

Introduction

Global Evolution and Global Ageing

Leonid E. Grinin and Andrey V. Korotayev

Application of the evolutionary approach to the history of nature and society remains one of the most effective ways to conceptualize and integrate our growing knowledge of the Universe, life, society, and human thought.

Our Yearbooks are designed to present to its readers the widest possible spectrum of subjects and issues: from universal evolutionism to the analysis of particular evolutionary regularities in the development of biological, abiotic, and social systems, culture, cognition, language, *etc.* Thus, we have tried to make up a wide collection of contributions from very different authors – not only from different countries, but also the authors who have very different educational backgrounds (historians, astrophysicists, biologists, sociologists, geologists, psychologists, archaeologists, and others) and who study the whole possible range of evolutionary processes. They all have come to a shared understanding that we need a unified picture of the evolution of the Universe.

The interdisciplinary studies have demonstrated their effectiveness, whereas the study of evolution is one of the most fruitful areas of interdisciplinary knowledge where the representatives of natural, mathematical, and social sciences, as well as the humanities can find a common field for their research.

The main objective of our Yearbook as well as of its previous issues is the creation of a unified interdisciplinary field of research in which the scholars specializing in different disciplines could work within the framework of unified or similar paradigms, using the common terminology and searching for common rules, tendencies, and regularities. At the same time, for the formation of such an integrated field one should use all available opportunities: theories, laws, and methods. In the present volume, a number of such approaches are used.

The present volume is the fifth issue of the ‘Evolution’ Yearbook. We strive to arrange each issue in such a way that the line from cosmic evolution to the human future is evident. Megahistory and global evolution become the main subjects of our Yearbook.

The first issue is entitled ‘Cosmic, Biological, and Social’ (Grinin *et al.* 2011) and comprises the analysis and comparison of evolutionary vectors and

different forms of macroevolution. In this issue, we try to show that Evolutionary Studies has application in many fields and thus, the objective to advance in the direction of creation of a general evolutionary megaparadigm is quite accomplishable.

The Yearbook's articles present a wide panorama of the application of various approaches and concepts in the framework of this emerging general paradigm that will allow detecting in a much more effective way both fundamental similarities and essential differences between different types of evolutionary dynamics.

The second issue of the Yearbook entitled 'A Big History Perspective' (Grinin, Korotayev, and Rodrigue 2011) includes a number of exciting works in this relatively new field that, along with a macroevolutionary approach, seeks to develop an inclusive view of the Cosmos, Earth, life and humanity by erasing boundaries between disciplines.

The third issue is called 'Development within Big History, Evolutionary and World-System Paradigms' (Grinin and Korotayev 2013). It comprises the articles demonstrating that the evolutionary studies are capable of creating a common platform for the world-system approach, globalization studies, and the economic long-wave theory. There is also added a section devoted to the discussions of contemporary evolutionism.

The fourth issue is entitled 'From Big Bang to Nanorobots' (Grinin and Korotayev 2015). Thus, we demonstrate that all phases of evolution and Big History have been covered in the articles of the Yearbook. Also, some articles attempt to combine Big History potential with the potential of Evolutionary Studies as well as to find general similarities and differences between different types of macroevolution. Several articles also present forecasts about future development.

What is the subject of the present issue of the Yearbook? Similar to the previous issues, it shows some aspects of the evolutionary advance from the earlier phases to the anticipated future of human society. But on the whole, this volume is devoted to different aspects and facts of megaevolution and some universal theories in an attempt to find common ground in the diversity of manifestation of evolution and its forms at different phases of development. Thus, the title of this issue 'Evolution and Big History: Dimensions, Trends, and Forecasts' is fully justified (about the connection with Big History see below).

