Origins

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E Pluribus Unum

International Relations and Big History

Shakespeare in the Cave: A Big History of Art

Defining Big History in a Scale Free Universe

IBHA Members

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E Pluribus Unum

*By **Chris Corbally**, SJ, and **Margaret Boone Rappaport***
Co-Founders, The Human Sentience Project, LLC

Our engagement with Big History was the result of no Big Bang. It came in fits and starts. In retrospect, it makes sense that an astronomer and an anthropologist from opposite ends of the scientific spectrum – one of the most rigorous of the physical sciences and one of the most qualitative of the social sciences – would need a home in which we both felt comfortable.

Before we explain, let's name the factors that have worked to place much of our work under the umbrella of Big History: (1) the educational goals of the Human Sentience Project, which we founded together, to engage in science teaching and public science education; (2) our dedication to empiricism and the rigors of the scientific method; (3) our willingness to consider and use in our writing the widest possible time frames, interdisciplinary frameworks, and the very latest evidence on humanity's place in the cosmos; and (4) our desire to view members of the genus Homo on a long timeline, and to consider the future of humans as well as their past as important topics of scientific investigation...

When Chris first met David Christian at a meeting on evolution in Hawaii, in 2008, he had no idea that he would team up with an anthropologist to write an entire series of books and papers. He simply was intrigued by the Big History that David presented. At that time, Chris saw Big History as an integral part of his work in interdisciplinary studies, for example, those sponsored by the ESSSAT, IRAS, and ISSR. He never expected that Big History would become the umbrella for much of his future work.

Margaret, a cultural anthropologist, also with a degree in biology, had already laid her sections of a bridge toward the more rigorous sciences, by publishing, with colleague John Wood, a book on computer applications for anthropologists.* Far from eschewing anthropology's timeworn method of participant observation, the book suggests (and she and others have demonstrated) that combining qualitative and quantitative methods in the same research design is fruitful. The methods support each other. And yet, at the publication of this book, cultural anthropologists were not having much to do with quantitative methods, so she turned to making a living in federal contracting – to program evaluation and policy research. Washington, DC, knew the importance of numbers.

Chris – an astronomer with the Vatican observatory, priest, and chorale singer – and Margaret – an anthropologist, biologist, futurist, poet, and science fiction writer – this unlikely pair came together in Big History, looking for a home that would span his discipline's stellar spectroscopy and evolution of galaxies, and her discipline's interest in evolution, human genetics, archaeology, physical anthropology, and the origins of religion. Chris and Margaret's joint interests focused on "the origins of religious thinking," and they gave a paper on that topic at the Moscow Big History Conference in 2013, where Chris met David Christian again.

Later, Chris mentioned the 2014 Big History conference in San Rafael to Margaret, and then he promptly dropped it for another long-standing conference commitment. She picked up the idea and convinced him to travel to California and present a paper with her that would evaluate Big History's Threshold 6. The rest is "small history." They have just completed a draft for publication.

Chris and Margaret also have just completed a manuscript for a book: *Space Science and*

Astronomy Skits; For Parents, Teachers, and the Future Workforce. In the book they explain that this book comes under "the umbrella of Big History." The Astronomy Skit Instructional Packages in this volume treat astronomy topics from the Big Bang forward, including the future collision of the Milky Way with Andromeda. The characters in the skits portray humans from 160,000 years ago, in East Africa, to the sighting of the Cassiopeian supernova in A.D. 3054 and mining asteroids in A.D. 3021. All of the skits are written either in the past or in the future, and they are written to teach astronomy lessons and lessons in the history and culture of the characters in the skits.

Their next book falls under the umbrella of Big History, too. They taped in January 2015, "A Dialogue by Priest and Anthropologist on Evolution." They will have the tape transcribed, then edit and supplement it with "Scenarios of Early Humans." They will present a version of this exchange to the freshman class at Dominican University in Fall 2015. They will also perform two of their skits, which illustrate the lessons in this book.

Next, Margaret and Chris will develop a book for an adult audience on Sentience and what they call "Matrix Thinking" (a major paper on this to appear in Zygon in March 2015**). The concept and framework of this volume are still in discussion, as is a fourth book on the lives and times of Jesuit scientists. This spring, they will further formulate their Emotional Brain Hypothesis (first presented at a 2014 ESSSAT conference in Assisi), which will be used in a workshop for members of the Jung Club of Philadelphia, in May 2015.

References

*Boone, Margaret S., and John J. Wood. 1992. *Computer Applications for Anthropologists*. Belmont, CA: Wadsworth Publishing.
**Margaret Boone Rappaport and Christopher Corbally. 2015 forthcoming. "Matrix Thinking: An Adaptation at the Foundation of Science, Religion, and Art." *Zygon: Journal of Religion and Science* 50 (March).

