail to return to its original value. Since hysteresis implies that the return path does not trace the forward path, it injects the possibility of a structural break in the economic system’s smooth equilibration, a possibility that mainstream denies with *déjà vu* arguments, i.e., using “history as the guide.”

Bioeconomics, Ecological Economics, Evolutionary Economics, Econophysics, and Green Economics claimed citizenship in scholarly discourse.

RELATIVE INTENSITY: ++

CC3

Pre-1973

Between the turn of the century and the end of World War II, fulfillment of this criterion was marked by a slow working down of negative notions about social safety nets, socioeconomic inequality, the status of colonies, and women’s education and employment.

The postwar era brought gradual acceleration in all four areas. Mainstream’s self-identification with “neoclassical synthesis” implies by itself the acceptance of public responsibility for individual welfare. Legal-political transformation in race relations began. Economic theorizing and research adjusted to the reality of former colonies and colonialists discussing issues and, on occasion, voting against one another at the United Nations.

Dependency Theory and Structuralist Economics challenged both the dominance of former colonial powers and dogmatic reliance on market mechanisms in fostering development. The examination of economic problems from a “feminist perspective” gained gradual recognition in the early 1970s.

RELATIVE INTENSITY: ++

Post-1973

Social protection in theorizing suffered major setbacks as the rise of extreme, market-dictated rationality swept across the profession. The historical process of socioeconomic equalization was interrupted, and by some measures, reversed. Policy recommendations

and Panglossian justifications coming from leading academic departments must share responsibility for this 30-year phenomenon.

The appearance of Feminist Economics and Ecofeminism; recent developments in the world economy that have largely discredited anti-government thinking and rhetoric among rank and file professionals, as well as new signs that the current sociopolitical situation is gravid with renewed focus on communities and solidarity among individuals could not compensate for this setback to an extent that would have retained fulfillment at the pre-1973 level of intensity.

RELATIVE INTENSITY: +

Summary Table

Composite Criterion	pre-1973	post-1973
CC1	+	++
CC2	++	++
CC3	++	+

Concluding remarks

Gebser's contention that signs of a perspectival consciousness emerged and intensified during the 20th century has been confirmed in the field of economics.

Based on adjusted and telescoped Gebserian criteria, we may assert that although this process has not been even; i.e., it shifted over time among strands of endeavors as captured by the three composite criteria, its overall strength has remained intact and may indeed have been even on the aggregate.

Nevertheless, economics, as it is taught and practiced today, remains a significant contributor to the preservation of mental-rational consciousness with its associated institutions, ethics, behavior, and historical narratives. "Maintained Theory," open and liberal as it may appear, fails to incorporate ecological (resource and environmental) issues into its analysis, discourse, and public commentary. Although integral attentiveness as represented by heterodox critique is growing, it still has not passed beyond marginal significance.

The future role of economics, whether as a catalyst or an obstacle of the contemplated macro-mutation, is open. But as over-driven rationalism becomes palpably unfit to accommodate humanity's quest for survival, the words of Gebser give both advice and encouragement:

"Not always is it possible to change a given mentality [or psychic disposition], but it is possible to oppose it with a stronger one, against which it [the entrenched one] will become increasingly helpless since the opposing mentality is more powerful and freer" (Gebser, 1975, p. 316).

