Beyond Global Studies. An Introductory Lecture into a Big History Course[*]

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Global studies can be made not only with respect to the humans who inhabit the Earth, they can well be done with respect to biological and abiotic systems of our planet. Such an approach opens wide horizons for the modern university education as it helps to form a global view of various processes. However, we can also ask ourselves whether the limits of our studies can be moved further. Would not it be useful for the students to understand the evolution of our planet within the context of the evolution of our Universe? The need to see this process of development holistically, in its origins and growing complexity, is fundamental to what drives not only science but the human imagination. This shared vision of the grand narrative is one of the most effective ways to conceptualize and integrate our growing knowledge of the Universe, society, and human thought. Note that the respective discipline already exists and it has been developing quite successfully for more than three decades; it is denotes as Big History.

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What is Big History?

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.* 2014a: 5). 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 timescales.

[*] The text of this lecture has been prepared on the basis of our introduction to the edited volume *Teaching & Researching Big History: Exploring a New Scholarly Field* (Grinin *et al.* 2014b). For more information on Big History see, e.g., Grinin *et al.* 2011, 2014b; Grinin, Korotayev, Rodrigue 2011; Grinin, Korotayev 2013; Grinin, Ilyin, and Korotayev 2012.

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 twenty-first 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). Indeed, globalization itself becomes a vehicle for Big History. The very existence of the International Big History Association is proof of that.

Origins of Big History

Big History ideas did not appear out of nowhere. They have deep roots in human spirituality, philosophy, and science. In the nineteenth and twentieth centuries there was an explosive growth of scientific knowledge accompanied by a deep differentiation of disciplines. This made borders between scholars and scientists much more rigid, while research specialization grew by an order of magnitude. As Erwin Schrödinger justly noted: '[I]t has become next to impossible for a single mind fully to command more than a small specialized portion of it'. However, he continued, there is 'no other escape from this dilemma (lest our true aim be lost forever) than that some of us should venture to embark on a synthesis of facts and theories' (Schrödinger 1944: 1). As disintegration peaked in the twentieth century, such undertakings were not mentioned as often as they ought to have been. When an interdisciplinary synthesis was mentioned at all, it was seen as a lofty goal, the barest whisper of a dream, rather than an approachable reality.

A very different picture appears if we look further back in the history of human thought. From the very moment of their emergence, grand unified theories of existence tended to become global. Even the Abrahamic theological tradition, that was dominant in the western half of the Afroeurasian world-system in the Late Ancient and Medieval periods, contains a sort of proto-Big History. It presents a unified vision of the Universe's origin, development, and future. In that grand narrative, the Universe has a single point of creation and it develops according to a divine plan. Similarly, classical Indian religious philosophy loosely resembles the principle of the unity of the world through the idea of reincarnation, in a Hindu approximation of the First Law of Thermodynamics. Even the delusions of astrologers and alchemists contained the idea of universal interconnectedness (stars and planets affect human fates; everything can be transformed into everything else). This is only a fragment of the pre-modern ideas that contained an element of Big History thinking. Many interesting insights on the properties of the Universe can be found in pre-scientific worldviews generated by various human civilizations.

Ancient philosophy even aspired to find the single principle cause for everything that exists[1]. This was done in a very insightful way in the works of the ancient Greeks, who were especially interested in the origins and nature of the Universe. Note that, even while Greek (and, more generally, classical) philosophy concentrated on ethical or aesthetic issues, it was still dominated by the idea of the single law of *Logos* that governed the whole Universe, with many different interpretations of it provided by various thinkers. This was reinforced by the concept of a 'cosmic circulation' that also influenced human society. Medieval philosophy inherited the Greek tradition 'to comprehend the universe on the basis of archetypical principles … as well as the inclination to detect clarifying universals in the chaos of the life' (Tarnas 1991).

The Beginning of Modern History of Big History

The transition from the geocentric (Ptolemaic) to the heliocentric (Copernican) perspective took many decades notwithstanding all the brilliant conjectures of Giordano Bruno (1548–1600). Discoveries by Johannes Kepler (1571–1630), Galileo Galelei (1564–1642), and Isaac Newton (1643–1727) produced a majestic vision of the Universe. For the first time in history, a more advanced form of Big History thinking was produced – not by the speculations of philosophers or theologians but on the basis of corroborated facts and mathematically formulated laws of Nature. 'Mechanicism' became the dominant paradigm in western scientific thought (including the social sciences). Thus the formation of a unified scientific worldview was consolidated. 'Natural philosophy', the precursor term for science, investigated everything from the highly cosmological to the deeply sociological and continued to preserve its dominant position in the eighteenth century: the age of the Enlightenment (see Barg 1987; Grinin 2012 for more details).

