Published in: *Kondratieff Waves, Warfare and World Security* (T.C. Devezas, ed.),
Amsterdam: IOS Press, 2006, ISBN: 1-58603-588-6

Waves of socio-economic development – an evolutionary perspective

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Abstract. The main aim of that paper is to outline an alternative view on a wavelike development of human systems. The hypothesis is based on evolutionary interpretation of human knowledge development. There are some evidences that individual knowledge of each human being consists of paragons (understood as an ideal pattern of human behaviour) – of perception, cognition, behaviour, understanding, and so on. Paragons play a role analogous to genes in biology and determine, in some way, the behaviour of an individual in a well-defined life situations. On the basis of biological analogy a hierarchical structure of human knowledge (a so-called archetype) is partitioned into six levels (taxa), namely: (1) epigenetic paragons, (2) the image of the world, (3) the image of the society, (4) the image of the economic system, (5) the epistechne, and (6) the paradigm.

Fluctuations and cyclical behaviour are observed in majority of socioeconomic processes; the literature on this subject is enormous and has its own long tradition in history of civilisations, politics, economics, and other social sciences. In the beginning of the 20th century, economics J. Kitchin has identified short, roughly 3 years, inventory cycles; a few decades earlier Clément Juglar discovered 8-10 year business cycles; Simon Kuznetz in 1930s noticed 15-25 years length cycles and associated them with fluctuations in rates of population growth and immigration, but also with investment delays in building, construction, transport infrastructure, etc. In the beginning of the 20th century Nikolay Dmitriyevich Kondrateff has postulated an existence of so called Long Waves (K-waves) of 50-60 years longevity. The K-wave idea can be considered as a link between economics and political science. In the recent review of the world system evolution Tessaleno Devezas and George Modelski [1] distinguish, beside K-waves, the 120-year long cycle of global politics (known also as the rise and decline of world powers), 240-year cycle of democratization, 480-year cycle of opinion making, 960-year cycle of world economy.

Human knowledge – evolutionary interpretation

Evolution is the specific process of a search for better solutions (types, ideas) by means of trial and error. A special, and distinguishing, feature of this process is the existence of two mechanisms – the generation of new types (ideas) and the selection of types.

Knowledge is the basis for any human action and the evolution of ideas may be considered as the essence of human development. A great part of the knowledge of an individual consists of *paragons*[1] – of perception, cognition, behaviour, understanding, and

[1] I use the term *paragon* to underline the ideal type of patterns of behaviour. A paragon in this context means a pattern of excellence or perfection. There are some similarities of *paragons* to the well known concept of *memes*, proposed by Richard Dawkins.

so on. Paragons play a role analogous to genes in biology and determine the behaviour of an individual in some well-defined life situations. Examples of paragons are: ritual action (conditioned by genes or culture), systems of law, technological standards, statements and theorems of scientific theories, successive steps of algorithms applied in solving standard (normal) scientific and technical problems and everyday duties to be fulfilled during the working day. The set of paragons of an individual is called his *individuality*, in contrast to *personality* which, in our understanding, is the social image of the individual described in terms of his comportment, roles, and mettle.

Two main areas of an individual's subjective knowledge ought to be distinguished:

1. Paragons of individuality (the so-called *active* paragons), and *latent* (redundant) paragons which are stored by an individual but do not belong to the individuality, that is, these latent paragons do not affect personality, but at any time they may be incorporated into the set of paragons' individuality.
2. Knowledge of the environments in which an individual lives; this knowledge consists of facts, events, human activities and their evaluation, and so on. This area of knowledge enables an internal, subjective evaluation of others' personalities, as well as self-personality evaluation.