APPENDIX

- (1) *The whole*: Originary givenness spiritually *awared*.
- (2) *Integrity*: Harmonious coexistence among all structures in the lived experience of integral consciousness.
- (3) *Transparency*: Based on the thermodynamic worldview, the individual sees, senses, and feels the unity of past, present, and future. Such a *synairetic* way of “understanding” becomes the permanent backdrop in dealing with all problems of human life.
- (4) *The spiritual*: Excessively ambitious calculative deficiency withdraws in the face of originary presence. The intellect is no longer dominated by a compulsion to squeeze the world into categories; quantifying, tabulating, and formalizing every aspect of it. Primal trust overcomes primal fear.
- (5) *Supersession of the ego*: Reduction of egoity -- *Ichhaftigkeit*. (Feuerstein describes the outward manifestations of integral consciousness. See, *Feuerstein, 1987*, p. 170).
- (6) *Realization of timelessness*: Connection between archaic-magic preconceptual and integral postconceptual “being-without-time.”
- (7) *Realization of temporicity*: Recognition of mythical elements (e.g., cyclicity and destiny) in the structure of consciousness.
- (8) *Realization of the concept of time*: While becoming the integrating factor of all dimensions, time itself disappears (becomes *amension*) both as an absolute scientific/philosophical concept and as the Molach of daily life.
- (9) *Realization of time-freedom*: The integrative vantage point renders individual, community, and cosmic existence transparent.
- (10) *Disruption of the merely systematic*: Freedom from mental-rationally perceived causality, liberation of creativity.
- (11) *Incursion of dynamics*: Conscious appreciation that ceaseless animation is a fundamental aspect of all forms of existence, including human thought.
- (12) *Recognition of energy*: The science of thermodynamics absorbs and reinterprets conceptualizations and characterizations of time.
- (13) *Mastery of movement*: Transformation of consciousness begins to take an outward shape.
- (14) *Fourth dimension*: Conscious absorption that Being is temporally dimensionless.

(15) *Supersession of patriarchy*: Movement toward *integrum* is catalyzed by the elimination of man/woman duality in the socioeconomic sphere; decline in the relevance of masculine symbolism in theological metanarratives.

(16) *Renunciation of dominance and power*: Discovery that imbalances in personal and social relations are ultimately futile, collectively harmful, and consequently, untenable in the long run.

(17) *Acquisition of intensity*: The *presentation* of “Itself” (*Sich*) as internal transcendence in opposition to the mere expansion of consciousness. (This theme is too abstractly related to economic theory to make a plausible connection.)

(18) *Clarity (instead of mere wakefulness)*: Recognition through a “*static act*” that the outer-related (exhaling) mental-rational world of wakefulness, buffeted by previously dominant structures, is insufficient to achieve true freedom.

(19) *Transformation of the creative inceptual basis*: History is no longer viewed as a path of some linearly imaged progress; the future as an unlimited design of human volition.

BIBLIOGRAPHY⁸

Combs, A., Radiance of Being: Complexity, Chaos, and the Evolution of Consciousness, Paragon House, St. Paul, MN, 1996.

Daly, H. and Farley, J., Ecological Economics, Principles and Applications, Pearson and Longman, Delhi, India, 2004.

Dopfer, K. (ed.), The Evolutionary Foundation of Economics, Cambridge University Press, Cambridge, UK, 2005.

Feuerstein, G., Structures of Consciousness, The Genius of Jean Gebser -- An Introduction and Critique, Integral Publishing, Lower Lake, CA, 1987.

Feuerstein, G., The Essence of Yoga, Grove Press, New York, NY, 1974.

Gebser, J., The Ever-Present Origin, Ohio University Press, Athens, OH, 1984.

Gebser, J., Transformation of the West, Novalis Verlag AG, Schaffhausen, Switzerland, 1975 (in German).

Jing Chen, The Physical Foundation of Economics, World Scientific Publishing Co., Pte. Ltd., Singapore, 2005.

Kuhn, T.S., The Structure of Scientific Revolutions, University of Chicago Press, Chicago, IL, 1962.

Lakatos, I., The Methodology of Scientific Research Programmes: Philosophical Papers, Volume 1. Cambridge: Cambridge University Press, 1980.

Pogany, P., Rethinking the World, Shenandoah Valley Research Press/iUniverse, Lincoln, NE, 2006.

Polanyi, K., The Great Transformation, Beacon Press, Beacon Hill, Boston MA, 1957.

Popper, K.R., The Logic of Scientific Discovery, Basic Books, Inc., New York, NY, 1959.

⁸ Print