* * *

We try to preserve the general arrangement of our Yearbook. In particular, there is a traditional section which is devoted to the discussions about future. For many reasons, it is very important to reflect upon the future but as regards the evolution it is much more important since the glance into the future shines a spotlight on the past. For example, in **Anton L. Grinin's** article 'Self-Regula-

tion as a Global Evolutionary Mega-Trend' from Section III the assumption that the future phase of the Cybernetic Revolution will be connected with self-controlled technological systems implies that one should search for the roots of self-control (and self-regulation as its previous form) in the depths of Big History.

The article introduces and describes the notion of 'self-regulation' which allows combining the processes of different nature and complexity into a single trend associated with self-preservation, operation, transformation and increasing complexity of systems in the course of interaction with changing environment. Meanwhile, the study of self-regulation can become an integrative methodological approach uniting various areas of knowledge, such as Cybernetics, Synergetics, and Evolutionary Studies. The author traces the manifestations of self-regulation within Big History and its important role in evolution, especially in mega-evolution and in evolutionary transitions to new levels of complexity. One can observe the signs of self-regulation even at the early stages of Big History, for example, during the formation of the first stars. We can also see different alternatives and mechanisms of self-regulation in chemical evolution at the level of systems lacking operating control. The origin of life became the most important qualitative transition of self-regulation and its complication in the evolutionary context. The systems passed from self-organization and self-adjustment to simple and later complex control. The developed nervous system, especially the brain, became the first self-controllable system. Later the biosocial branch of self-control (including human society) emerged in which self-control is even more vividly manifested in some respects.

However, within evolution the self-regulation is inherent not only to chemical, biological, and social systems. In his paper 'Self-regulation as a Global Evolutionary Mega-Trend' Anton L. Grinin shows that in the coming decades a new generation of self-regulating systems will emerge and spread in a new form of human-created self-regulating technologies. It will result from the new production revolution which he calls the Cybernetic one. Its first phase has already begun while its mature phase will start between the 2020s and 2030s. This revolution will lead to critical transformations in economy and society and will significantly change the world as well as human *modus vivendi*.

Therefore, the development of technologies and biological aspect of human life have appeared to be closely interconnected. Medicine, science and technologies increasingly invade the human body and modify it which set a number of urgent questions: Will humans turn into cyborgs, as a result of the rapidly developing areas of bionanotechnology and cognitive sciences? It is not an idle or innocent matter at all, especially with the account of the increasing number of prophets of 'avatarization'¹ who bravely (and without thinking) appeal to dis-

¹ Avatar is the term used in Hinduism philosophy to denote the terrestrial embodiments of God (especially Vishnu). Respectively this term is used by some supporters of coming human immor-

card the perishable biological body. How much truth is there? Actually, on the one hand, medicine has been moving in this direction for many decades and it has learnt to make false teeth, connective tissues, bodies, to replace sense organs with devices, and to create life support systems (hearts, lungs, kidneys, *etc.*), not to mention the production of artificial preparations (drugs) causing reactions similar to those resulting from the activity of endocrine glands, impulses of the brain or work of internals. Currently, we observe the development of production of bioprinters that are able to create some human organs; there are also neural interfaces (or brain–computer interfaces) permitting to operate some facilities, devices, and equipment ‘by force of thought’ through biological currents and microelectronics. Undoubtedly, the opportunities for producing organs, tissues and fractions from artificial non-biological materials will considerably increase in the future. All this start to contribute to the transformation of the human body into a kind of cyborg. Besides, this increases a certain oncoming traffic of technologies in terms of rapprochement of people and artificial smart systems, in particular robots. These robots will be employed not only as workers, but also in very close or even intimate contacts with people (*e.g.*, they can be used for sexual services, or as companions, *etc.*). Then the borders between the human and artificial anthropomorphous systems are likely to become less pronounced.² Besides, modern information technologies already create a virtual environment where it becomes more difficult to distinguish reality from illusion; to say nothing of use of modern bio, cognitive and robotic technologies for military purposes.