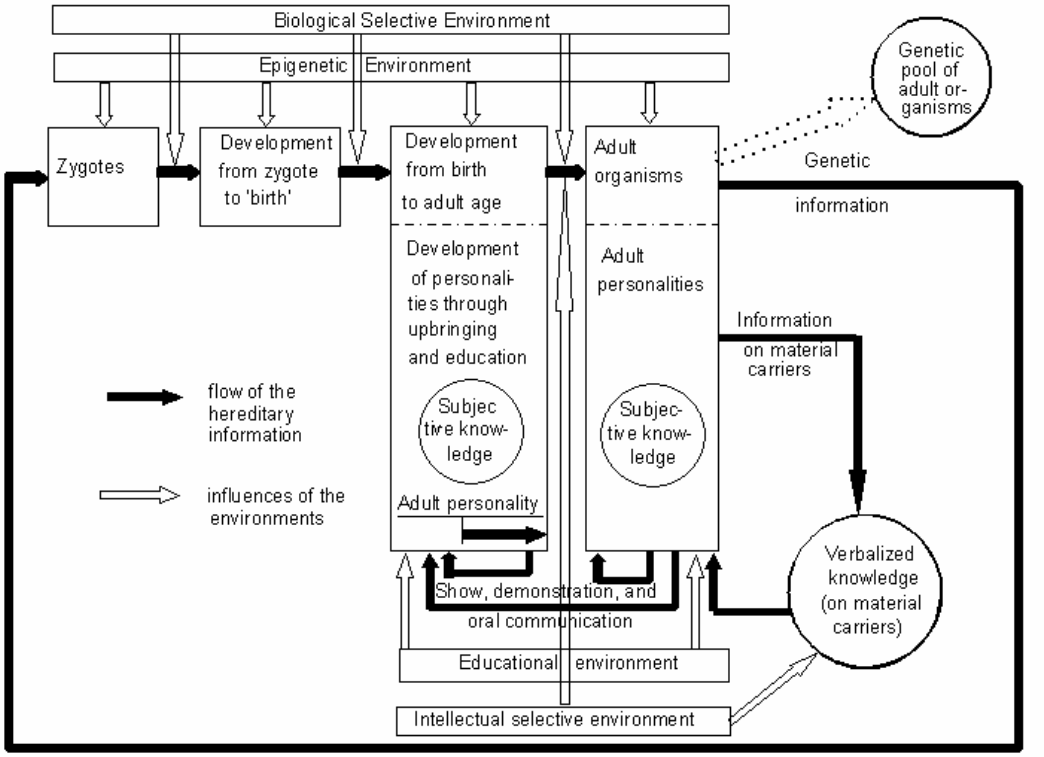

Figure 1. Knowledge development coupled with biological evolution

Most of the human paragons, either active or latent, are unconscious to each of us and exist in our minds in a nonverbal form. Michael Polanyi calls this kind of knowledge 'tacit', that is, knowledge which cannot be articulated. As Polanyi [3] writes: 'We know more than we can tell'. The quintessence of tacit knowledge is that it can be used almost freely by its holder (although in most cases unconsciously), but cannot be directly communicated to someone else. Individual skills, competence and talents are based mainly on tacit knowledge. Such organization of our knowledge is probably the outcome of the evolutionary forces (selective mechanisms) acting during the long phylogenic evolution of the human species. It is much more efficient for an individual to focus attention on a small part of individual activity and leave the other activities to unconscious processes.

The development of personal knowledge is strongly connected with the biological evolution of man. An essential role in knowledge development is played by extra-genetic transmission of paragons (cultural and social learning). From the biological point of view there exist two environments, namely epigenetic and selective. Human beings also live in a cultural environment and from the cultural and social points of view we may distinguish also two environments, namely the educational environment and the intellectual selective environment (Fig. 1). Personality is shaped by the educational environment on the basis of written knowledge as well as on the basis of verbal communication. A very important role in social and personal learning is played by tacit ways of paragon transmission such as show, instruction, training, demonstration, exemplification, and so on. The emergence of adult personality frequently occurs before the maturation of the biological adult organism – it is indicated by the shaded arrow at the bottom of the third stage of the different phases of development. Some paragons are transmitted through the social and personal education process on the basis of written knowledge. Contents of this written knowledge (the knowledge pool of the human species) are also affected by the intellectual selective environment – some pieces of information may be considered important and the carriers containing the written information are much less likely to be destroyed; some others are considered less important and carriers containing such information are frequently destroyed or disappear in the historical process.

Structure of the hereditary information

We can expect that there exist a hierarchical order of an individual's hereditary information, that is, a hierarchy of paragons. This hierarchy stems from: (1) the successive incorporation of some types of paragon during the development of individuality and personality, and (2) the consequences of the adaptation of a new paragon's shape to the cohesion of individuality; even a small variation in a high-ranking paragon implies a disintegration of individuality, and personality, followed by the reconstruction and adjustment of many correlated paragons.

It is said that an entity in which a small change of some of its details results in a drastic diminishing of the quality of work is a fine-tuned object. I postulate that individualities, as well as genotypes, are such fine-tuned objects. Paragons of individuality are divided into two categories: *archetype* and *adornment*. Archetype paragons remain unchanged during a relatively long period of personality development, while adornment paragons change frequently according to local and temporal changes in the environment in which an individual lives. The adornment paragons allow incremental adaptation of the personality to local, highly diversified, environments. Diversity of paragons may be used as a criterion for partitioning the paragons into these two categories. The smaller the diversity of the given category of paragons within a society, the higher the rank of a paragon is.

