

Big History – “The Study of All Existence”

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Abstract

Big History is a new interdisciplinary field of study that attempts to comprehend the Universe in a unified and scientific way – from its beginning in the Big Bang almost 14 billion years ago to the formation of the Earth, evolution of life, the development of our own species and its social evolution, along with the many global challenges that we face today. Put concisely, Big History is the “Study of All Existence”. In order to provide focus and organization to this ambitious study, a group of scholars with backgrounds in the physical, biological and social sciences gathered in August 2010 at the Coldigioco Geological Observatory in the mountains of eastern Italy and founded the International Big History Association (IBHA). This collective action was the culmination of not only decades of individual development of Big History at universities in the United States, Russia, Australia, Europe and elsewhere, but also a process that rose above the conflicts of the Cold War and the Space Race, transcending disciplinary rivalries and national differences. In this paper, we describe the developments that led to the founding of the International Big History Association.

“The astronomer talking of ‘galaxy and star formation’, the geologist discussing ‘plate tectonics and erosion’, and the biologist describing ‘life and evolution’ were all referring in different ways to what historians might describe simply as historical change or change through time. Is change fundamentally the same thing in cosmology, geology, biology and history?”

—David Christian, President, International Big History Association, and professor of Big History, Macquarie University, Sydney, Australia.

Introduction: The Roots of Big History

We begin with the question: “What meaning can we derive from the vast panorama of the Universe, life on Earth, and our current global challenges?” Up until recently, much of humanity’s creative focus to understand nature has been on developing methods and technologies to facilitate the collection of data and development of theories within particular disciplines or between a few related ones. As a result, an explosion of knowledge has resulted within the physical, biological, and social sciences; while the contemplative realms of the humanities and the expressive realms of the arts have resulted in creative infusions of this knowledge into society to various degrees.

Let's consider an example of this "chain of knowledge". In the 1920s, Edwin Hubble and colleagues made the startling discovery that the Universe is not static, as had been assumed for millennia, but is in a general state of expansion, as if it had begun with a primordial explosion. Already in the 1940s, interacting teams of physicists and astronomers from various parts of the world speculated on the existence of left-over radiation from this event, the so-called cosmic microwave background (CMB). This radiation was detected in 1964 and provides the most convincing observational evidence for the explosive beginning of the Universe, which has become known as the "Big Bang". First enunciated by a Catholic priest (Georges Lemaître) in 1927, Big Bang cosmology has received endorsement from a wide variety of philosophical traditions, including Pope Pius XII and followers of the Abrahamic religions to those in Buddhism and Hinduism, as well as post-modernists, neo-Kantians, and many others. In popular culture, it has appeared in children's literature, novels, TV shows, musical compositions, cinema, and T-shirt logos. Such interactive synthesis around one concept of astrophysics is a testimony to the power of global communication today. Any number of other examples could be chosen from Biology, Geology, Anthropology or other clusters of disciplines.

This kind of intellectual synthesis has taken place in various ways since ancient times, whenever humans tried to explain the world around them and their place in it. It happened when Paleolithic artists painted or etched images on rock walls and is certainly recognizable in the Axial Age, when Pre-Socratic scholars in Greece and Zhou philosophers in China developed holistic cosmologies. Despite the subsequent growth in religions of salvation, such rational efforts persisted and were expressed most visibly in technological development, adaptation, and diffusion. It was a global effort. Much of this innovation came from China, was revised in Europe, and then was re-exported to overseas colonies. Examples include ceramics, gunpowder, spaghetti, and vaccination. Likewise, Europeans drew on ancient Chinese traditions of encyclopedias, resulting in similar Enlightenment efforts to unify all knowledge. In this tradition, German naturalist and explorer Alexander von Humboldt (1769–1859) developed his five-volume work, *Kosmos*, between 1845 and 1862, which may be regarded as a founding event of Big History. (Spier 2010: 10).



Memorial to Alexander von Humboldt, Humboldt University, Berlin.
Sculptor: Reinhold Begas (1883). Credit: Wikimedia,
(<http://en.wikipedia.org/wiki/File:AvHumboldt.jpg>).