However, new ideas stressing historical variability soon emerged. Those ideas and discoveries led to a crisis of the dominant scientific paradigm. In geology, Georges-Louis Leclerc, Comte de Buffon, systematized all the known empirical data and analyzed a number of important theoretical issues of the development of the Earth and its surface. He also produced a few insights that turned out to be important for the development of the theory of biological evolution. The hypothesis of the emergence of the Solar System from a gas nebula was first spelled out by philosopher Immanuel Kant and later by mathematician and astronomer Pierre-Simon Laplace in one of the notes to his multivolume *Mécanique Céleste* (1799–1825).

Some of the philosophical roots of evolutionary ideas are very old indeed, and scientifically based evolutionary ideas first emerged in the seventeenth and eighteenth centuries. But the idea of universal evolution only became really influential in the nineteenth century. The first major evolutionary theory in biology was produced by Jean-Baptiste Lamarck (1744–1829), who advocated change via acquired traits. Another no less evolutionary theory was formulated in geology by Charles Lyell (1797–1875) who, in his *Principles of Geology* (1830–1833), refuted the theory of catastrophism.

It is no coincidence that the first narratives beginning to resemble modern big histories first emerged around this time. The first real concerted and conscious attempt to unify the story of the physical processes of the universe to the dynamics of human society was made

[1] In particular, in the classical Indian Philosophy one finds the belief in the 'eternal moral order' of the Universe as well as ideas of the collossality of the world space and time, infinity of the Universe comprising millions of such worlds as our Earth (see, *e.g.*, Chatterjee, Datta 1954).

by Alexander von Humboldt (1769–1859), a Prussian natural philosopher, who set out to write *Kosmos* (1845–1859), but died before he could complete it. Also, Robert Chambers anonymously published the *Vestiges of the Natural History of Creation* in 1844. His book began with the inception of the Universe in a fiery mist and ended with a history of humanity.

In the second half of the nineteenth century, the concept of evolution by natural selection as pioneered by Charles Darwin (1859) and Alfred Russel Wallace (1858) merged with the idea of social progress espoused by Herbert Spencer (1857, 1862, 1896) and became a major influence on western thought. The idea of evolution/progress as a transition from less to more complex systems dramatically transformed the human worldview (note: although Spencer paid more attention to biological and social evolution, he treated evolution as a universal process taking place at all possible levels – from microorganisms to galaxies). It became known that stars and planets, including the Sun and the Earth, are objects that have their origin, history, and end. There was a great deal of indication that revolutionary changes in astronomy were forthcoming.

Two discoveries produced the most important contribution to the emergence of Big History. First, the interpretation of the redshift by Edwin Hubble in the 1920s demonstrated that the Universe is not static and eternal, but is in a general state of expansion, as if it began with a primordial 'explosion'. By the 1940s, interacting teams of physicists and astronomers from around the world speculated on the existence of left-over radiation from this event – cosmic microwave background radiation. This radiation was detected in 1964 by Arno Penzias and Robert Wilson and provides the most convincing observational evidence for the explosive beginning of our Universe, which in the late 1940s George Gamow and Fred Hoyle called the 'Big Bang'. The simple epithet became useful for the theory's supporters. Moreover, the emergence of *historical* evidence for a point of origin of the Universe established a sense of chronology and transformed astrophysics into a historical science. The door firmly swung open for scholars of all shades to produce a universal history, called, to use our own simple epithet, 'Big History'.

Cambrian-Style Explosion of Big History

By the last decades of the twentieth century, it became clear that the natural sciences contained a clear narrative from the Big Bang to modern day and this unity began to find expression in an increasing number of written works. For the first time it was actually possible for the mainstream to grasp the entire chronology.[2] This began the process of thinking about both natural and human history as part of the unified whole. In 1980, astrophysicist Eric Jantsch wrote *The Self-Organizing Universe* (Jantsch 1980), now sadly out of print, which tied together all universal entities into a collection of processes. It constitutes the first modern unifying Big History. Jantsch did a credible job of examining human history as an extension of cosmic evolution and as just one of many structures operating beyond thermodynamic equilibrium. Jantsch's work constitutes the first attempt to find a common strand or dynamic that streamlines, unites, and underwrites the entire grand narrative. It is thus possible to explore history from the Big Bang to modern day without being weighed down by the scale of the chronology.