I suggest that there exist six taxa of archetype paragons, namely: (1) genetically determined paragons (epigenetic paragons), (2) the image of the world, (3) the image of the society, (4) the image of the economic system, (5) the *epistechne*, and (6) the paradigm. A more detailed description of the main categories of paragons of the above six taxa is presented in [2].

In my understanding, a long-range development of evolutionary processes (among them of knowledge development at personal and social levels) is cyclical with two phases in each cycle, namely, the *substitution phase* and the *quasi-equilibrium phase*. The transition from a quasi-equilibrium phase to the ensuing, substitution phase, is connected with a fulguration of a new and better archetype. The duration of the quasi-equilibrium phase is much longer than the duration of the substitution phase. In the quasi-equilibrium phase the evolutionary

system is in a near stasis state and individuals adjust to a varying environment through changes of adornment paragons.

The new archetype delimits the scope of possible changes in the adornment domain, that is, a new archetype demarcates in the adornment domain a new canalized pathway of change – a *chreod*, to use Waddington's terms:

> The stabilization of a progressive system acts to ensure that the system goes on altering in the same sort of way that it has been altering in the past. Whereas the process of keeping something at a stable, or stationary, value is called homeostasis, ensuring the continuation of a given type of change is called homeorhesis, a word which means preserving a flow. A phrase used to describe such systems, is to say that the pathway of change is canalized. For the pathway itself one can use the name chreod, a word derived from Greek, which means 'necessary path'. [6]

Probably a new form of higher taxon demarcates analogous chreods in all lower taxa of the archetype paragons. The personal development of man and the resulting social development of human societies are bounded by our biological constitution. The same may be said about all other taxa: the accepted worldview (the image of the world) delimits, more or less broadly, the spectrum of our acceptable views on forms of organized society, or ways of economic order; the accepted social view delimits the spectrum of acceptable economic orders, and so on, down to the lowest taxa of human knowledge (paradigm, and adornment).

It is not possible to describe each taxon in terms of its paragons, but we can point out some categories of paragons. The situation is similar to that in biology. Biologists describe each taxon by giving examples of organisms of a specific taxon and describe each taxon in terms of phenotypes (morphological traits) of the organism.

Probably there is no possibility to make a formal proof of the existence of proposed taxa but it is possible to find some corroboration of that taxonomy. One of the possible ways to search for such corroboration is by showing similarities between successive stages of the development of individual knowledge and the parallel stages of the historical development of knowledge in a given cultural realm.

Study of the personal intellectual development of man may be used also to search for evidence of our proposition of taxonomy of knowledge. If we look closely at the personal development of human beings, we can notice that the forms of paragons of the higher taxa are modified less frequently than those of the lower taxa. A researcher is much more eager to change his (her) methods of research (for example, of making scientific experiments) through the adoption of more efficient methods than through a change his (her) beliefs, or moral attitudes, shaped during his (her) first, 'youthful' phases of development.

It seems that the strong evidence of the proposed taxonomy of knowledge and ensuing mode of development flows from a time span of the domination of given categories of paragons within large societies. Let us assume that it is possible to describe at any moment of historical time and within a relatively large society dominant categories of description of the reality. In the long-term development of the society we can observe significantly longer periods of the domination of paragons belonging to higher taxa than of those belonging to lower taxa. Within a relatively large society, an evolution of a given taxon is an 'outcome' of all paragons of that taxon as observed in all members of the society; and, for example, the 'outcome' of paragons of the image of the world determines what is called civilization (or culture in the narrow sense); the outcome of the image of society's paragons settles the political and social order of the society; the paragons of the methods of management determine the economic system; and the *epistechne*'s paragons determine the epistemological and technological systems of scientists and engineers in the given society.

It ought to be underlined that at any stage of human development different categories of paragon coexist and at any time we observe great diversity of paragons. It is possible to find a wide spectrum of opinions, a wide spectrum of thought categories within the chosen

society; but it seems that at any time it is possible to distinguish the dominant categories of thought. Estimations of the duration of the substitution phase and the quasi-equilibrium phase for the five taxa are presented in Table 1. These are subjective evaluations, made mainly to illustrate a hypothetical dynamics of evolution of different taxa. Apart from the image of the world, the estimations are made on the basis of observed historical changes in Europe and North America in the last 500 years.

