

2 Quantum Energetic Evolution

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Abstract

This brief piece of research introduces into the thought the model of quantum energetic evolution; the basic physics of human socio-economic systems is shown as energy transduction mechanism. The historical transition and technical evolution from a land-based natural economy to a money-based human social economy did not alter the natural laws that govern social production and distribution, i.e. the physical energy efficiency of a socio-economic system has to point to minimal entropy for natural reasons of temporal survival. All human economic life is only an inter-temporal niche in the thermodynamic evolution of eco-energetic behavior. A geonomic systems approach is proposed to develop human economic activity towards global long-term sustainability.

Keywords: *money, energy, calculation, entropy, geo-economics, thermodynamics, evolution, time.*

Introduction. Basic Thoughts

It is well known that there took and still take place great debates about the contra-polarity of scientific theories, for example, the temporal order of global (planetary) evolution vs. the eternal order of universal (cosmological) thermodynamics. Sometimes, such arguments become very personal and insulting as we can learn from the history of science and technology, but these often passionate disputes among scientists do not only reveal the competition about career and status, they do inform us about the deeper quest for meaning or meaninglessness of human life and strive. The more precise, exact and consistent a theory is constructed and presented, the more it is confined to a single, isolated and microscopic aspect of research into 'reality'; of course, as perceived by human beings via the scientific method in a circulatory, repetitive and recitative manner, at worst by rigid regurgitation of 'details and facts', at best as an open investigation (free scientific inquiry) without doctrinal inquisition. The origin and nature of scientific knowledge is hierarchic, and we have to digest the whole body of existent information, before we can start our own research as a reliable communicative process of ideas, methods, observations and results. In nature and real life, we cannot have opposing conditions at the same moment

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as, for example, eternal thermodynamics and temporal evolution. Consequently, great minds in religion, philosophy, science and technology always tried to reconcile or harmonize the divergent data of natural chaos and human order, for example, the development of quantum theory serves also this purpose to resolve cognitive dissonances which result from hidden inconsistencies of scientific discovery. Being human (and humanistic) actually means to bear this existential tension of being 'placed' in this material world, with all the pain, suffering and torments that 'the act of inhaling air to stay alive' implicates for us as 'creatures and/or higher chemical reactions' of planetary substances. Consequently, science ought to be connected to life; economic science is, therefore, about making a living for individuals, groups and societies; the individual level of private wealth management is very well advanced and there exists also a substantial body of knowledge for economic group survival, but the societal level is very badly researched. According most probably to human nature and physical existence, the territorial economics of self-interest is better advanced than the inter-territorial economics of mutual altruism. It also does not help to point to the lack of economic calculation methods, because they reflect simply the 'economic state of the art'.

The Quantum of the Human Economy

The quantum of the human economy is energy; this basic economic unit is quantifiable and it easily documents that all human societies are energy transduction systems. If there is any evolutionary selection mechanism or procedure for human economic activity, in historical and empirical terms, then it is the systemic process to reach dynamic energy efficiency which results in minimal/minimized entropy of a living system, *i.e.* of the human economy. This adaptation and learning process, concerning the laws of nature, characterizes human economic development in the civilizations (Elias 2000) or technical cultures (Goudsblom and Vries 2002) of the last 5000 years, since Sumeria. While matter tends to maximal entropy, the survival tendency or vital niche of living systems is to exercise minimal entropy of their bodies in motion and exchange (principle of least effort); this physical fact applies also to the body economic of humanity. Any given human social economy (which is today globally inter-connected for production and exchange via monetary tools) is not just a perpetual motion and accounting sheet for households, firms and the state, but an energy driven enterprise to convert natural resources (land) via human resources (labor) into technical resources (capital); it is reasonable to apply a long-term strategy for global dynamic efficiency and not to repeat endless battles of ideological interpretations (narratives) of 'reality'. While the ancient Sumerian economy had clear-cut natural ratios for monetary exchange (silver/barley), the modern market economy is lacking such a physical ratio (*e.g.*, fiat credit money/energy quanta); this physical deficit (Soddy 1926) is not