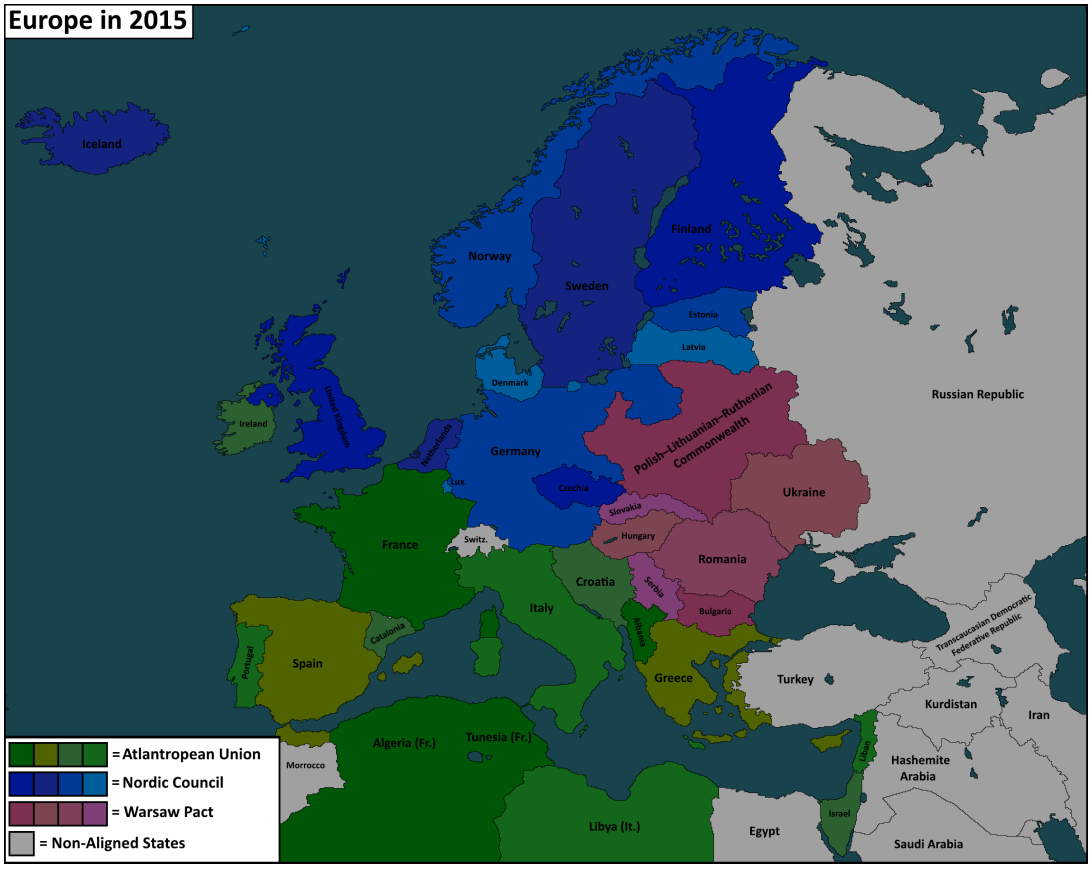
International Relations and Big History: My Personal Account

***Maarten Oranje**, Utrecht, The Netherlands*

Two years ago, almost to the date, there was no denying any longer that my work in a Dutch NGO was boring me.[1] Moreover, I had accumulated quite a lot of unused vacation time, and my employer urged me to do something about that. I decided to do something I had done before. I signed up for a course at the Institute for Interdisciplinary Studies (IIS) of the University of Amsterdam. As a matter of fact, I registered for their Big History course.

Not only did the course by Fred Spier and Esther Quaedackers turn out to be the most fascinating and educational one I had ever taken, presenting a coherent framework for fragments of knowledge that had always seemed unconnected, it also gave me new perspectives on my own field of study and work, the field of International Relations. I will share some of those observations with you, in a more or less chronological order.

Part of the course was to write a Little Big History, connecting a subject of your own choice to the different phases of the history of the universe. Having graduated in European Studies, I chose to write about the European Union. I was surprised – taking things to a more abstract level – how relatively easy it proved to find a link or similarity between my subject and literally every lecture given. As a matter of fact, I started to see the process of European Integration in a whole new way. Looking at a growing and ever more diverse group of countries, with growing and ever more diverse relationships between them, it became clear to me that, from a Big History perspective, this was just the emergence of a new level of political complexity.[2] The member states were the building blocks of a new type of political entity, the European Union (EU). Taking this perspective, it was also clear that the integration process had already advanced so far that it would be very hard to unravel that intricate web. As is also illustrated by the tenacity demonstrated by politicians and institutions during the recent debt crises: if it is at all possible to unbundle this overarching European framework, such an operation would



incur very high costs.

All this implied that both the EU and the preceding nation-states should be considered pockets of political complexity, each serving the needs of its own time. The breakthrough of the nation-state had obviously been the political solution that suited the enormous changes of the 19th century: industrialization and revolutions in transportation and communication. Characteristics such as (perceived) cultural homogeneity and the bottom-up legitimization of power – features that set the nation-state apart from its predecessors - had apparently helped states to become more efficient in harvesting matter and energy. In our age, in a similar way, the emerging of a European political framework in the second half of the 20th and early 21st century was the political answer to the acceleration of globalization, the rise of information technology, the Cold War, and the huge progress made in mastering nuclear energy.

This 'emerging political complexity' perspective helped me to assess the probability of scenarios for the EU's future. For one thing, the disappearance of the existing nation-states, i.e., their coalescence into one grand European nation, high ideal of some and nightmare of others, could now easily be judged highly unlikely. For whenever new complexity had emerged throughout Big History, the original building blocks had actually *not* disappeared. When atoms emerged, subatomic particles did not disappear in the process, but remained, as building blocks of a new, more complex order. When molecules first formed, atoms didn't disappear. Neither did molecules disappear when cells formed or did cells disappear when organisms formed. Moreover, emerging complexity typically came with brand new features, not present in the original building blocks. The idea of a European *nation*-state was therefore in all probability not a very accurate description of a future order.