From Departmentalism to Cross-Disciplinary Studies

However, such “universal” efforts began to decline with the advent of the modern university and its departmentalized studies in the mid-19th century. Indeed, reductionist accumulation of knowledge into strictly demarcated disciplines led to distrust of attempts to synthesize information into a larger meta-narratives. (Rodrigue 2010, 2011).

Despite limitations of modern university infrastructure, scholars formed cross-disciplinary studies to match the newly generated knowledge. Thus, we saw the rise of Astrophysics, Biochemistry and Electrical Engineering...to name just a few. As a result of the scientific and technological activities of the Second World War and Cold War eras, the vast assemblage of new data soon led to the need for even larger frames of reference. In the 1960s, the Space Race galvanized efforts to foster new interdisciplinary discoveries, while socio-historical scholarship that had sought to understand the post-colonial world underwent similar revitalization.

Soviet scholars developed an integrated pedagogy, which was called Universal History and fit under the Education Ministry’s category of “Conceptions of Modern Sciences” (Nazaretyan 2005a; Grinin, Markov, Korotayev 2009). One of the first modern books to attempt to describe this new view of existence was by astrophysicist Iosif Shklovsky in *Universe, Life, Intelligence* (Shklovsky 1962). Four years later, an expanded English-language adaptation of this work was

produced with American astrophysicist Carl Sagan, *Intelligent Life in the Universe* (Shklovsky and Sagan 1966). This international co-operation was not accidental, as a similar form of macro-study had also developed in the United States.

Much of this macrohistorical work in the United States originated in physics and astronomy departments. Astronomer Harlow Shapley had taught a course on “cosmography” at the Harvard College Observatory from the 1920s through the 1950s. His courses addressed the interlinked nature of stars, Earth, life, and humanity. Carl Sagan followed Shapley at the Observatory, where he taught a course on life in the Universe. Astrophysicist Eric Chaisson succeeded them and developed a course on Cosmic Evolution with physicist George Field in 1975 (Chaisson 2010b). Astronomer Tom Bania at Boston University also developed a course on Cosmic Evolution in the Physics Department, which was spun off from astronomer Michael Papagiannis’ course on “Our Blue Planet,” as well as astronomer Robert Rood’s course on “Life Beyond Earth” at the University of Virginia. Rood, Papagiannis and Bania were all founders of the bioastronomy commission of the International Astronomical Union (Bania 2014). Astrophysicist G. Siegfried Kutter taught a course on physical and biological evolution at The Evergreen State College in Olympia, Washington at this time. It traced cosmic evolution from the Big Bang to the appearance of *Homo sapiens* on planet Earth. He developed this material into a textbook in 1987.

This process emerged on its own in other parts of the world. In the 1980s, several Chinese scholars, including rocket scientist Qian Xuesen, began to research complexity. They published a paper on the Open Complex Giant System (OCGS). The OCGS had parallels with Big History, in that it was a meta-synthesis of scientific knowledge. (Qian, Yu and Dai 1990). In 1996, science historian Dong Guangbi and Tian Kunyu published the book, “The Origin of Heaven & Earth – Natural Evolution & the Birth of Life.” Three years later, historian Ma Shili at Nankai University extended his two-volume text on world history to include cosmic origins and the evolution of life.¹

A variety of scientific books that were early formulations of Big History also began to be published at this time (Cloud 1978; Jantsch 1980; Chaisson 1981, 1987; Reeves 1981; Asimov 1987; Nazaretyan 1991). Some of them became very popular. The television series, *Cosmos*, by Carl Sagan (1980) was viewed by over 500 million people in 60 countries, while the book, *A Brief History of Time* (1988), by English astrophysicist Stephen Hawking, sold over 9 million copies (Wikipedia 2010: “Carl Sagan”; “A Brief History of Time”).

There had also begun a variety of projects designed to bridge national narratives. In 1949, the United Nations Educational, Scientific & Cultural Organization (UNESCO) established an international commission to assemble a scientific and cultural history of all of humankind. The initial volume of the six-book series came out in 1963. A revised edition was released in the 1980s, and a third edition in 2009. The lofty goal of these publications was a holistic assemblage of material about human development over time. (United Nations 2011).