only unhealthy for the human social economy, it also threatens our sanity in physiological and mental terms. Such cognitive shift to reconnect the ‘calculative’ paper economy to the ‘real’ physical economy is not a scientific act of awareness; it is a matter of applying a reasonable rationality and morality for global human survival, life and vital refinement. If we do not close the money/energy gap in the eco-energetic circuit, we will definitely fall into the trap of thermo-economic regression or total geo-economic collapse, *i.e.* thermodynamic catapult effect (‘negative time-machine’).

Waves, Cycles, and Spirality

Waves are translated mathematically into cycles, and cycles are translated (in probabilistic terms) into progressive, stagnate or regressive spiral motion, *i.e.* the sustainable speed of economic motion and evolution is driven by dynamic energy efficiency (Ternyik 2013). However, we can observe, for 5,000 years, the tragic phenomenon of the Sisyphean economy which shows up in human progress and poverty. The root cause of this repetitive fall backs in the economic production circle is the re-occurrence of the ‘disease’ of economic rent, the ‘robber’ mechanism that captures a large portion of productive advancement for nothing or performance in return. The rentier mechanism works on the territorial principle of the land value monopoly (physical assets as location of real estate and natural resources of production) and its modern arm is the money monopoly of private commercial banks that can issue fiat credit money (virtual liquidity) ‘out of thin air; these two decisive monopolies (2) or dual economic system of privileges (‘rentier elite’) is able to switch assets into liquidity (and vice versa). Today, this gambling with nature as banking collateral is reinforced and speeded up by the media information monopoly (3) of the new cyber landlords. Meanwhile, the tax monopoly (4) of the state extracts value from labor and entrepreneurship, saving the rentier elite from economic hardships/fluctuations (ground rentiers, state securities holders, officials, pensioners) and the loss of overall productivity is the outcome of this ‘monopoly game’. Economic growth and distributive justice can be achieved by taxing primarily economic rent, making it public revenue and paying even out a citizen's dividend when the eco-energetic circuit is directed towards upward spirality. All of us will be living better, we will achieve an earth sharing economy without sacrificing legitimate private wealth, individual liberty and societal freedom; a cognitive tendency towards a more natural geo-economic order is the moral and rational imperative of our time. Knowledge (predictability) and wisdom (outcome) together can achieve this geo-economic goal that the earth and the fruits of the earth belong to all humanity; however, the geonomic system of production and exchange will not be a paradise for the lazy, but a fruitful garden of human creative laborers/entrepreneurs who know how to work and enjoy life. Optimal resource allocation efficiency towards economic democracy is not

a distant dream, but can be achieved via legal economic reforms within one working generation of 35 years, if the chosen direction (geonomics) is applied via prudent economic calculation models. We owe this wise decision towards a global economic (ecological) Marshall program to the young people on this planet, to make them heed in their future. No freedom can be won without solidarity, citing the old slogan of Solidarnosc, the Polish opposition movement against communism in the 1980s.