Table 1. Long waves of development (Western Civilisation)

Taxon	Substitution phase (years)	Quasi-Eq. phase (years)	Total longevity (years)
Image of the world/civilization	100– 300	300–700	400–1000
Image of the society/political order	50–100	150–200	200–300
Image of the economic system/economy	30–60	70–90	100–150
Epistechne/epistemological and technological systems	10–30	30–90	40–120
Paradigm (scientific and technological)	5–10	25–50	30–60

The period around the 6th century BC is a singular period in the history of humankind. It is marked by the activities of the great Greek philosophers, the prophet Isaiah (concluding the work of the Jewish prophets), Confucius and Lao-tsy in China, Gautama Buddha in India, Zarathustra in Persia and King Numa – Numa Pompilius – in Rome. It is reasonable to claim that in that period the main evolutionary lines (chreods) of cultural development in the history of humankind were initiated.

Epigenetic paragons

The results of research in psychology, physiology, ethology and other social sciences suggest the existence of many categories of cognition and perception in man which depend strongly on our biological nature. The idea of the existence of some *a priori* categories of our brain and *a priori* forms of human cognition comes from Immanuel Kant. The examples of categories in this taxon are: some *a priori* categories of space and time (Immanuel Kant); inborn categories of language structures (Noam Chomsky), disjunctive thinking, that is, thinking in categories of opposition (Konrad Lorenz); some expressive forms like inviting, leave-taking, quarrelling, consternation, fearing, delighting, courting (Irenäus Eibl-Eibesfeldt), thinking in terms of analogy and the search for similarities; classification abilities and recognition of common traits in different objects; and anticipation of impending events and building mental models of our action.

Image of the world

The main categories of paragons associated with the image of the world are the following:

- *existential categories* – paragons of these categories enable us to find answers to secular questions concerning: the sense and aim of human existence; the meaning of human suffering, torment, pain and death; the role of evil and the attitude of human beings to evil; the meaning of community spirit; understanding of the mind-body problem; the attitude of man towards nature; the place and role of man in the Universe.
- *aesthetic categories* – paragons of these categories enable us to evaluate the beauty of ideas and the beauty of physical objects; they define general categories of beauty.
- *cosmogonic* and *cosmological categories* – paragons concerning origin, evolution, structure and the essence of the Universe, its end and the goal of its evolution.

- *perception categories* – paragons of these categories refer to: general apprehension and knowledge of the world; ways of noticing phenomena, events and processes in the world; categories allowing the acceptance of some explanations of real phenomena (theories, hypotheses, ideas, and so on) as sufficient, adequate and satisfactory; attitudes of man to the incomprehensible, mysterious, inscrutable and transcendental phenomena; perception of man's surrounding spaces such as life space, social space, geographical space, and so on; nature of spaces – physical and theoretical; nature of time, awareness and experience of time; relation between space and time.

The three last shifts of the image of the world in the Western hemisphere (European Civilization) were observed in the periods from the 6th to the 4th centuries BC in Ancient Greece, between the 2nd and the 4th centuries AD in Western Europe and in the 16th and the 17th centuries. Probably since the end of the 19th and the beginning of the 20th century an emergence of the next wave of the image of the world is observed.

Image of the society

The image of society consists of paragons concerning the arrangement of social activity and the institutional organization of society which make community life harmonious and amiable.The main categories of paragons forming the image of society are as follows:

- *subjective categories* – paragons of these categories enable us to expound on the roles and duties of the basic units of societies such as the individual, family, lobby (group of interest), social class, and so on, and their relative influence on the course and tempo of development of the whole society;
- *notional categories* – paragons of these categories give meaning to such notions as equality, justice, law-abidance, responsibility and liability, sense of duty, freedom of the individual, sovereignty of social groups and nations, and so on;
- *governing categories* – paragons of these categories denominate ways of judging the conflicts between basic units of the society; ways and scope of using force, constraint and violence; ways of assuring the security of every individual within the society and the security of the society in relation to other organized societies.

A predominant model of organized society in the Western hemisphere is the model based on the idea of the state as a social contract. The idea of such an organized society was the direct result and crowning moment of protracted efforts made by philosophers of the English and French Enlightenment – Locke (1632-1704), Montesquieu (1689–1755) and Rousseau (1712-1778), creators of political democracy based on such principles as individual freedom, democratic representation and the separation of powers. The restriction of government to the exercise of its proper function was provided by the system of checks and balances of such government agencies as the legislature, the executive and the judiciary. In the successive stages of development of this system an important role was played by political parties as the representatives of main social groups (classes).

Current efforts to rebuild the social order within contemporary capitalist society are clearly visible. Probably now we are in the substitution phase of emergence of the next wave of image of the society.