The Merging of Cross-Disciplinary Studies into Big History

In this period of the 1970s and 1980s, socialist and capitalist models coalesced with international studies in an effort to comprehend the many faces of global development. This led to a merger of the Annales Approach with Dependency Theory, which evolved into World Systems Analysis. Economic historian Andre Gunder Frank attempted to move global studies outside of Cold War frameworks and described what he saw as a one-world system (Frank 1978). Historian Immanuel Wallerstein, who also identified a unified world economy, envisioned it as being composed of interlocking systems (Wallerstein 1984). This socio-historic work expanded further and began to merge with larger paradigms, as when economist Graeme Snooks moved his Theory of Global Dynamic Systems beyond the modern era to encompass all of Earth's history, including its physical interactions. (Institute of Global Dynamic Systems).

Yet another manifestation of this interdisciplinarity appeared in calls for reform of general education in universities. In 1985, historian John Mears advocated for what was essentially a general education curriculum for the United States based on Big History (Mears 1986, 2010). Four years later, historian David Christian at Macquarie University in Sydney (Australia) and John Mears at Southern Methodist University in Dallas, Texas (USA) began teaching courses that attempted to span all existence, in the context of history.

As David Christian explains, it began with asking scholars from other disciplines the question: "When does history begin?" Receiving different answers from biologists, astronomers, geologists and others, he realized that students were getting confused fragments about our origins from different disciplines. So he sought to "erase" the "jagged edges" between these studies and make a course that was more unified. In 1991, he coined the term, "Big History," and the name stuck, at least for many social scientists. (Christian 1991, 2010; Christian and McNeill 2008;

Spier 2005). Physical scientists tend to retain “Cosmic Evolution” as the name of their integrated studies, while Russian scholars call it “Universal History” or “Megahistory.”

This holistic concept spread when sociologist Johan Goudsblom encountered Big History on a visit to Australia in 1992 and began offering a similar course with anthropologist Fred Spier in the Netherlands two years later (Spier 2005: 1). As a result of this course development, Spier wrote, *The Structure of Big History: From the Big Bang until Today*, which was the first text labeled as Big History in 1996. The field’s early promotion was assisted by the support of an earlier generation of global scholars, most notably William McNeill (Christian and McNeill 2008). Others, such as geologist Walter Alvarez, who had long been doing work that fit within the Big History paradigm, joined the effort (Alvarez 1997, 2008).

Eric Chaisson’s works serve as standard texts for physical scientists, as with *Cosmic Evolution: The Rise of Complexity in Nature* (2001). In Russia, historical psychologist Akop Nazaretyan synthesized the principles of Universal History with his book, *Civilization Crises within the Context of Big (Universal) History: Self-Organization, Psychology & Forecasts* (2001). David Christian developed what became the standard Big History text for social scientists with *Maps of Time: An Introduction to Big History* (2004). Educator Cynthia Brown wrote a popular text, *Big History: From the Big Bang to the Present* (2007), while Fred Spier brought out a second book, *Big History & the Future of Humanity* (2010). Most of these volumes have been translated into world languages and are regularly produced in new editions. Thus, a solid core of literature has come into service of the new field.

People in a variety of fields began to adopt a Big History model. Frank Niele, principal scientist at the Royal Dutch Shell Laboratories in Amsterdam, used energy as a baseline for periodizing developments on Earth in his study, *Energy: Engine of Evolution* (2005). Barry Wood, at the University of Houston in Texas, developed a model of “Cosmic Narratives” for his English courses (Wood 2011). Big History entered primary education, as in the Montessori system, where it is called “Cosmic Education”. (Werkhoven 2011). Students developed Big History social networks that linked hundreds of participants from around the world (Facebook: Big History Club). The creative arts already held such universal views, as in bioregionalism, geopoetics, and eco-art (Lawless 2011, Metallo 2011). A rich variety of children’s books have also resulted (Gronek 2011, Hawking 2014). This creativity was apparent when poet Nanao Sakaki declared himself to be a citizen of the Milky Way! (Lawless 2010; 2011: 267).