A Natural Science of Human Society

Hermeneutic interpretation or the laboratory experiment does surely have methodical relevance in social science, but applied empirical research must be methodically based on the observation of real events. For example, the overall distribution of literacy in a population is a decisive cultural tool and the territorial colonization of any people in history was only successful, if the majority of inhabitants had low literacy and technical skills, in Gaussian distributive manner, but these human skills must not necessarily be derived from the knowledge to master holy texts. A natural science of human societies must, therefore, be fully liberated from religious-mystical proto-science of 'Judeo-chrislam' or similar subconscious influence on researching into the origin and nature of humanity, *i.e.* there must be a clear distinction between the individual faiths of scientists (*e.g.*, atheism) and the actual research activity (*i.e.* freedom of thought). The project of science (and subsequently technology) as historically higher developed human thought than traditional religion and classical philosophy can only reach its full empirical potential, if cognitive consciousness and awareness prevail over orthodox dogmas. There are too many non-conscious and sub-conscious superstitions about the human being in circulation, but the research into the origin and nature of humanity is in fact all that we can gain in scientific terms. Anthropology is the most scientific among the humanities and the most humanistic among the sciences; let it be so, without canceling the creative belief in an eternal upper force or imposing this belief on others. No written, oral or legal tradition in humanity knows all the secrets of life, and no human wisdom can claim to work on this earth in super-natural terms. This is especially true for the social science discipline of economics where we deal actually with the accounting of living chances, *i.e.* every plus has to be accounted on the other side as a minus, and this is the way how our physical universe works and the material universe is a perfect accounting system. It would be simply unfair to claim anything else, but no good deed remains unpunished as the dynamic balance of legitimate moral self-interest and rational altruism is still not researched profoundly through the scientific method. Until now, one can only observe a Sisyphian economic circle that is driven in any given system by growing economic rent-seeking which curbs human productivity in the end; reaching dynamic efficiency, in global economic terms, is one of the most

challenging tasks of contemporary humanity despite all techno-cyclical innovation that is regularly coupled with high debt and poverty levels, but ‘somebody’ has to pay for the ‘excessive waves of progress’. However, this is not an inescapable human fate or natural law; it can be circumvented by submitting to the laws of nature via human ingenuity, *i.e.* aiming at minimal entropy of the living body economic.

Quantum Energetic Evolution

Schumpeterian innovation (‘creative destruction’), Kondratieff waves or Austrian business cycles do factually describe certain levels and momenta of spiral motion and development in human economic activity, according to quantum energetic evolution, *i.e.* identifying a thermodynamic gap of minimizing systems entropy, in terms of tech-know-logical energy efficiency, for example as the Snooks/Panov algorithm formalizes it as 1/3 historical gain (empirical leap) in technical efficiency. However, it is decisive or vital to develop a deeper understanding of the workings of the living body economic as quantum unit: money/quantifies/energy; energy/quantifies/time; time/quantifies/production. The neo-classical formula of: $P = R + W + I$ (P = production; R = rent; W = wages; I = interest) is based on a false understanding of the economic production circuit, in cybernetic terms; the geo-economic (geonomic) formula of: $P - R = W + I$ better captures the real workings in the living body economic, in terms of assets, liquidity and productivity. The length (l) of an economic wave is determined by its frequency (f), the monetary volume (x) and the reserve requirement (r) which formalizes into the calculative relationship of: $l = f(x/r)$; the production (p) functions in time (t), with the multiplying elements of the monetary volume (x) and energy (e) which formalizes into: $p = t(x/e)$. A fiat economy cannot actually run out of money; always and everywhere on this globe, there is work to be done and there are enough people who want to do the work; what is factually stopping people from doing the work they want to do and that must be done in any way? It is money. Who controls the money supply? It is private commercial banks who can issue credit money ‘out of thin air’. Why should these types of banks decide where the money should be used for? Money should be available in a sufficient quantity to meet the productive capacity of the people; otherwise, economic growth slows, innovation is inhibited and distributive injustice is the result. The so-called great depression will become the greatest depression, if the lessons of economic history are not studied to avoid greater economic pains. It is always said that the rentier function is an essential mechanism in a credit (interest)-based monetary system; if this is true and if we want to avoid greater social conflict, revolution and/or war, then the simplest economic method to restore the cybernetic feedback circle of production and distribution is to tax primarily economic rent as public revenue, *i.e.* to tax the extraction of value from the economic circuit for nothing or perfor-

mance in return. This would be the straight road to a just third way and not the road to money-based neo-feudalism in a capital-based economy.

