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## World System Energetics

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### Abstract

*Human societies are evolving as energy transduction systems and the biophysical flow of energy in a socio-economic system quantizes the flow of time and drives temporal acceleration. The decisive role of money in a monetary production economy is highlighted as temporal access to energy. The greater the natural energy input for productive output, the higher the economic wave frequency and the shorter the wave length. A singularization of human history, that is a replacement of long wave patterns, in the nearer future depends on the technical achievement of a relatively constant energy input. According to the basic formulae of the Snooks–Panov curve, a significant quantum change of the temporal flow will take place in the next decade; it is an open mathematical guess and an ongoing human intelligence test, if this temporal turning point is of discrete or continuous nature.*

**Keywords:** transduction, energy, time, money, Snooks–Panov curve, acceleration, singularity, global intelligence.

Waves can be understood as travelling energy and matter as geometry of curved space-time. Force equals geometry and the structure of matter equals different wave's types. An increase in whatever size is proportional to size itself and the speed of evolutionary waves in human civilization is directly proportional to the number of its inhabitants, that is a systemic process of self-similar evolution. This is a stochastic process with time dependency where the statistical coupling of equal parameters/values is either rapid (short-range) or slow (long-range) in performance curves (e.g., of human production and learning); however, economic life or being is an existential conflict that consumes energy and increases entropy and it takes energy to convert energy from one form to another, always with a loss of some energy by friction.

**The more energy (e) in a wave, the higher its frequency (f); the wavelength (l) is inversely always proportional to f (we can actually interconvert e, f and l).** It follows that shorter wavelengths are more energetic than long wave lengths, increasing energy input leads to higher wave frequencies and shorter wave lengths, that is principle of cyclical causality, most probably in spiral form as applied evolutionary to human history. Measuring the empirical acceleration of observable human history (equal to about 50,000 solar years,

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eventually starting with 1 million people) tells us that every new great techno-economic wave took only about one third of former evolution temporary intervals, expressed as logarithmic scale formula (Snooks–Panov curve); from this evolutionary algorithm follows that the duration of future technological shifts will become exponentially smaller and that techno-economic evolution could become a continuous process, rather than the discrete time-lapsed cyclical waves of past experiences, leading to a singular techno-global civilization until 2050, with 9 billion people and the quantum of potentially more inventors or entrepreneurs.

World energy consumption per capita has almost doubled from 40 to 80 gigajoules (1960–2010), according to the numerical canon of all statistical data charts (*e.g.*, BP); this not only reflects the corresponding symmetric population dynamics, but points to our argument that every human civilization can be observed primarily as an energy transduction system and that predictive models can be based on this technical fundament. It is, for example, important to note that even U.S. non-governmental debt (divided by GDP, *e.g.*, FED data) tripled in this temporal period which methodically recalls the financial misuse of bank credit money to stimulate ‘the economy’ via fiat debt and interest ‘creation’; in any case, this monetarist technique is no more sustainable and monetary policy will have to become more congruent with energy economics. In addition, new technologies have to be consequently applied to as ‘time saving technics’, according to the life maintaining principle of syntropy. Unfortunately, we found not one data extrapolation of the world energy consumption that modeled any stoppage of the increasing energetic demand, concerning the temporary interval of the time-space from 2000 to 2050.

The 6<sup>th</sup> Kondratieff (of eco-energetics, biotech, health science, propelled by advanced AI, new energy technology and quantum monetary economics) that started in 2000/2001 could convert in the time-space from 2018 to 2050 into technological singularity (like envisioned by J. Neumann and visualized by Snooks and Panov), *if* world energy consumption can be kept relatively constant by sustainable global economics science (if  $e$  will be constant /  $f$  and  $I$  will behave accordingly / in *reciprocal conversion*). It goes without saying that any future monetary system has to implement this factual formula via narrow reserve banking, that is applying a more ‘boring’ financial system; it is unwise to finance artificial living standards via credit money as placebo and ultimately palliative effect, because money is *physically* access to energy. In any case, not the speed of any reform is decisive, but its direction; this is basically a radical rational challenge for the human mind to expand intelligence beyond traditional methods of cognitive thought (different levels of time and causality). For example, mathematical logic is consciously not directed at temporal levels, but any causal formulation of the bio-physical universe in classical or quantum theoretical terms is actually operated in temporal sequences. A future extension

of the human cognitive horizon has to be methodically rationalized via causal, retro-causal and super-causal process learning that implies multiple time arrows or loops.

