

# Introduction. To Verify Harmony by Algebra<sup>\*</sup>

*Leonid E. Grinin and Andrey V. Korotayev*

The scope of human thought along with its ability to proceed from reconstruction of the most ancient periods to anticipation of the distant future, from small objects to galaxies and the Universe as well as, to embrace different trends and dimensions of reality never cease to amaze us. Generally speaking, such comprehension has always been characteristic for creative and inquiring human mind that tries to perceive the world in its grandeur and diversity.

The present Yearbook (which is the sixth in the series) to some extent reveals the extraordinary potential of scientific research. In particular, it opens with a large co-authored investigation ‘Genes and Myths: Which Genes and Myths did the Different Waves of the Peopling of Americas Bring to the New World?’ by **Andrey V. Korotayev, Yuri E. Berezkin, Svetlana A. Borinskaya, Albert I. Davletshin, and Daria A. Khaltourina**. This contribution shows the ability of scientific thinking to find correlations between different phenomena. For example, in what way can genes be connected with myths? And still the link does exist and is far from incidental. Myths have been spread by the carriers with peculiar features of genotype. Myths and genes of ancient populations have survived in some way in their offspring and nowadays due to scientific quantitative methods one can study the ancient heritage. The paper studies the spatial distribution of folklore-mythological motifs to show their correlation with the distribution of mitochondrial DNA (mtDNA) and Y-chromosome (NRY) haplogroups.

We hope this paper will allow an informed reader to make many interesting discoveries. Among them the most important one will be the significant hypothesis allowing an insight into the period of the utmost importance for the perception of human history, namely, the dispersal of *Homo sapiens* from Africa which may be considered as a starting point of the humankind's history and social life. The migration of *H. Sapiens* from Africa can be dated to at least 50,000 thousand years ago (and probably much earlier). The hypothesis presented in the paper may give an idea (at least a supposition) of what the ancient

---

<sup>\*</sup> This research has been supported by the Russian Foundation for Basic Research (Project № 17-06-00476).

humans may have thought about. For example, it turns out that they thought about death and immortality since the myth about Shed Skins (according to the authors of the paper, one of the most ancient myths) explains the origin of death and loss of immortality for humans.

Furthermore, the Yearbook concludes with the paper ('Dynamical Generalizations of the Drake Equation: The Linear and Non-linear Theories') by **Alexander D. Panov**. Basing on the reinterpretation of the Drake equation, the author of the paper attempts to suppose which is the number of Communicative Civilizations (CCs) and how it changed in the course of time. Communicative civilizations (CCs) are the ones which tend to send messages to other civilizations and are able to receive and analyze messages from other civilizations.

Our Yearbook also covers other relevant issues including, in particular, the technological activity and competition starting from the Middle Ages; the process of urbanization, and problems of modern economy and values.

Since the present issue of the Yearbook covers such a wide range of issues we have given it the subtitle *Economy, Demography, Culture, and Cosmic Civilizations*.

The common feature for all our Yearbooks, including the present volume, is the usage of formal methods and social studies methods in their synthesis to analyze different phenomena. In other words, if to borrow Alexander Pushkin's words, 'to verify harmony by algebra'. One should note that publishing in a single collection the articles that apply mathematical methods to the study of various epochs and scales – from deep historical reconstruction to the pressing problems of the modern world – reflects our approach to the selection of contributions for the Yearbook. History and Mathematics, Social Studies and formal methods, as previously noted, can bring nontrivial results in the studies of different spheres and epochs.

The present Yearbook consists of four sections, the first three of which comprise two contributions each.

**Section I** 'Historical and Technological Dimensions' includes the described above article by **Andrey V. Korotayev, Yuri E. Berezkin, Svetlana A. Borinskaya, Albert I. Davletshin, and Daria A. Khaltourina** ('Genes and Myths: Which Genes and Myths did the Different Waves of the Peopling of Americas Bring to the New World?').