The Arc of Economic Democracy

Participatory economy, decentralized market socialism and economic democracy are now a tech-know-logical option in a geo-economic system of production and distribution; geonomics is a calculable way of earth sharing (land value of natural resources and real estate locations) and a sharing economy, with the additional option of paying out a citizen's dividend as basic economic income. The financially commanded rentier capitalism which serves only the monopolistic demands of a global rentier elite has *no* workable economic future; an optimal allocation of locations and resources for capital formation is simply not possible under such centralized monetary rule of landlords. The original role of capitalism, *i.e.* to produce more capital from capital (via labor and land) to break free from the ancient and feudal limitations of land and labor, is set out of empirical function. Financial instability is exactly caused by this excessive static wealth concentration of real estate and natural resources in the hands of a small oligarchy that extracts value from the dynamic economic circuit for nothing or performance in return. This Sisyphean circle (the quantitative point when economic rent outperforms growth) can only be ended by taxing primarily economic rent, making it public revenue and stabilizing the economic circulation of values; the great economic calculation paradox can be solved by geonomic thought. The physical universe is a perfect accounting system and maintaining economic life is always about searching/finding a state of minimal systems entropy; this thermodynamic or geo-economic gap opens basically through systems energy efficiency. The current economic trend reinforces the physical tendency towards maximizing entropy (temporal acceleration of energy consumption, measured in quanta) which will become a vital matter of survivalist rationality and morality, *i.e.* mutual economic guarantees of humane existence via a sharing and eco-energetic economy. The way from ideological utopias to a natural science of human society is a painful expedition, but the destructive nature of human territorial behavior cannot be tamed by any other method and the universal road towards human emancipatory liberty always leads against serfdom. This does mean, in metaphoric terms, that the slave has to be emancipated from the master (and vice versa); this implies that both have to learn about the laws of nature and its sustainable economic application. Consequently, more economic growth and distributive justice are compatible under the rational and ethical imperative of geo-economic rule as legal code. The economic path of thermodynamic evolution of the body of humanity on this globe can, in civilizational and recorded terms of long-term strategy (since Sumeria), be traced back to the Code of Ur-Nammu, the ancient Israelite ecology (Bible, Leviticus: ch. 25) and 'modern thinkers' like B. Spinoza (1677),

D. Ricardo (1821 [2005]) and H. George (1879) who warned explicitly against the economic mechanical orbit of dead objects in human production and exchange; every economic steady state is a dynamic (short-term) temporal stage that must be understood via long-term strategic thinking.

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Supplementary Notes

Final Observation: A Synoptic Review of Almanacs ‘Evolution’ (with Explicit Reference to Quantum Energetic Evolution as Explanation Model of Human History)

As an attentive reader of all Almanacs ‘Evolution’ published in 2011, 2013, and 2015, it is the original intention of the author to connect the natural, social and cultural history (of humankind) as a cosmological and temporal unity, with an evolutionary pathway/gateway model of human problem-solving processes in mind. In this thermodynamic or energetic model, thermo-economic, geo-economic and process-sociological (behavioral) micro-evolutionary leaps/steps play a vital role for survival, *i.e.* the dynamic interplay of short-term (‘sudden’) and long-term (‘trends’) processes does decide about systemic survival, life and life quality. Social systems' evolution is about broadening the thermodynamic gap for mutual human life on this planet or narrowing this gap down towards ‘cutting throat/predator-prey’ selection procedures of killing and annihilation via great social conflict, revolution, war and genocide. Our current socio-ecological problem situation is to balance legitimate economic self-interest (private property) and economic altruism (public welfare/common ground) in

a globalized and monetized world. The attached links¹ (in the footnote and in this text) shall introduce the prospective reader into these research topics which are of great importance for the social future of the human economy where private and public interest shall be harmonized via a geo-economic model of earth sharing, strictly following the scientific method and not ideological utopias which do stem from wishful thinking, wish lists and omnipotence theories.