At the same time, the complete opposite, i.e. the return to full national sovereignty, nostalgic dream of populist politicians, could also be declared very improbable. Throughout Big History, I could not think of an example of entities that became extremely entangled with each other, then reverted to the exact state from which they had originated. A fall back in complexity was possible, by all means, but not such a 180-degree reversal.

The future, therefore, had to lie somewhere in the middle. It follows from the arguments presented above that the existing countries will persevere as building blocks of a new political order, as will, by the way, the building blocks of those building blocks, such as regions, cities, etc. From there, the picture becomes less clear. In one scenario, the EU could prove an evolutionary success and continue to develop, creating an ever denser network of European, national, regional and local institutions, ever more interconnected, but probably without a clear decision-making center. Seen from the sky at night, Europe already very much resembles such a web. In another scenario, the EU could increasingly suffer from imperial overstretch and overcentralization, resulting in a lack of flexibility and innovation. In that case, the EU could indeed fall apart. Not simply into the constituent states however, I would argue, but fragmenting along new fault lines, creating yet new political entities.

As I was now observing Europe, and its future, through a Big History lense, I also started to see the extent to which all of the above was related to the role of borders, of boundaries. The nation-state, to be sure, was a political entity obsessed with its territoriality, and hence with its borders. As a matter of fact, those borders had always fascinated me personally. As a boy, sitting in the back of my parents' car, on our way to France, or elsewhere in Europe, each border we crossed had seemed a passage from one world of meaning to another. Later on, I had learned how arbitrary these demarcations sometimes were, how they correlated only vaguely to the reality on the ground. When studying European history, I had become aware to what extent 'bordering' was actually a verb. Now, from a Big History perspective, I saw that the way in which a country created, maintained and needed its borders was hardly unique. It not only reflected how a city needed

its city walls, or a village its fence, but also how a human or animal needed its skin, a cell its wall or membrane, and the planet Earth its atmosphere. Pockets of complexity always bordered themselves, I understood, competing, co-existing or cooperating with the neighboring pockets, depending on the circumstances.

What then, I asked myself, were the shared features of successful boundaries? I could come up with three. Firstly, they needed to be *semi-permeable*. On the one hand, blocking flows of energy, goods or people was obviously vital: a boundary should have the capability to prevent potentially harmful flows, either from the outside to the inside (a destructive level of energy) or from the inside to the outside (the leaking of energy). However, should a boundary block all flows? This would hinder all interaction with the outside world, which is usually a very unfavorable condition If our atmosphere would not let part of the sunlight pass, or if our skin would not allow for transpiration, that would clearly damage our complexity greatly. Borders should, hence, be *semi*-permeable. Secondly, well-functioning boundaries all seemed to have the capability to grow weaker or stronger over time, adapting to changing circumstances. They were, in other words, *dynamic*. Thirdly, most if not all of them seemed to be *multi-layered*. Think for instance of the cell membrane, the earth's atmosphere, our skin, or city walls. Differentiation apparently makes a boundary stronger.

Applying this scheme to national borders, it was clear that they met all three criteria. They were definitely semi-permeable, meant to block aggressors, or to prevent a capital flight or a brain-drain, but allowing for importations and exportations that were estimated to be favorable. They were also dynamic – strengthening in times of danger, blurring in times of peace – and they were often multi-layered, for instance, creating the buffer zone that is commonly known as a no man's land. However, coming back to the second criteria, two contradictory forces seemed to be at play in recent decades. On the one hand, borders are blurring as a result of the liquidizing forces of globalization: people, goods, information and capital are often flowing regardless of borders. This is what is sometimes called the process of debordering. Re-bordering, however, is taking place at the same time, as recent years have seen a sharp increase in the number of border walls and fences being built worldwide. Think of Israel and Palestine, think of the US-Mexican border, think of India and Bangladesh. When discussing the EU, both trends are at play at the same time: whereas internal borders become increasingly blurred, external borders – especially along the Mediterranean – are being strengthened to prevent immigration, creating a so-called Fortress Europe. To me, this is another indication that a new pocket of complexity is emerging, and generating its border.

A final observation regarding borders and boundaries has to do with the interaction between core and periphery and is strongly related to the theme of innovation. As Fred Spier observed in *Big History and the Future of Humanity*, at lower levels of complexity it is mostly in peripheral zones that the highest level of complexity in a system is found.[3] This is, for instance, the case for the habitable zone of our galaxy, it is true for our solar system, and it is definitely true for planet Earth, where the biosphere is situated very far from the core.

This trend seems to have reversed when living organisms originated. In a cell, the highest level of complexity can be found in the nucleus, where it is protected against danger. Other examples include the position of organs in the human body, or a city center. As a matter of fact, it also goes for the location of many capitals in their countries. Border zones, however, remained fertile soil for innovation, as some flows are blocked, and matter accumulates, while other flows can pass and cause change, for better or for worse.

An interesting interplay now exists between the core and the peripheral zones of pockets of complexity, to which I will come back in a moment. Let me first tell that I attended the IBHA conference in San Rafael, giving a presentation on the above, and combining it with a stay in San Francisco. One of the sights I visited there was the AIDS memorial grove in Golden Gate Park. It commemorates AIDS

victims in the US since the early 1980s, first within the gay communities of New York and San Francisco, and then among a much wider population. It made me think about the nature of epidemics.