Scholars identify the processes that come together in Big History in various ways. Biologist Edward Wilson refers to the cross-disciplinary unification of knowledge as *consilience*, while Fred Spier breaks it down into a series of nested *regimes* (Wilson 1998; Spier 1996, 2008). Spier also has been engaged in an effort to clarify a research agenda for Big History. Thus far, an acknowledged research theme rests with Eric Chaisson's metric of "energy rate density", which is the rate of energy-flow through a system in order to determine its degree of complexity. (Chaisson 2010a; Spier 2011a).

Although *globalization* describes general human outreach around the world, as well as its recent intensification by information technology (Findley 2011), some international humanists distinguish world social networking as *mondalization* (Rodrigue 2011: 75). Geographer Barry Rodrigue suggests that the inherent need for inclusive understanding and wide parameters that exists in Big History is a process of *mutualization*, as it results in a heightened awareness of the fragile, mutual dependence between human and non-human worlds, between organic and inorganic regimes, and between microscopic and macroscopic levels.²

Big History has even begun receiving public endorsements from prominent public figures like Microsoft founder Bill Gates and Nixon White House counsel John Dean. (Gates and Rose 2009; Dean 2009). Akop Nazaretyan light-heartedly summed up the popularity of this field of study when he restated Marx and Engel's dictum: 'The ghost of Big History is roaming the Earth!' (Nazaretyan 2005b: 264).

The Founding of the International Big History Association

Besides courses and texts, other venues for presenting Big History have developed. Inspired by David Christian's audio-course on Big History (2007), Bill Gates engaged him to develop a free online high school curriculum, and textbook, on Big History.³ Released in 2013, it promises to deepen and spread Big History further. Since 2006, Barry Rodrigue has taught Big History in his college's general education curriculum at the University of Southern Maine. It has been so successful that he developed an online course, which recruited students from as far away as Germany and South Korea, and he is in the process of developing a sequel course. (Rodrigue 2011: 77–78). Dominican University in California is building an entire general education curriculum around Big History.

Along with their work in the deep history of their professions, astronomer Eric Chaisson and geologist Walter Alvarez have also become leaders in science education. Both have developed websites that articulate a Big History approach in their formulation of time and the Universe. Chaisson and his colleagues brought online, *The Arrow of Time* (Chaisson, Berry 2007) and *Cosmic Evolution: From Big Bang to Humankind* (Chaisson 2008), while Alvarez and Roland Saekow developed *Chronozoom* (Alvarez, Saekow 2010).⁴

World academic journals have welcomed articles on Big History, while panels on Big History have been convened at international conferences. An entire edition of the journal, *Social Evolution & History*, was devoted to Big History in 2005, as were two editions of the almanac *Evolution* in 2011. In July 2011, the World History Association conference in Beijing convened 7 panels and 2 roundtables on Big History. It is easy to look backwards now and see this trend, but, as recently as 2009, the leading advocates of Big History, Cosmic Evolution and Universal History were unsure about how widespread this movement really was or would become.

So, Barry Rodrigue began assembling a global directory of big historians and expanded his correspondence network in an attempt to determine who was doing this kind of work. The shared belief among its leading proponents was that there were only perhaps ten active big historians. To his and everyone else's surprise, he quickly identified dozens of people teaching and researching Big History around our planet. This network is rapidly growing. Some came to Big History as a result of encountering materials or people involved in the field, but a significant number had independently developed Big History because "it just made sense" – in other words, a global *conjuncture* was taking place. (Rodrigue 2009).

Big History practitioners come from a variety of backgrounds. They work in Sociology, Astronomy, History, Geology, Philosophy, Anthropology, Biology, Education, Art, and many other disciplines and departments. A rich supra-disciplinary collaboration has resulted. The classes of Fred Spier in Amsterdam, Eric Chaisson in Boston, and David Christian in Sydney number between 200 and 400 students (Spier 2011b), while Christian has recently begun accepting Big History graduate students in his program at Macquarie University.⁵ Christian also teaches a summer course on Big History at the Ewha Women's University in Seoul (Korea), while the late astronomer Tom Gehrels taught an annual spring course on Big History at the Physical Research Laboratory in Ahmedabad (India). Not all Big Historians work at the

university level, some teach in high schools and primary schools, while others are in the private and public sectors, from NASA to Microsoft. (Rodrigue 2009).