Around the same time American-based astrophysicists, geologists, and biologists such as Preston Cloud, Siegfried Kutter, George Field, and Eric Chaisson began writing and

[2] A phenomenon best discussed in David Christian (2009).

teaching courses about the cosmic story. Then at the end of the 1980s history and psychology professors like David Christian in Sydney, John Mears in Dallas, and Akop Nazaretyan in Moscow[3] began to craft grand narratives that incorporated the human story more seamlessly into a larger universal narrative. Fred Spier did the same at Amsterdam and Eindhoven. From here, a Cambrian-style explosion of courses and works has occurred.[4]

Eric Chaisson's *Cosmic Evolution* (2001) defines the unifying theme of Big History as the rise of complexity, which, he argues, occurs when energy flows through matter become increasingly dense. Chaisson even proposed a way of objectively measuring this trend. Free energy rate density is the energy per second that flows through an amount of mass. In this way Chaisson empirically established that complexity has been rising in the Universe for 13.8 billion years. The theme of rising complexity was incorporated into David Christian's *Maps of Time* (2005) which further employed it in the human tale. Fred Spier, most recently in his book, *Big History and the Future of Humanity* (2010), has emphasized the Goldilocks principle, and how the rise of complexity occurs when conditions like temperature, pressure, and radiation are 'just right' for the rise of complexity to occur. Spier asserts that the rise of complexity combined with energy flows and the Goldilocks principle form the beginnings of an overarching theory of Big History.

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.

Big History and Evolutionary Megaparadigm

Big History has much in common with the interdisciplinary evolutionary research, and this is not a coincidence that the Russian version of Big History is called Universal History or Universal Evolutionism.

We need epistemological key terms in order to understand change in nature and society in its entirety. There are not that many scientific notions that could play the role of such key terms. We think that evolution is one of them.

One of the clearest manifestations of the universal evolutionary approach is just Big History that considers the process of evolution as a continuous and integral process – from the Big Bang all the way down to the current state of human affairs and beyond.

Big History provides unique opportunities to consider the development of the Universe as a single process. However, one should note that the Big History studies tend to pay little attention to such an important aspect as the unity of principles, laws, and mechanisms of evolution at all its levels. We believe that combining the Big History potential with evolutionary approaches can open wider horizons in this respect (see Grinin *et al.* 2011). Indeed, common traits in development, functioning, and interaction can be found in

[3] For more detail on the Russian Big History tradition see Nazaretyan 2011.

[4] For recent survey of size and of the field see Rodrigue, Stasko 2009; and the canon of seminal works includes but is not confined to Fred Spier's *The Structure of Big History: From the Big Bang until Today* (1996), David Christian's *Maps of Time: An Introduction to Big History* (2004), Eric Chaisson's *Epic of Evolution: Seven Ages of the Cosmos* (2006), Cynthia Stokes Brown's *Big History: From the Big Bang to the Present* (2007), and *Evolution, a Big History Perspective* (Grinin, Korotayev, Rodrigue 2011).

apparently quite different processes and phenomena of Big History. In this respect the universality of evolution is expressed in those real similarities that are detected in many manifestations at all its levels. The comparison between different types of macroevolution appears to be essential for the search for such similarities. We also believe that there are several important aspects to such an approach.

First of all, there are established fundamental notions such as 'matter', 'energy', 'entropy', 'complexity', 'information', 'space', and 'time', that provide a general framework for comparisons.

In the second place, matter has some very general properties, which were perhaps already predetermined during the initial super dense phase of the universe. During the subsequent phases of universal evolution, matter acquires very specific forms, while new properties emerged at every new stage of the universal evolution.

In the third place, a few general system-dependent structural properties of matter[5] appear to determine similarities between different types of macroevolution. Ashby (1958) noticed that while the range of systems is enormously wide, most systems consist of physical parts: atoms, stars, switches, springs, bones, neurons, muscles, gases, *etc*. (see also Hall and Fagen 1956). In many cases we are dealing with very complex systems that are found in many places (Haken 2005: 16). The emergence of forms of greater complexity results from the transition from one evolutionary level to another. The general principles related to the functioning and development of such objects can be described by general system theory. The concepts of self-organization and transition from equilibrium to a non-equilibrium state are also relevant in this respect. In addition, both biotic and abiotic systems show complex interactions with their environment that can be described in terms of general principles.

In the fourth place, mega-evolutionary trajectories can be considered as components of a single process, and their different phases can be regarded as different types of macroevolution that could be similar in terms of their main trends and directions as well as particular mechanisms. This will be discussed in more detail below.

In the fifth place, we can speak about common vectors of megaevolution as well as common causes and conditions during the transition from one level of organization to another. There is a number of very important categories that are relevant for the analysis of all phases of megaevolution, most notably self-organization, stable and chaotic states, phase transition, bifurcation, *etc*.

It appears to be also possible to speak about some other points confirming the unity of many principles of the organization and functioning of our world at all the levels and in rather various aspects. Hence, the integration of such paradigms as Big History and megaevolutionary comparative studies allow researchers and students to view a colossal panorama of our Universe at various levels and in very different aspects.

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[5] If we take into account the concept of dark matter, it might be more appropriate to speak about ordinary matter as 'matter that is capable of evolution' (see Grinin 2013).

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