Shortly after arriving back home, I started a new job, at another international NGO. In my new position, I became responsible for the financial coordination over healthcare projects in three African countries. To deepen my knowledge of the context I would be working in, I studied a book on Africa's recent history, *The State of Africa*, by Martin Meredith.[4] Uganda being one of the countries in my portfolio, I learned that in this country, in the mid-1980s, one of the first major outbreaks of HIV (and consequently of AIDS) in Africa occurred. The disease was most probably introduced to Uganda by Tanzanian soldiers in the early 1980s, pushing back Ugandans into their own territory during an armed conflict, and engaging in sexual intercourse with local women. HIV, in other words, invaded Uganda from its border region with Tanzania. Since nobody was aware of it at the time, it easily reached Kampala, the Ugandan capital and center of gravity, where further transmission of HIV was assured. As the city saw intensive contacts among people from all over the country, travelling there for business, to see relatives or just on their way to another destination, its consecutive spread over the country was inevitable. Moreover, the city was a hub for foreign travellers, migrant workers and refugees, guaranteeing that the disease would also spread internationally. Summarizing, three stages can be discerned in this Ugandan HIV outbreak: first the invasion into its periphery, then the infiltration of its core and lastly proliferation from there.

It is a pattern that can be discerned in other epidemic diseases. As a matter of fact, one of the other countries in my portfolio is Sierra Leone. In September, when I took up the new job, it was just becoming clear to the world that the Ebola outbreak in West-Africa (Guinea, Sierra Leone, Liberia) was far from under control. While it was – and is – my job to provide long distance financial support to our local partner organizations, and to monitor how donor money is actually being spent, I started reading a little bit about the origins of the disease. Unknown to me initially, I learned that Ebola had been around for some 40 years. Until now, however, outbreaks had always taken place in peripheral, rural regions, where the disease transmitted – as goes for HIV – from animals (bats, primates) to humans. To my surprise, I discovered that the vast majority of Ebola outbreaks had actually taken place in regions relatively close to national borders, out of sight from central health authorities. As a matter of fact, the disease itself is named after a small river in the North of Congo-Kinshasa, close to the country's border with the Central African Republic. Thanks to the low population density in such areas, and the disease not being as contagious as is commonly thought, previous outbreaks had always stopped, or been extinguished, at an early stage.

This time, however, something else had happened. Once again, the disease sprung up in a very peripheral region, in the village of Meliandou in Guinea (in November 2013), far from the national capital Conakry, out of its sight and out of its control. From there, it easily reached the local hub Guéckédou, a city of 200,000 inhabitants and located just kilometers from both the Liberian and the Sierra Leonean border. As Guéckédou has intensive trade relations with those two countries, and no central authorities had yet become aware of the outbreak, the disease easily spread to neighboring border regions. Not only were more people infected now, they were also part of three different national networks, creating the danger that the disease would reach three capitals and would proliferate from there. And that, as we all know, is exactly what happened. As I am writing this, in December 2014, the infection rate is going down in both Guinea and Liberia, but it is not in Sierra Leone. There, the capital Freetown is now one of the most affected areas and new outbreaks keep popping up throughout the country, partly as a result of people traveling via Freetown.

The pattern is clear: a disease affects the periphery of a body, then infiltrates the center of control and proliferates from there.

The similarity to the workings of the actual biological virus could not be much clearer, I would be inclined to say. Whereas the cell nucleus is the replicator of the biological virus, a national capital – or another big city, acting as a center of gravity – plays that role in an epidemic. The pattern does not seem to be confined to biological disease, but may be applicable to cultural practices too, as for instance recent judicial investigations in Italy suggest. The fact itself that mafia practices, originating in the peripheral South of the country, deeply infiltrated national political bodies in Rome in past decades may not have come as a surprise to many. It does fit the pattern though, as from there, they seem to have proliferated and pushed levels of corruption all over Italy.

This interplay between periphery and core, I conclude, can be a change mechanism for better (innovation) or for worse (disease). As the examples have illustrated, there was and sometimes still is, a very good rationale behind the creation of territorial borders. Our world, however, is rapidly changing. Air travel has made it easy to circumvent the actual physical borders, information and capital are flowing freely thanks to the Internet and metropolises are increasingly becoming cultural, ethnic and linguistic 'border zones' in their own right. National borders, therefore, have lost much of their relevance. In those places where authorities are building new border walls and fences, they often seem to be fighting an uphill battle. And this is where I return to my initial observation regarding the relevance of Big History for the study of International Relations. Emergent political complexity, such as the EU, the Association of South East Asian Nations, or, globally, the United Nations, seems inevitable to tackle environmental problems, to stop international crime and terrorism and to counterbalance multinational enterprises, to name but a few examples. In places where such an overarching political framework has not yet emerged, and international coordination is insufficient, effects can be disastrous, as is now illustrated in West Africa. Given the current ineffectiveness of state power in Sierra Leone, strong international coordination will be the key to building a resilient healthcare system that is capable of stopping a future Ebola outbreak much earlier.