The synoptic review result and the selection of research articles, concerning the social thermodynamics (energetics) of human economic evolution, followed the below created list of Almanacs, authors and articles.

Evolution Almanac 1 (EA1): Grinin L. E., Carneiro R. L., Korotayev A. V., and Spier F. (Eds.) 2011. *Evolution: Cosmic, Biological, and Social*. Volgograd: 'Uchitel' Publishing House.

Snooks G. 2011. Constructing a General Theory of Life: The Dynamics of Human and Non-Human Systems. *Evolution: Cosmic, Biological, and Social* / Ed. by L. E. Grinin, R. L. Carneiro, A. V. Korotayev, and F. Spier, pp. 84–100. Volgograd: 'Uchitel' Publishing House.

Spier F. 2011. How Big History Works: Energy Flows and the Rise and Demise of Complexity. *Evolution: Cosmic, Biological, and Social* / Ed. by L. E. Grinin, R. L. Carneiro, A. V. Korotayev, and F. Spier, pp. 30–65. Volgograd: 'Uchitel' Publishing House.

Evolution Almanac 2 (EA2): Grinin L. E., Korotayev A. V., and Rodrigue B. H. (Eds.) 2011. *Evolution: A Big History Perspective*. Volgograd: 'Uchitel' Publishing House.

Chaisson E. 2011. Cosmic Evolution: More than Big History by Another Name. *Evolution: A Big History Perspective* / Ed. by L. E. Grinin, A. V. Korotayev, and B. H. Rodrigue, pp. 37–48. Volgograd: 'Uchitel' Publishing House.

Evolution Almanac 3 (EA3): Grinin L. E., and Korotayev A. V. (Eds.) 2013. *Evolution: Development within Big History, Evolutionary and World-System Paradigms*. Volgograd: 'Uchitel' Publishing House.

LePoire D. 2013. Potential Economic and Energy Indicators of Inflections in Complexity. *Evolution: Development within Big History, Evolutionary and World-System Paradigms*. Yearbook / Ed. by L. E. Grinin and A. V. Korotayev, pp. 108–118. Volgograd: 'Uchitel' Publishing House.

Thompson W. 2013. Energy, Kondratieff Waves, Lead Economies, and their Evolutionary Implications. *Evolution: Development within Big History, Evolutionary and World-System Paradigms*. Yearbook / Ed. by L. E. Grinin and A. V. Korotayev, pp. 84–107. Volgograd: 'Uchitel' Publishing House.

¹ URL: <http://www.nonmon.esy.es/>

URL: <https://biblio.repec.org/entry/bbb.html>

URL: www.norberteliasfoundation.nl

URL: <http://www.urbantoolsconsult.org>

URL: <http://www.eoht.info/page/Chemistry+professor+paradox>

- Evolution Almanac 4 (EA4): Grinin L. E., and Korotayev A. V. (Eds.) 2015.** *Evolution: From Big Bang to Nanorobots*. Volgograd: 'Uchitel' Publishing House.
- Baker D. 2015.** Collective Learning as a Key Concept in Big History. *Evolution: From Big Bang to Nanorobots*. Yearbook / Ed. by L. E. Grinin and A. V. Korotayev, pp. 81–100. Volgograd: 'Uchitel' Publishing House.
- Grinin L. 2015.** Cosmic Evolution and Universal Evolutionary Principles. *Evolution: From Big Bang to Nanorobots*. Yearbook / Ed. by L. E. Grinin and A. V. Korotayev, pp. 20–45. Volgograd: 'Uchitel' Publishing House.