Nonetheless, we think that the process of a complete cyborgization will hardly be a threat to humans in the nearest (and probably in the distant) future. The matter is that any simplified ideas about human body and, all the more, brain and consciousness are extremely dangerous (similar to the dangerous use of brain at the level of electronic device). Millions of years of biological evolution have made all constituents of biological organisms and their functions optimal, interconnected, and sensitive to changes at any part of the body so that any interference with physiology, and all the more, the brain, has to be thought over many times to prevent possible damage. Even the slightest knowledge of biology makes it clear that human brain cannot work without body since its main function is to accept signals from the body and to transfer them. Thus, any ideas that consciousness can be

tality to determine the transformation of the human spirit (brain and consciousness) into the new (non-biological) body.

² Let us note that the production of sexual robots (generally ‘female’, so far) has already started. There were also statements that by the middle of the century such contacts between humans and robots will become commonplace. Not without reason a campaign for their prohibition has been initiated (see Griffin 2015). However, so far, these requirements come from the feminists who are concerned with such a detraction of the female role, but we agree with them. It is better to forbid or to take under control this situation in advance, because if businessmen have a chance, sex robots for any sexual orientation might appear.

somehow ‘transplanted’ are a rough and ignorant imagination. Therefore, the process of cyborgization can never go too far, it will always remain ‘supplementary’ for the biological component of organism and it can considerably improve quality of life as well as prolong it.

* * *

One can observe the connection between evolution and Big History in most (in four out of five) our issues including the present one. Why? The rapidly globalizing world needs global knowledge and a global overview. That is why the ideas of universal history or Big History, which cover all of the Universe's existence, from the Big Bang to the present human networking of the planet, are becoming more and more popular.

Big History has been developing very fast indeed. We are currently observing a ‘Cambrian explosion’ in terms of its popularity and diffusion. Big History courses are taught in the schools and universities of several dozen countries, including Australia, Great Britain, China, Germany, India, Japan, Korea, the Netherlands, the USA, Russia and many more. The International Big History Association (IBHA) is gaining momentum in its projects and membership. Conferences are beginning to be held regularly. Hundreds of researchers are involved in studying and teaching Big History.

What is Big History? And why is it becoming so popular? According to the working definition of the International Big History Association, ‘Big History seeks to understand the integrated history of the Cosmos, Earth, Life and Humanity, using the best available empirical evidence and scholarly methods’ (Grinin *et al.* 2014: 7). So, Big History brings together constantly updated information from the scientific disciplines and merges it with the contemplative realms of philosophy and the humanities. It also provides a connection between the past, present, and future. Big History is a colossal and extremely heterogeneous field of research encompassing all the forms of existence and all time-scales.

Scientific specialization and the immense amounts of information contained in the various ‘compartments’ of academia can hinder our capacity for inclusiveness, but, paradoxically, it also amplifies the need for it. Many scientists would like a more integrated vision that sees beyond their meticulous and complicated fields of specialization. One can see the growth of such interest in the framework of individual disciplines, as well as in interdisciplinary research. Moreover, without using ‘mega-paradigms’ like Big History, scientists working in different fields may run the risk of losing sight of how each other's tireless work connects and contributes to their own.

Yet while interdisciplinarity is not a new idea, many disciplines can run the disappointing tendency of only paying lip-service to it. This is not possible in Big History. In a discipline that *starts* by weaving together all the disciplines into a single narrative, interdisciplinary work is not only possible, it is essential. A unification of the disciplines, a deep symbiosis of academic cells, will open

up research areas that are vital to the development of the 21st century thought and culture. As has been mentioned on a number of occasions, the rapidly globalizing world needs global knowledge that explains a unified global system (see Grinin, Carneiro, Korotayev, and Spier 2011; Grinin and Korotayev 2009; Grinin *et al.* 2014).³ Indeed, globalization itself becomes a vehicle for Big History. The very existence of the International Big History Association is proof of that.

The unique approach of Big History, the interdisciplinary genre of history that deals with the grand narrative of 13.8 billion years, has opened up a vast amount of research agendas. Or, to engage an evolutionary metaphor, it has triggered a scholarly speciation event where hundreds of new niches have opened up waiting to be filled. The ecological terrain is vast and the numbers that currently populate it are few. The research comes in a variety of forms. We, big historians, must collaborate very closely to pursue this vibrant new field.