Is Big History indispensable to come to such a conclusion? No. This is, of course, a view shared by many observers. It has been my experience though that Big History *does* make a difference by providing a theoretical framework, a scientific underpinning, which can help us to distinguish between scenarios that are feasible – or probable – and scenarios that are not. As such, for me personally, the enrollment in a Big History course two years ago has not only led to a much deeper understanding of the world around me; it has also changed the way I look at my own work.

(Endnotes)

1 NGO is the acronym for a Non-Governmental Organization.

2 Drawing on Fred Spier's definition of complexity in *Big History and the Future of Humanity,* Chichester, Wiley-Blackwell, pp. 24-25.

3 Spier, Fred (2011), *Big History and the Future of Humanity*, Chichester, Wiley-Blackwell, p. 38.

4 Meredith, Martin (2006), *The State of Africa: A History of Fifty Years of Independence,* Simon & Schuster, London.

Comments are welcome: maartenoranje@gmail.com.

Responses to Rich Blundell's IBHA presentation on Deep Time Journey Network to "**Shakespeare in the Cave: A Big History of Art**" on YouTube.

Macquarie University PhD candidate in Big History, Rich Blundell, gave a well received presentation at the recent IBHA conference. It was recorded and recently placed on YouTube. Responses to it have recently been posted on the site run by IBHA member, Jennifer Morgan, called Deep Time Journey Network.

Shakespeare in the Cave: A Big History of Art

Rich Blundell

"Shakespeare in the Cave" is brilliant, thought-provoking, connective, and inspiring. What an incredibly multivalent presentation! I'm especially moved by how Rich synthesizes macro issues and how he facilitates the viewers' own transformative and/or insightful experiences, versus simply communicate information from his brain to ours. For example, connecting the results of scientific "rules" with the emergence of planets, connecting Carrara marble with earth's original eco-system, and connecting the development of stone tools with the emergence of narrative, aesthetics, and metaphor is heady, mind-bending stuff! One thing I will continue to contemplate is his comment that: "Van Gogh's visions and dreams are connected to his ability to sequester electromagnetism from the universe—AND SO IS OURS." (emphasis mine :-). So, not only is every THING on Earth made of star stuff, but our own human PROCESSES are also?! His interest in the personal and cultural transformative power of Big History totally resonates with me. I applaud his work connecting art and science with Big History and meaning.

Imogene Drummond, MSW, MFA
Creator of Divine Sparks multimedia project

Invaluable! Rich has gotten to the heart of our work and challenge in this time. The fusion of art and science and meaning may well be the equivalent of discovering language itself. His presentation collapsed time and space. Imposing the poetry and power of language from one

century on the imagery of our digital world not only made deeper sense of each of the parts in a new way. It very well may shape the consciousness of the future species.

He has accomplished what I've been trying to do in an experience we provide at our retreat. In a labyrinth walk through the woodlands we have visual markers to denote significant moments of the universe story. But finding the right images to mark 'the first cell or photosynthesis, etc. has not been satisfying. Why. Because all I could accomplish was a visual and scientific narrative 'impoverished' of meaning.

This was an excellent experience for me viewing A Big History of Art..

Thank you, Carol Kilby,
Gaia Farmhouse Retreat,
www.gaiafarmhouse.com

Great comments, Carol! I love your idea that the fusion of art and science may shape future consciousness.

I've been thinking more about this presentation/video and the direct connection that Rich makes between the ability of humans to dream and envision with electromagnetism from the Big Bang. (Am I understanding this correctly?) I have long understood that our own creative, self-transforming processes are—abstractly and metaphorically—connected with/reflective of the creative, self-transforming processes of the universe. Indeed, my Divine Sparks multimedia project is a metaphor for exactly that! However, I didn't realize that these human processes—of dreaming and presumably creating too—are scientifically and physically connected to the cosmos. That adds a deeper level of understanding and meaning! For me, this is a fascinating example of how Big History can provide transformative learning.

Imogene Drummond

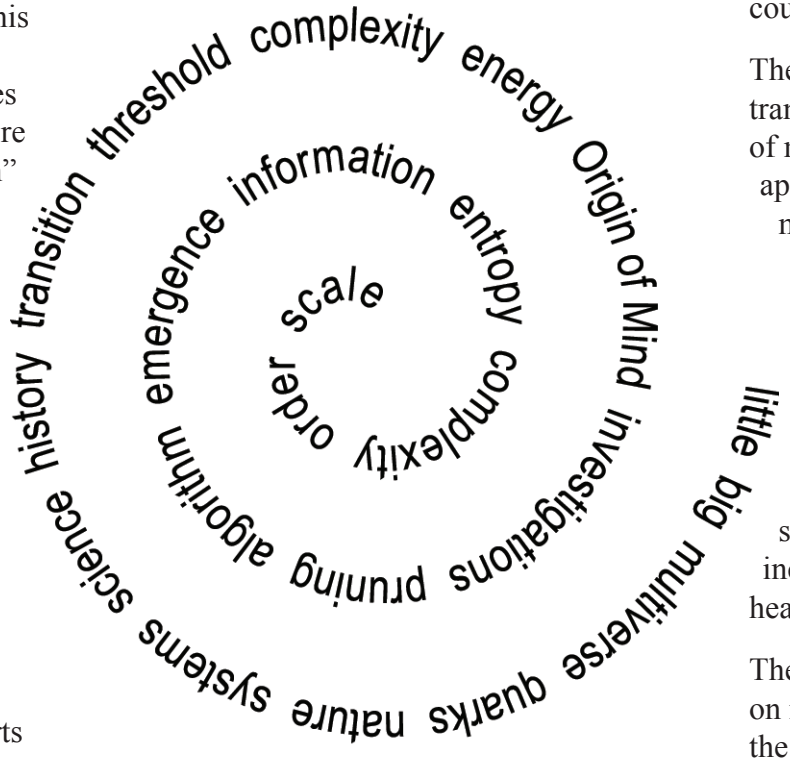
Defining Big History in a Scale Free Universe

*by **Camelo Castillo**, European Society for the Study of Human Evolution, Frankfurt am Main, Hessen, Germany*

Big History starts with small particles and ends with clever apes. We would love to know how this happened, but where do we start?