Our scientific inquiry deals actually with the last 5 minutes of a 24 hour day, that is about 50,000 years of human archeological evidence, with accelerating economic long wave spiral cycles of 5000, 500 and 50 years. It is not big history research, but human history in-depth. We methodically suspect that the quantity of energy input for productive output (conversion of natural energy for human needs) is a reliable measure for the scientific observation and prediction of human societal change along this temporal algorithm. However, we do not perceive this biophysical scaling of socio-economic systems as determinism or ‘randomism’, but as a human behavioral phenomenon of probabilistic adaptation and cognition. The dogmatic objection that there is no natural science of human society cannot be accepted from our side; it might be biographically true that the fate of an individual is not calculable, but *collective action* (e.g., *energy consumption, monetary payments*) is *countable mass motion* with biophysical consequences. As we are now in the last seconds of the 24 hour cosmic day, it is exiting to elaborate the methodical guess for future human direction of the beginning new day cycle, that is to research into the current quantum leap to a new level of science, in search of creative unity for humankind. However, we are aware that the demand for ideas and ideals is not equal to knowledge, but that which can be improved by knowledge, should be.

**The more natural energy a human economy transduces into social needs, the more accelerates the economic life of that social entity in temporal terms (the increasing conversion of energy quantities equals physically the temporal acceleration of economic wave frequency and length).** This seems to be the *basic hypothesis* of applied natural law for social science; the formal statement applies biophysically to global geometric time and local arithmetic time (*chronos* in Koine Greek), but is physically not valid for universal cosmic time: the temporal clock on this globe (closed world clock / *kairos* in Koine Greek) is not equal to the universal time flow (open cosmic clock); according to ancient Hebrew wisdom, human biological age follows the cosmic clock (*aeon* in Koine Greek). The energetics of (monetary) economics is decisive and especially in a monetary production economy, *money is access to energy* (inter-conversion of energy, time, money; the economic circuit reads: **energy/quantizes/time = time/quantizes/production = money/quantizes/energy**).

Human performance will never outperform these natural forces, but intelligence can cleverly adapt and expand the degrees of economic freedom, reaching higher rational levels of human action; this qualitative temporal interval between thought and deed can be called consciousness, with the human brain as time-processing organ, operating basically on changing levels of photonic energy. The techno-economic evolution of human civilization in fractal waves

from natural chaos to social harmony is a cosmological enigma that implies the existential question why human life emerged as growing organism on the surface of this limited globe (?); the purpose of the civilizing process is to defend human life from the brutish laws of Mother Nature via the survival strategy of dynamic efficient syntropy. The natural enemy of human life as individual and as collective is entropy and it is world time for economic science to learn this lecture from biophysical science. Consequently, all data quantifications of how and what of human evolution imply the qualitative rational challenge of data interpretation. The biophysical paradox that is rationally hidden in all these energy transductions is that death makes life possible; L. Fantappie and E. Schrödinger were synchronically the first scientists to point to this psycho-medical and philo-theological mystery of extreme future value for human problem-solving.

The economic production cycle is primarily not a perpetual motion of human firms, households, banks and the like (which is the canonical explanation of standard textbook liturgy and litany), but fundamentally an energy circuit of natural input and processed output, with the cyclical motion of energy, time, production and money (= access to energy). This biophysical viewpoint is not an ethical denial of human ingenuity or liberty; on the contrary, social psychology is an eminent analytical part of this methodical approach that fits mathematization and statistical data science. The methodical research into universal history via natural-law social science can measure the degrees of human freedom more exactly than any other systems forecasting strategy; monetary critique has to be an essential part of world system energetics, because a fiat monetary system intrinsically first tends to spend and then to earn (the only realistic brake for this financial mischief is technically narrow reserve banking). We have to remember that Economics is still not a science, but a profession that evolved from private and public accounting techniques for property, credit and interest; it is more than probable that book-keepers developed human script out of counting finite entities for stock formation and trading in the Sumerian city states where temples served as commercial centers. In any case, further mathematization of global system energetics (mathematical globalistics) will surely clarify the original and natural laws of energy waves in our human social economy and its role in the quantum time-space of future production circuits as discrete repetitive **or** continuous singular socio-natural events.

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