* * *

Though, we have already discussed in detail Big History but there are many aspects which we have not touched upon yet. Thus, it is not surprising that in this volume we devote to this issue a whole **Section II** entitled **Big History's Manifestations**.

In his contribution ‘The Universal Breakthroughs of Big History: Developing a Unified Theory’ to the Section, **Ken Gilbert** argues that the currently unfolding panoramic view of the eons, which the modern scientific and historical disciplines present, reveals an outstanding series of critical and transformative universal breakthroughs running throughout the history of the cosmos, life, and man. In the paper the author begins to explore and develop an orderly framework for Big History based on this remarkable overall pattern of similarly sudden and rapid outbursts of expansive creative power marking the entire course of evolutionary manifestation. On this basis Gilbert considers and proposes: 1) ‘A Great Story of Origins’ with sixteen ‘Origin Events’, each of which in turn dramatically establishes and defines a new ‘Regime’ and subsequent ‘Evolutionary Era’ with emergent qualities; 2) a reconsideration of current issues at the cutting edge of evolutionary theory including ‘punctuated equilibrium’; 3) a recognition of the essential ‘twofold’ or ‘biphasic’ nature of developmental change in time; 4) an expansion of evolutionary thought in the context of Big History; and 5) approaches towards developing a Unified Theory.

Then comes **Craig Benjamin** with his ‘Big History and Liberal Education in the Undergraduate Classroom’. The author points that Big History instructors at the university level have long argued that the field of Big History is ideal for teaching the skills and goals of liberal education. The Association of American

³ About the importance of interdisciplinarity in evolutionary studies see also Grinin *et al.* 2009; Grinin and Korotayev 2014a.

Colleges and Universities (AAC&U) has articulated a set of learning outcomes that can only be achieved within the context of contemporary liberal education. In his contribution Benjamin uses student feedback to argue that Big History is the ideal course to help university undergraduate students achieve the set of learning outcomes promoted by the AAC&U.

In the third paper of this section ‘Brazil in the World-System between 1989 and 2016: The Rise and Fall of a Semi-Peripheral Dream’ contributed by **Antonio Gelis-Filho**, the author analyzes Brazil’s situation inside the Western capitalist world-system (WCWS) over the period from 1989 to 2016. He splits the period into five phases, each roughly corresponding to a new presidential mandate in Brazil: ‘cleaning up the house: 1989–1994’, when the Plano Real finally managed to curb the country’s hyperinflation; ‘the good pupil: 1995–2002’, when with variable success Brazil applied to its economy the IMF receipt; ‘the westernized BRIC: 2003–2012’, a period when Brazil benefited from a windfall associated with China’s hunger for commodities, and when it had managed to become a darling for both the global right and the global left; and finally ‘the banquet of consequences: 2013–?’ In the last phase, still unfolding, Brazil paid the price for the lack of a comprehensive and realistic national plan to go beyond benefitting from another cycle of high prices for commodities, a plan that should have encompassed economy, internal politics and geopolitical stance. Too isolated geographically to have any pressing strategic issues, Brazil does not seem to have the motivation to decisively place the geopolitical bets that are inevitable if a country plans to make it into the major league of national powers. The country that until recently dreamed of being a major player in international affairs is again only a spectator of the great geopolitical game being played in our times, essentially waiting in the sidelines to see which will be the winners of such momentous contest.