In 2010 I started writing a series of essays titled "Investigations" in homage to Wittgenstein's "Philosophical Investigations." The essays were an attempt to encapsulate the essential ingredients of natural transformation. It seemed to me that theorists from many different disciplines were struggling to describe a new way of understanding nature. My take on this new point of view was that scientists were starting to look outside their own disciplines for a broader consilience. Cosmologists were starting to look at processes like "evolution" while biologists were starting to use conceptual tools like "phase space." The nature of scientific inquiry was subtly changing. It smelled like a mini revolution. At the front of this revolution was a new set of ideas, new ways to imagine the nature of transformation across disciplines. The watchwords of this revolution were concepts like 'emergence', 'information', 'entropy', 'complexity', 'order' and 'scale'.

In the beginning I thought that writing a Big History would not be hard. In a naive sense I just needed to string together 'reports from the field' of a vast number of scientific disciplines. However, what I found was that it is difficult to choose what is relevant from the 'embarrassment of riches' that modern science is producing. To write Big History you need an angle. As Harold Morowitz is fond of saying, you need a 'pruning algorithm'. This is where it gets interesting. In my case, I wanted to go for the ontological throat of the problem like Terrence Deacon and Daniel Dennett had, but both of these theorists have consistently been



forced to move backwards into definitional conundrums and categorical morasses to try and establish a lexicon capable of unifying different scientific disciplines. Like them, I found myself increasingly forced back into the fundamental concepts we use to frame our questions. Ultimately, words are important. They channel our questions. They limit the ways we can think about a problem. What Big History lacked was a philosophical bedrock on which the science could be logically founded.

The problem was how to unify natural transformation so that an unbelievably hot soup of matter-energy could develop into clever apes in a logically consistent and testable manner. A history that is just one damn thing after another is deeply unsatisfying to the scientific mind, a mind that strives for a predictive and testable consensus. What I strove for in my "Investigations" was a fully scientific explanation of the nature of dynamic emergence. The problem was that the conceptual tools necessary to fit the science into a functional unity are currently incomplete. If Big History is interested in heavy lifting, it will need to bridge this gap.

The depth of this gap became apparent to me on my book tour this summer. I had finished the book, changed the name to *Origin of Mind:*

A History of Systems, flown back to North America, bought a car, and determined to meet the minds behind the ideas. Over the course of 2014 I presented and spoke at over 20 leading universities (including the wonderful IBHA conference at Dominican University, thank you!). The most surprising thing I learned on tour was how many of us have different ideas of some of the most basic concepts we are using to represent natural reality. Concepts like, 'order' 'emergence' 'information', 'scale', 'complexity' and 'entropy' are being used everywhere differently.

These concepts are the tools that define our emerging scientific understanding of how, when, where and why we exist. Developing a competence with them requires, first and foremost, an understanding of their limitations. What a tool like "entropy" or "Shannon information" gives us is one way to measure what nature is doing. However, nature itself is in no way limited by the metrics we use to represent it. The concepts we will need to make our scientific origin story work are, as yet, incomplete. To complete them we need to know what an idea like "entropy" or "information" can and, more importantly, cannot explain. Big History needs some fundamentals. Only then can we begin to develop those additional concepts necessary to fill in the gaps. Only then can we move to test our story against nature and take meaningful steps towards a predictive and testable consensus.

Origin of Mind proposes a philosophical methodology, a pruning algorithm by which we can start to measure the history of the universe by a unified metric. It starts with small particles and ends with clever apes but it is not really about what happened when. It is about 'how' such a transformation could happen. It is about what ideas we should think about changing and what ideas we should add. *Origin of Mind* weighs in on the conceptual revolution that is currently being waged on the nature of emergence. Like all revolutions, this one is being led by a handful of ideas. In the interest of opening a conversation about the limits and efficacy of some of these ideas I would like to include an excerpt on "scale" from *Origin of Mind*. This excerpt belongs with two other sections titled "Complexity and Information" and "Entropy, Energy and Order". All three can be found on my website originofmind.com.

Excerpt from *Origin of Mind: A History of Systems*:

A Scale Free Universe

Coming to terms with scale limits is like coming to terms with prejudice. Both beliefs limit our understanding of the universe. Enlightened people no longer believe in prejudice, but the same cannot be said for scale limits. Judging from the literature, many scientists and science writers believe that there is nothing smaller than elementary particles and nothing bigger than the Big Bang.