Image of the economy

Paragons of this taxon relate to ways of the fulfilling material needs of members of the society. The main categories of paragons in this taxon are as follows:

- *categories of needs* – paragons of these categories refer to the material human needs possible to be fulfilled at the current stage of socio-economic development;
- *management* (*organizational*) *categories* – paragons of these categories concern (1) economic criteria (objectives) to be applied during the manufacturing process, (2)

manufacturing structure and manner of manufacture of material goods, and (3) ways of distribution of material goods and services;

- *relational categories* – these paragons determine (1) the role of political power in the economic process, that is, intensity of connections or separation of political power (e.g. of the state), and economic 'power' (for example, of economic agents), and (2) the role and 'weight' of organized labour (for example, guilds, trade unions) in the economic process.

The 'classical' image of the economy, which lasted over 100 years from the middle of the 18th century until the end of the 19th century, was based on the liberal ideas of David Hume, Adam Smith and Jeremy Bentham.

The 20th-century image of the economy was shaped in the last 30 years of the 19th century. During that period the image of the economy which had prevailed in Western societies since the end of the 18th century was significantly modified.

Epistechne

The name of this taxon comes from the Greek *episteme* (i.e. knowledge, acquisition, understanding), and *techne* (i.e. art, craft, proficiency, wiliness). An intention was to include in this term both cognition research, which extends man's knowledge about the world, and practical knowledge, which decides on a degree of suppression of nature by man. So, *epistechne* includes both types of research activity of man, or what is now called science and technology. Paragons of the *episteme* describe:

- research domains recognized by a researcher as important, interesting and suitable to undertake;
- ways of carrying out research activity and its organization; forms of interchanges and protection of knowledge and research achievements;
- type, place and meaning of experiment (observation) in a research activity; type of instruments, devices, plants, installations, and so on, applied in experiments (observations);
- types and forms of mathematics (for example, computation methods, formal methods) applied to describe and explain results of experiments (observations).

Until the 17th century the fields of research of *episteme* and *techne* were almost fully separated. *Techne* was mainly connected with craft work, and, since the 15th century, also with manufactures, and was developed through the transmission of practical skills from generation to generation. Innovations within *techne* were made mainly through trial-and-error processes, by making prototypes and testing their performance on material objects, not by using any systematic methods of research.

Development of the *techne* is widely documented and described by different authors as so-called long waves or Kondratieff cycles. The last Kondratieff cycle has probably started in the 1990s and most likely will be identified with the revolutionary development of computer, information and telecommunication technologies.

More detailed analysis of episteme is presented in [2], the analysis suggests the following periodization: (1) from 1620 to 1677, (2) from 1677 to 1787, (3) from 1787 to 1859, (4) from 1859 to 1912, (5) from 1912 to the 1980s, (6) current wave, the substitution phase, *circa* 1980s.

Paradigm

Paragons of this taxon relate to forms, patterns and designs of conducting scientific and technological research in some well-defined research domains. The term 'paradigm' is adopted from Kuhn. After publication of his *The Structure of Scientific Revolutions* in

1962, the concept of paradigm was very popular and readily accepted, even by the opponents of his concept, but, as Kuhn himself emphasized, also differently understood. Our intention is to use the concept of paradigm as a pattern of research or as a disciplinary matrix.

In technology, an analogous concept was proposed by D. Sahal [5], who used the term 'technological guidepost', but its meaning is very similar to the meaning of paradigm in the Kuhnian sense. Examples of paradigms are numerous, so only a few will be given here:

- in physics, successive paradigms are: Galileo's mechanics (1609), Descartes' physics (1644), Newton's mechanics (1687), the modification of Newton's mechanics made by Hamilton (1853), the special theory of relativity of Einstein (1905), quantum mechanics (1920s);
- in biology, theories of the development of living organisms: Lamarckism (1809), Cuvier's catastrophism (1825), the theory of evolution based on the principle of natural selection (Darwin and Wallace, 1859), Weisman's neo-darwinism (1892), the synthetic theory of evolution (1946);
- in technology: in aeronautical engineering – the design of the famous DC-3 aeroplane in 1935 (followed by the Lockheed Electra in 1936), which was a pattern for numerous airplanes designs in the next 30–40 years; the design of digital computers as proposed by J. von Neumann (1947) – probably neuro-computers or so-called fifth generation of computers (for example, field computers, transputers) may be considered as an attempt to design digital computers on the basis of a new paradigm.

Summary

We have only outlined an evolutionary concept of long waves existence in humen development. The presented concept was developed independently to the work of George Modelski, W.R. Thompson and others [1]. Because of limited length of the paper any comparative study was not done here but it seems to by useful to made it in future.

Identified categories of paragons affiliated to different taxa can be a good starting point to find more formal and more convinced proofs of existence of different long waves of human development.

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