Now let us return to **Section I** of the present volume entitled **Dimensions, Trends, and Aspects**. The first article here is also devoted to Big History. It is an important theoretical article from **Ken Baskin** about the connection between Big History and evolution which is called ‘The Dynamics of Evolution: What Complexity Theory Suggests for Big History’s Approach to Biological and Cultural Evolution’. The author claims that the twentieth-century science, from physics to neurobiology, redefined our understanding of the world, overturning the linear worldview of Newtonian physics for a more dynamic image. Especially as illuminated by complexity theory, this worldview suggests a conception of evolution in which phenomena adapt to each other, at many scales, embedded in a continually expanding universe of interconnected agents. Given this conception, human culture has evolved to adapt to changing conditions which, thus far, have generated a social world whose complexity has increased to serve a larger, more technologically advanced, more highly interconnected population. To demonstrate this conception of evolution, one can examine

the Axial Age and Modernity as cultural ‘phase transitions’, periods of experimentation punctuating periods of relative stable social structures. Such an examination offers an insight into the potential for Big History to contribute to solutions of the many challenges that call for innovative adaptations across our world.

Other three articles of Section I are devoted to important aspects of evolution, namely, energetic, political, and environmental ones.

Stephen I. TERNYK in his contribution ‘Quantum Energetic Evolution’ presents a brief piece of research introducing the model of quantum energetic evolution and also shows the basic physics of human socio-economic systems as energy transduction mechanism. The author argues that 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.

Olga A. Sorokina and Rendt Gorter in their contribution ‘Pathfinding: Macroecology as a Social Science’ point that the last socioeconomic crisis of 2009 has made it clear that the present path of world development is not sustainable in the longer term, even if one recognizes the enormous potentials of the market and technological innovation. We will need new ideas and strategies to ensure that the improved living conditions and opportunities for a growing population across the world can be reconciled with the preservation of viable living conditions for this species – or, in other words, with enlarging of the carrying capacity of the human biotope. An ‘Ecosystem evolution’ approach offers a vision and path for understanding human social development and for finding new pathways for social development.

In his contribution ‘Evolution of World Order’ **Leonid E. Grinin** analyzes the world order in the past, present and future as well as the main factors, foundations and ideas underlying the maintaining and change of the international and global order. The first two sections of the paper investigate the evolution of the world order starting from the ancient times up to the late 20th century. The third section analyzes the origin and decline of the world order based on the American hegemony. The author reveals the contradictions of the current unipolar world and explain in what way globalization has become more profitable for the developing countries but not for the developed ones. The paper also explains the strengthening belief that the US leading status will inevitably weaken. In this connection the author discusses the alternatives of American strategy and the possibility of the renaissance of American leadership. The last

section presents a factor analysis which allows stating that the world is shifting toward a new balance of power and is likely to become the world without a leader. The new world order will consist of a number of large blocks, coalitions and countries acting within a framework of rules and mutual responsibility. However, the transition to a new world order will take certain time (about two decades). This period, which the author denotes as the epoch of new coalitions, will involve a World-System reconfiguration and bring an increasing turbulence and conflict intensity.

* * *

Section III. Trends and Forecasts comprises the articles analyzing the current (as well as past) trends that allow forecasting the future changes. The paper by Anton L. Grinin has already been discussed above.

In his contribution entitled ‘Science-Based Global Enlightenment in the Quantum-Digital Age (or How to Prevent the Earth from Becoming a Dead Planet)’ **David Hookes** considers the climate crisis as a part of the global environmental crisis, that is, the poisoning of the water, air, and earth leading to massive loss of biodiversity as well as widespread ill-health. The author anticipates that with the serious possibility of runaway global warming there is the chance that the earth may become a dead planet.

In their contribution ‘Global Population Ageing, the Sixth Kondratieff Wave, and the Global Financial System’ **Leonid E. Grinin** and **Andrey V. Korotayev** speak about another urgent issue of population ageing which concerns both developed and many developing countries and has turned into a global issue. The authors claim that in the forthcoming decades the population ageing is likely to become one of the most important processes determining the future society characteristics and the direction of technological development. The paper analyzes some aspects of the population ageing and its important consequences for particular societies and the whole world. Basing on this analysis, the authors draw a conclusion that the future technological breakthrough is likely to take place in the 2030s and is supposed to be accompanied with the upswing of the forthcoming sixth Kondratieff wave introducing the sixth technological paradigm (system). All those revolutionary technological changes will be connected, first of all, with breakthroughs in medicine and related technologies. Grinin and Korotayev also present their ideas about the financial instruments that can help to solve the problem of pension provision for an increasing elderly population in the developed countries. They think that a more purposeful use of pension funds' assets together with an allocation (with necessary guarantees) of the latter into education and upgrading skills of young people in developing countries, perhaps, can partially solve the indicated problem in the developed states.