The second article of this **Section** ('The Technological Activity and Competition in the Middle Ages and Modern History: A Quantitative Analysis') by **Andrey V. Korotayev and Leonid E. Grinin** presents a quantitative analysis of innovative activity and competition in technological sphere in the Middle Ages and Modern Period (until the early 20<sup>th</sup> century). The authors consider the innovative competition in two aspects. In the first part of the paper they show the growing number of innovations over half-century intervals in Europe and

Asia. In terms of such historical breakthroughs, it is very important to trace the changes of leadership in Europe. The second and the third sections of the paper are devoted just to this aspect. Here the authors consider the dynamics of technological inventions in Europe from the 15<sup>th</sup> to the 19<sup>th</sup> centuries and offer some interesting conclusion.

The contributions of **Section II** 'Economic and Cultural Dimensions' are mostly focused on modern period. The article by **Leonid E. Grinin and Andrey V. Korotayev** ('Inflationary and Deflationary Trends in the Global Economy, or Expansion of "the Japanese Disease"') shows the connections between current economic trends of weak inflation and even deflation and the depressive development of economy in the last decade. The authors attempt to explain why the problems of deflation previously manifested only in Japanese economy have spread to other European countries. Basing on the analysis of available resources and the theory of long cycles, the authors suppose that a new crisis will start in 2018. They also suppose that in the next five or ten years, the global economy will remain in the crisis-depression phase with rather sluggish and weak rises. The paper also offers some forecasts for the forthcoming sixth Kondratieff wave (from 2020 to the 2060/70s) as well as identifies its possible technological basis and discusses possible evolutionary consequences of the forthcoming technological transformations.

The article by **Arno Tausch** ('Towards New Maps of Global Human Values, Based on *World Values Survey (6) Data*') provides a new approach to the study of the evolution of global values, based on a statistical analysis of the freely available data from the World Values Survey, the 6<sup>th</sup> wave of global opinion surveys which now has been made public.

**Section III** 'Modeling and Theories' opens with **Antony Harper's** article ('An Equation-Based Systems Approach to Modeling Punctuated Equilibria Apparent in the Macropattern of Urbanization over Time'). This paper presents a detailed description and explanation of a model of punctuated growth since that pattern of growth is related to population size, carrying capacity, and level of technology. General limits to modeling are introduced to give context to the results of the model, and the model itself is a set of differential equations representing the relationships between the aforementioned variables. The description of the construction of the model, an intuitive construction, is given, the model is then used to generate results consistent with the occurrence of both punctuation and stasis, and a simple mechanism is proposed to explain the interaction between population size, carrying capacity, and level of technology that would then produce the pattern of punctuation over time. Finally, further modifications of the model to give greater reality to the results are presented.

The section concludes with the article by **Alexander D. Panov** which we have described above ('Dynamical Generalizations of the Drake Equation: The Linear and Non-linear Theories').

**Section IV** ‘Reviews and Notes’ contains a review by *Antony Harper* of a recent book ‘Great Divergence and Great Convergence’ by Leonid E. Grinin and Andrey V. Korotayev (Springer, 2015) which studies the interaction between global economic and demographic evolution.

### References

- Goldstone J. A., Grinin L. E., and Korotayev A. V. (Eds.) 2015.** *History & Mathematics: Political Demography & Global Ageing*. Volgograd: ‘Uchitel’ Publishing House.
- Grinin L. E., de Munck V. C., and Korotayev A. V. (Eds.) 2006.** *History & Mathematics: Analyzing and Modeling Global Development*. Moscow: KomKniga/URSS.
- Grinin L. E., Herrmann P., Korotayev A. V., and Tausch A. (Eds.) 2010.** *History & Mathematics: Processes and Models of Global Dynamics*. Volgograd: ‘Uchitel’ Publishing House.
- Grinin L. E., and Korotayev A. V. (Eds.) 2014.** *History & Mathematics: Trends and Cycles*. Volgograd: ‘Uchitel’ Publishing House.
- Grinin L., and Korotayev A. 2015.** *Great Divergence and Great Convergence. A Global Perspective*. New York, NY: Springer.
- Turchin P., Grinin L. E., de Munck V. C., and Korotayev A. V. (Eds.) 2007.** *History & Mathematics: Historical Dynamics and Development of Complex Societies*. Moscow: KomKniga/URSS.