In experiment after experiment people of different 'races' have turned out to be equally capable and intelligent. Presumably the statistically equal distribution of intelligence not only applies to people over geographical space, but also over historical time. Presumably, people in the seventh century Persia were no 'stupider' than people in Philadelphia today. They may have 'known' less, but they were no less capable of knowing.

What does this tell us about scale in our universe? Let us take a look at the bottom end. Right now we believe that the bottom end of the scale is Planck's constant and the sixty or so elementary particles. Everything that we know of is made of sixty or so tiny energy structures (Gell-Mann, *The Quark and the Jaguar: Adventures in the Simple and the Complex*, 1995). We can't *see* any of these structures, but we can measure their effects with high tech tools. By categorizing these effects we have been able to give these structures distinct names like 'electrons' and 'quarks.' In 2010 when this investigation was written, the bottom end of the scale of causality was these sixty or so 'quanta,' but this was not always the case.

At the beginning of the nineteenth century John Dalton re-proposed a classic type of elementary particle.[1] He proposed that each chemical element was composed of tiny distinct

1 Democritus originally proposed the concept of atoms.

'atoms.' This was revised at the beginning of the twentieth century when the hydrogen nuclei was thought to be an 'elementary' particle. However, in 1911 Ernest Rutherford discovered that most nuclei contained 'protons' and 'neutrons.' In 1964 Murray Gell-Man and George Zweig discovered that these protons and neutrons were composed of 'quarks.' In just over one hundred and fifty years the bottom end of our scale of causality went from elements, to atoms, to nuclei, to protons, to quarks. The logical question this incites is; where does this all end? What indications do we have that our current 'quanta' are truly at the bottom of causality?

Science is founded on replication. If an experiment can be replicated it can be verified. If it is true that scientists in the twentieth century consistently found smaller scale levels, what about the nineteenth century? What about the eighteenth, seventeenth and sixteenth centuries? Can the twentieth century experiment be replicated? Do the equally clever scientists of each century equally believe that they know what the materia prima of the universe is? Have they all equally been proven wrong by the next generations of scientists? What would we find upon careful inspection?

We would find that the scientists of each century were all more or less equally intelligent (we wouldn't want our experiment to be inherently prejudiced?). We would find that they were all equally convinced that their system explained causality because they are famous for claiming so. We would find that they were all proven more right than their predecessors and more wrong than their antecessors. And finally we would find that they were all equally restricted by the technology of their age because proof depends on exactness of measurement and this has continually improved.

If this investigation were of a different character we could take the time to conduct this experiment. From classical elementalism to medieval alchemy to enlightenment chemistry to modern cosmology, each age has been populated by intelligent people who believed they knew the materia prima at the bottom of causality. All of these people built theories that were not only logically consistent, but were also constrained by their technology. All of these theories were eventually improved when technology improved, and improvement in each case has meant defining smaller, more precise parts that compose the physical world around us.

This historical fact implies that unless we believe ourselves smarter than others, or we have invented perfect measurement technology, we should be very careful in our belief that we know the bottom end of causality. It means that future generations armed with better technology will continue to find smaller, more precise causal patterns. Quarks will be found to contain galaxies of smaller pattern, perhaps the miniscule 'dimensions' that string theories posit. Furthermore, there is no evidence that we know the top end of causality either. Every time we build a stronger telescope we see bigger, more distant patterns. Recently we discovered that the previously known universe is really just a tiny part of a vast universe of unknown dark matter and dark energy. Historically, there seems to be every reason to believe that the Big Bang universe we see now will soon be recognized as just another location within a far vaster 'multiverse.'[2]

The beliefs that everything is within the Big Bang and that nothing is smaller than quanta are probably wrong. We may or may not live in a scale free universe, but there is no reason to believe that the current measurable boundaries are the true boundaries. The history of science has consistently reminded us that there is no special place in space-time from which to measure scale. The discoverer of one of our current scale limits, Max Planck himself, "was warned by a professor of physics that his chosen subject (physics) was more or less finished and that nothing new could be expected to be discovered" (Kragh, 2002, p. 3). That was in the nineteenth century.

Humans have a natural inclination to limit their thought to within the paradigms that map their own location, size and time scales.

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2 This reference to multiverse is not specifically referring to parallel universe theories, only to an expanded, yet unknown, conception of the universe.

Revolutionaries like Galileo, Newton, Planck, Einstein and Schrödinger proved these scale-limits wrong at every turn. Enlightened people should not believe in prejudice, whether it be against colour of skin, country of origin, or the fine graining of space-time.

For this reason, this investigation presumes a scale free universe. It takes Nobel Laureate Robert Laughlin's position that the reason quanta are all 'wave like' is because they too are collective phenomena. They too are composed of many parts interacting in concert, like waves. Like everything else in this universe, quanta are *communal*. One of the longest running experiments known to science could be framed as, 'Do we know the materia prima of the universe?' Every century that scientists repeat this experiment the result is the same, a resounding 'No.' If a millennia of historical experiments are any indication, there is every expectation that quarks and electrons will soon be found to be the results of interactions at lower levels of causality.

The quark itself will become understood as a "void for the greatest part, only interwoven by centers of energy" just as its antecedents were (Bertalanffy, *General System Theory*, 1968).

As our telescopes push the limits of our universe ever outward, our microscopes and particle accelerators push the limits ever inward. At every scale level we find pattern. There is no indication that the current level is special or definitive.