All these research articles are in close intellectual and scientific range to quantum energetic evolution as related to the geonomic (cosmic) model of the human societal economy, because they focus on the dynamic interplay of energy, matter and mass in social motion by human actors as individuals, groups, societies and globalized networks of mental and material exchange. Spier (2011) elaborates on energy flows and complexity emergence. Snooks (2011) highlights strategic energetic exchange as selection procedure. Chaisson (2011) clarifies the physical connection of cosmic and energy processes as applied to human society. Thompson (2013) points to global leadership patterns and new energy sources. LePoire (2013) examines the crossroads of inflection and energy pathways. Grinin (2015) touches upon delicate scientific questions of energetic borderlines in the life-death cyclicity on this planet. Baker (2013) investigates the dual role of human societal learning and consumption of energy rates. These are decisive pieces of a puzzle which will lead us to the greater picture, concerning the strategic momentum of societal energy applications in human history.

The Chaisson index closely connects to the social energetics (thermodynamics) of human evolution. It counts on mass density, measurable units of energy per time and mass, respectively the amount of energy available per unit of mass (Chaisson 2001), *i.e.* social complexity is about increasing energy efficiency. This energy concept is related closely to the ERoEI², a key measure of energy applications and the economic wealth (health) of nations. However, quantum energetic evolution goes much further and examines the role of economic rent, *i.e.* the cyclical (Sisyphian) fact that the increased surplus value of accumulated capital stocks disappears into economic rent, the ground-rent being the mother of all rents (monopolies or privileges=unearned income from natural resources or locations/declared private property/via legal codification). Geonomics³ is exactly about this 'cash flow' (or physically energy absorption) into a few pockets. The operationalization of this economic value capture (rent extraction) via formula, equations and calculations falls into the intersection of biophysical and evolutionary economics, *i.e.* human societies evolved in thermodynamic gaps and it is vital to understand the origin and nature of such eco-

² URL: https://en.wikipedia.org/wiki/Energy_returned_on_energy_invested.

³ URL: www.collinsdictionary.com/dictionary/english/geonomics.

logical niches that make extended human life on this planet possible. Consequently, geo-energetic thought is about the complexity of natural, social and cultural forces (patterns) on the Earth, which made and still make human communities survivors in an actually hostile physical setting as far as social systemic energy transduction is concerned as operation principle. However, the already existing measurement indexes have to be connected to the physical or natural working body of the modern monetary production economy, *i.e.* at this technological stage of monetary tools and supply, money has become the access to energy (natural resources/land) and it emerged into the ‘omnipotent function that all human needs are being satisfied’ with money. The scientific clarification of this money/energy interplay is long overdue.

The author agrees to the decisive observation of M. Tugan-Baranovsky and N. Kondratieff that capitalism *is not* a natural system and that it can, therefore, not die a natural death (Kondratieff 2014: 405; 396–407). It is a systemic human invention and its rapidly increasing negative impacts (fast progress *vs.* rising poverty, private and public debt, alienation of the human psyche, physical contamination of natural life resources) can only be overcome by advancing societal (socio-technological) ingenuity and creative management, concerning the natural (physical) boundaries of human economic activity. The market is a much older human invention (institution) and the inevitable question of a social market and free economy without capitalism arises. Natural resources (land) are converted via human resources (labor) into technical resources (capital/as product of accumulated labor-time). All this can only be done by applying energy and today all these human economic activities are measured in monetary units. It will be impossible to move a growing mass of 7 billion people back into a natural (land-based) economy, it is only possible to advance the monetary (capital-based) economy, for example via a geonomic model (as a just third way/JTW). The natural selection pressure to find a workable solution for this existential problem is also increasing rapidly and worldwide observable, in terms of ecological (environmental), economic and psycho-mental crisis, but a successful evolution procedure (concerning the optimal interplay of money, conjuncture and energy) needs to creatively combine physical and spiritual forces as Nikolai D. Kondratieff elaborated: ‘The power of a nation in various spheres of life is determined not only by far and even not so much by its physical forces, but considerably by its spiritual forces’ (Kondratieff 2014: 406).

Appendix

For didactic purposes the author created the following learning resource which is playable in different motions: URL: https://www.goconqr.com/en/p/2124645-energy-mind_maps.