The present volume is concluded by **Section IV. Reviews and Information** which includes **Antony Harper's** ‘Review of Leonid Grinin and

Andrey Korotayev's "Great Divergence and Great Convergence: A Global Perspective", Springer International Publishing, 2015'. The book represents an insightful analysis of the processes associated with historical change, specifically those processes that have given rise to the current state of the world system. Uniquely, the authors suggest that continuity of the process extends to both the Divergence and Convergence. Further, they suggest that the time depth of the origin of this process is much deeper than the traditional marker of the mid-17th century and build a strong case for this assessment. Finally, Grinin and Korotayev make some predictions regarding the further effects of the process of convergence into the near future, predictions suggesting a significant reshuffling of world system organization and the rise of a global middle class.

A brief announcement from **Peter J. Richerson** and **Joe Brewer** 'Inaugural Meeting of the Cultural Evolution Society' informs about a significant event in the community of evolutionary studies experts. They say that on September 13–15, 2017 the Cultural Evolution Society will host its first international conference at the Max Planck Institute for the Science of Human History in Jena, Germany.

* * *

Thus, the fifth issue of the Evolution Yearbook considers different issues each deserving extra attention. On a final note, we would like to refer to some forecasts of the problem of global ageing. In the paper by **Leonid E. Grinin** and **Andrey V. Korotayev** 'Global Population Ageing, the Sixth Kondratieff Wave, and the Global Financial System' this process is referred to the period of the Cybernetic Revolution (from the 2030s to the 2070s). The problem of increasing elderly population in the coming decades can contribute to the acceleration of the technological development.

However, global ageing, the process about which in respect of future trends one can say that it will be realized with almost absolute certainty (one can make such kind of forecasts not about all processes), will have multi-aspect results. For a better understanding of the coming lapse of a hundred years the analysis of global ageing appears to be of utmost importance. It is reasonable to reflect upon global evolution with respect to global ageing. The matter is that it has never occurred in human history that elderly people made such a large and increasing proportion of population. The response to this challenge can further determine the course of evolution. Singularity which is often considered as a turning point for human evolution is very significant in this process. Yet, perhaps, ageing will become the factor which will change the course of our civilization's development. On the one hand, the advances in medicine, bio-, information and cognitive technologies will allow increasing the life expectancy along with drastic expanding of the age limit of physical activity. 'To put off ageing' does not seem fantastic any more but is a program plan for biogerontologists (see, *e.g.*, Grey and Rae 2008). On the other hand, elderly

people's mentality significantly differs from the young people's thinking which can affect the course of the scientific and technological progress (see below). Let us make some predictions about global ageing in the Introduction.

So, what the world will be like when the share of older people dramatically increases? It is evident that significant changes will happen. In the nearest two or three decades, as it has been already mentioned, global ageing will be the driving force of changes, reforms and acceleration of technological innovations. This will be facilitated by the increasing savings of social and pension funds and by growing demand for such technologies. Thus, until at least the middle and probably the last third of the 21st century the population ageing will not restrain the further development of technologies; rather on the contrary.

But one should remember that elderly people tend to be more conservative and for this reason by the end or in the beginning of the next century the economic development will undergo significant changes (see below). Yet, in some other fields conservatism can manifest itself even earlier (*e.g.*, in the crisis of democracy). And probably in 50–70 years, *i.e.* in the end of the 21st century the world will significantly change. By this time the share of young people will likely dramatically drop even in the societies with 'youth bulges' and high fertility rates, for example, in most or in all African countries.