As a result of discovering this global ferment, Rodrigue proposed the formation of a global association of Big History in August 2010 during a workshop at the Coldigioco Geological Observatory in the Apennine Mountains of Italy. Discussion of forming such a professional society had gone on for years, but the documentation of Big History practitioners made it apparent that there was indeed a critical mass sufficient to make such an association viable. Thus, the International Big History Association (IBHA) was launched.⁶ The working definition of Big History that they adopted is:

“Big History seeks to understand the integrated history of the Cosmos, Earth, Life and Humanity, using the best available empirical evidence and scholarly methods.”

The IBHA is presently headquartered at Grand Valley State University in Grand Rapids, Michigan (USA). Members of the IBHA have been active with speaking and writing engagements, from classroom and community discussions to meetings with educational, industrial and political leaders. For example, IBHA President David Christian’s Technology, Education and Design (TED) presentation in Long Beach, California in March 2011 generated great enthusiasm.⁷ The IBHA has established a website (<http://ibhanet.org/>), which serves as a portal to much of the material that has been produced about Big History, as well as a newsletter that covers Big History events around the planet.

Several regional centers of Big History have formed. The Eurasian Center for Big History & System Forecasting, based in Moscow, is part of the Russian Academy of Sciences, while other centers have been established in North America, East Asia, and Oceania. The IBHA’s first conference took place at its headquarters in August 2012, a journal is in the process of being launched, and regional conferences and associations are planned in South Asia, Africa, the Middle East, and Central Asia.

So the question arises, what does this all portend? If it were just an obscure micro-discipline that a handful of specialists are advocating, then it would not necessarily be of significance. But, since the movement, as well as its area of scholarship, reflects a human trend of wider, more inclusive awareness of natural phenomena, we see Big History as a field of cooperative endeavor

that will continue to expand with exciting possibilities and lead to a deeper understanding of the Cosmos, Earth, life, and humanity.

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¹ Professor Sun Yue at Capitol Normal University in Beijing is the leading big historian in China and has been engaged in a study of Chinese traditions of macrohistory. Lecturer Sun Chao at Shandong Normal University in Jinan was a student of Ma Shili. We appreciate their insights into the development of Big History in East Asia. Li Qingcheng, a graduate student at Sun Yat-sen University in Guangzhou, also assisted with translation.

² This process of mutualism is an especial concern of Big History in Russia and Japan. Nazaretyan 2010. Tsujimura 2011.

³ Co-authors in the Big History Project are educator Cynthia Brown and historian Craig Benjamin.

⁴ ChronoZoom is being developed with the assistance of the University of California at Berkeley and Microsoft.

⁵ Spier teaches his course not just in the university, but also in the Eindhoven University of Technology and Amsterdam University College.

⁶ The Big Historians who met at the Coldigioco Workshop that founded the International Big History Association on 20 August 2010 and became its provisional board of directors were David Christian of Macquarie University in Sydney (Australia), Walter Alvarez of the University of California at Berkeley (USA), Craig Benjamin of Grand Valley State University in Michigan (USA), Cynthia Brown of Dominican University in California (USA), Fred Spier of the University of Amsterdam (Netherlands), Lowell Gustafson of Villanova University in Pennsylvania (USA), and Barry Rodrigue of the University of Southern Maine (USA). Other participants who were instrumental at this founding session of the IBHA were Alessando Montanari and Paula Metallo (directors of the Coldigioco Geological Observatory), Milly Alvarez, Pamela Benjamin, Gina Giandomenico, Penelope Markle, Daron Green and Michael Dix.

⁷ The official TED link is at (http://www.ted.com/talks/david_christian_big_history.html). It also appears on other sites, such as *YouTube* and *Wired*. Roland Saekow of the University of California at Berkeley created a high-definition format of this presentation at *Vimeo* (<http://www.vimeo.com/22243899>).

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