But the world share of older population will continue to grow. In the future the societies' behavior will certainly differ from the present situation or from the situation in the nearest two or three decades. Perhaps, it will coincide with the period of transition to a certain stabilization of social development (if it is possible at all) after the completion of the Cybernetic Revolution. Yet, other scenarios are also possible, including, for example, the climatic deterioration may result in some degradation of the society.

Thus, it is quite probable that ageing together with increasing opportunities of planning will facilitate the society's transition to a more smooth and slow development (the widely discussed sustainable development). By the end of the 21st century – the beginning of the 22nd century it will probably have a slowing down effect on the scientific and technological development. It will be natural-historical slowdown as there are no mechanisms of control over the rate of the scientific and technological progress. And since the developmental rate cannot accelerate indefinitely (since the process reaches its singularity point) one can assume that the population ageing can become a natural way to restrain the development in order to move to a smoother path. Of course, any change carries large risks and at some moment the elderly people's conservatism can probably be helpful. The thing is that the society's developmental rate increased several times and our mentality and physiology do not keep pace with these changes. Not without reason over the past hundred years the younger generations have overtaken their parents in regards to training in handling technical devices but it also has many drawbacks since the older generations' experience becomes de-

preciated. It is evident that the problem of global ageing requires greater attention on the part of evolutionists.

The mentioned conservatism of elderly people can cause not only a slow-down in growth rates but also a transition to a different economic pattern. The contemporary economic model is connected with increasing consumption. At present, we consume more than we consumed yesterday; and tomorrow we will consume more than today. This is in many respects an absurd model, the same way as the pursuit of GDP steady growth sometimes seems absurd but it works and will continue to work for many decades especially in poor countries which are less satisfied with consumption. The population ageing can change human needs; moreover, the stabilization or decrease of the world population can bring changes either. The changing of economic model of consumption will be a complicated process which can affect many aspects. At present Japan demonstrates one of the examples of such type of development without growth. Despite the fact that it is a leading nation in science and technologies, it has a small GDP growth and for more than two decades Japan has been struggling with deflation since the Japanese do not want to spend much and prefer to save money. Nowadays this ‘Japanese disease’ has penetrated to European countries, which is also partly related to ageing (there are some other reasons which we do not touch here) (see, *e.g.*, Grinin and Korotayev 2014b, 2015a).

But on the whole the Cybernetic Revolution together with population ageing will lead the society to a new economic model of consumption. If we escape from the necessity to increase consumption, the models of economic growth should be different from the present one. Perhaps, it will include some aspects of quality of life. Therefore, the business models will change as well, although it is not clear in exactly what way.

In conclusion, one should note that despite the diversity of themes and issues which we touched in previous volumes of the Yearbook, many aspects still remain not covered within the interdisciplinary field of Evolutionary Studies. But this makes it more interesting to be pioneers in this field.

References

- Grey A. B. De, and Rae M. 2008.** *Ending Aging: The Rejuvenation Breakthroughs That Could Reverse Human Aging in Our Lifetime*. St. Martin's Press.
- Griffin A. 2015.** Sex Robots should be Banned, Say Campaigners, as Engineers Look to Add AI to Sex Toys. *Independent*, September 15. URL: <http://www.independent.co.uk/life-style/gadgets-and-tech/news/sex-robots-should-be-banned-say-campaigners-as-engineers-look-to-add-ai-to-sex-toys-10501622.html>.
- Grinin L. E., Carneiro R. L., Korotayev A. V., and Spier F. (Eds.) 2011.** *Evolution: Cosmic, Biological, and Social*. Volgograd: ‘Uchitel’ Publishing House.

- Grinin L. E., Korotayev A. V., and Rodrigue B. H. (Eds.) 2011.** *Evolution: A Big History Perspective*. Volgograd: 'Uchitel' Publishing House.
- Grinin L. E., and Korotayev A. V. 2009.** *Social Macroevolution: Genesis and Transformation of the World System*. Moscow: Librocom/URSS. *In Russian* (Гринин Л. Е., Коротаев А. В. *Социальная макроэволюция: Генезис и трансформации Мир-Системы*. М.: ЛИБРОКОМ).
- Grinin L. E., and Korotayev A. V. (Eds.) 2013.** *Evolution: Development within Big History, Evolutionary and World-System Paradigms*. Volgograd: 'Uchitel' Publishing House.
- Grinin L. E., and Korotayev A. V. (Eds.) 2015.** *Evolution: From Big Bang to Nanorobots*. Volgograd: 'Uchitel' Publishing House.
- Grinin L. E., Baker D., Quaedackers E., and Korotayev A. V. 2014.** Introduction. Big History's Big Potential. *Teaching & Researching Big History: Exploring a New Scholarly Field* / Ed. by L. E. Grinin, D. Baker, E. Quaedackers, and A. V. Korotayev, pp. 7–18. Volgograd: 'Uchitel' Publishing House.
- Grinin L. E., and Korotayev A. V. 2014a.** Introduction. Once More about Aspects, Directions, General Patterns and Principles of Evolutionary Development. *Evolution: From Protostars to Singularity?* / Ed. by L. E. Grinin, A. V. Korotayev, and A. V. Markov, pp. 5–19. Volgograd: Uchitel. *In Russian* (Гринин Л. Е., Коротаев А. В. Введение. Вновь об аспектах, направленности, общих паттернах и принципах эволюционного развития. *Эволюция: От протозвезд к сингулярности?* / Ред. Л. Е. Гринин, А. В. Коротаев, А. В. Марков, с. 5–19. Волгоград: Учитель).
- Grinin L. E., and Korotayev A. V. 2014b.** Inflationary and Deflationary Trends of the World Economy, or the Spread of 'the Japanese Disease'. *History and Mathematics: Aspects of Demographic and Social and Economic Processes* / Ed. by L. E. Grinin and A. V. Korotayev, pp. 229–253. Volgograd: Uchitel. *In Russian* (Гринин Л. Е., Коротаев А. В. Инфляционные и дефляционные тренды мировой экономики, или распространение «японской болезни». *История и Математика: аспекты демографических и социально-экономических процессов* / Отв. ред. Л. Е. Гринин, А. В. Коротаев, с. 229–253. Волгоград: Учитель).
- Grinin L. E., and Korotayev A. V. 2015a.** Deflation as a Disease of the Modern Developed Countries. *Analysis and Modeling of World and Country Dynamics: Methodology and Basic Models* / Ed. by V. A. Sadovnichiy, A. A. Akaev, S. Yu. Malkov, and L. E. Grinin, pp. 241–270. Moscow: Moscow Publishing House 'Uchitel'. *In Russian* (Гринин Л. Е., Коротаев А. В. Дефляция как болезнь современных развитых стран. *Анализ и моделирование мировой и страновой динамики: методология и базовые модели* / Отв. ред. В. А. Садовничий, А. А. Акаев, С. Ю. Малков, Л. Е. Гринин, с. 241–270. М.: Моск. ред. изд-ва «Учитель»).
- Grinin L. E., Markov A. V., Korotayev A. V., and Panov A. D. 2009.** Evolutionary Megaparadigm: Possibilities, Problems, Perspectives. Introduction. *Evolution: Cosmic, Biological, Social* / Ed. by L. E. Grinin, A. V. Markov, and A. V. Korotayev, pp. 5–43. Moscow: LIBROCOM. *In Russian* (Гринин Л. Е., Марков А. В., Коротаев А. В., Панов А. Д. Эволюционная мегапарадигма: возможности, проблемы, перспективы. Введение. *Эволюция: космическая, биологическая, социальная* /

Ред.

Л. Е. Гринин, А. В. Марков, А. В. Кортаев, с. 5–43. М.: ЛИБРОКОМ).