New and Returning IBHA Members

One of the key purposes of the IBHA is for those of us who are interested in Big History to have a place to associate. We enjoy learning of each other's Big History activities and thoughts through associating with each other. So we are delighted to welcome new members to IBHA membership. And we are delighted by the vote of confidence and recognition of the value of our association by those who have renewed their membership. It is a pleasure to have each of you with us.

December 19th - **Abel Alves** – renewal
December 20th - **Karl Benne** – renewal
December 20th - **John Knight** – new member
December 23rd - **Jim Cummings** – renewal
December 24th - **Jennifer Morgan** – renewal
December 26, 2014 – **James Campbell** – Renewal
December 26 – **Jeb Weisman** – New Member
December 28 – **Samuel White** – Renewal
December 29th - **Ross Dunn** – renewal
December 29 – **Mark Gregory** – Renewal
December 31 – **Michael Malesevich** – New Member
January 1, 2015 – **Eric Holmstrom** – Renewal
January 2 – **Deborah Johnston** – New Member
January 3 – **Joseph Woodhouse** – New Contributing Member

January 5 – **Kamran Nayeri** – New Member
January 8 – **Robert Moore** – Contributing Member Renewal
January 19th – **Alexander Mirkovic** – new member
January 20th – **Claas Neumann** – new member
January 21st – **Hope Benne** – renewal

Second International Symposium

Big History and Global Evolution

Moscow, October 21–23, 2015

On October 20–25, 2015 Lomonosov Moscow State University will hold the International Congress Globalistics-2015. In the framework of this congress, the Eurasian Center for Big History & System Forecasting in collaboration with the Faculty of Global Processes at Lomonosov Moscow State University is organizing the 2nd International Symposium "Big History & Global Evolution".

Big History is a relatively new field of study. It is a synthesis of disciplines from the natural sciences, social sciences, and humanities, one that seeks to explore overarching trends that stretch across all existence for 13.8 billion years, – based on the most current scholarly thinking. The definition adopted by the International Big History Association is as follows: "Big History is the attempt to understand, in a unified and interdisciplinary way, the history of the cosmos, earth, life and humanity."

Similar to Big History, the macroevolutionary approach seeks to develop an inclusive view of the cosmos, earth, life and humanity by erasing boundaries between disciplines, and that is why we have decided to organize a symposium dealing with Big History and Global Evolution as a unified whole.

The symposium will address a wide range of topics, such as:

- How Big History Works
- Interdisciplinary Development of Big History
- Understanding Big History and Evolution
- Big History Patterns, Trends, & Regularities
- Big History, Global Evolution, and Complexity Studies
- Evolution of the Universe
- Evolution of the Earth
- Evolution of Life
- Social Evolution
- Different Forms of Evolution: Connections and Comparisons
- Globalization within the Context of the Global Evolution
- Forecasting Global Future
- Big History Trends and Phases
- Teaching Big History

Co-organizers:
Faculty of Global Studies, Lomonosov Moscow State University
Eurasian Center for Big History & System Forecasting in the Institute of Oriental Studies, Russian Academy of Sciences

The Symposium will be held in the framework of the World Congress "Globalistics-2015" organized by the Moscow State University.

We would ask all those who do not exclude the possibility of their taking part in our symposium to fill in the participation form below and to email it to the Symposium conveners by March 1, 2015 at the following addresses:

Prof. Leonid Grinin (leonid.grinin@gmail.com)
Prof. Andrey Korotayev (akorotayev@gmail.com)
Dr. David Baker (D.C.Baker@uva.nl)

Faculty of Global Studies, Lomonosov Moscow State University
Eurasian Center for Big History & System Forecasting in the Institute of Oriental Studies, Russian Academy of Sciences

PARTICIPATION FORM

International Symposium

Big History and Global Evolution

(Moscow, October 21–23, 2015)

PLEASE, FILL IN THE FORM AND EMAIL IT TO THE SYMPOSIUM CONVENORS:
PROF. LEONID GRININ (Leonid.Grinin@gmail.com), PROF. ANDREY KOROTAYEV (AKorotayev@gmail.com), and DR. DAVID BAKER (D.C.Baker@uva.nl) by the 1st of March, 2015

Family name, first name

Title of the presentation

Abstract (within 300 words)

Institution/organization

Position

Office address

Tel/fax

E-mail

The Symposium will be held in the framework of the World Congress "Globalistics-2015" organized by Moscow State University.

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Nominations for IBHA Board of Directors

The members of the IBHA Board of Directors hold staggered three year terms. Each year, a few seats become open. Since the IBHA was founded, there have been a number of Board members who have cycled off the Board, a number of new people who have joined it, and a number who have stayed on. In the interest of fostering both continuity and change, the IBHA selects Board candidates in two ways:

(1) the existing Board proposes a list of names; and
(2) IBHA members identify additional names.

We encourage you to participate by logging on to the IBHA website at http://ibhanet.org/. Click on "Forum," "IBHA Discussions," and "IBHA Board of Directors Nominations." You may by April 15, 2015 post the names of any members you recommend for Board membership.

Up to that time, please check the forum periodically for new postings and endorse all candidates of your choice. (Just follow the simple instructions at the website.) Moreover, if you become a candidate, please add a statement describing your interest in serving as a Director. Should you be recommended but unable to serve, please let us know. Candidates endorsed by at least 10% of IBHA membership (37 people) before May 15, 2015 will become nominees.

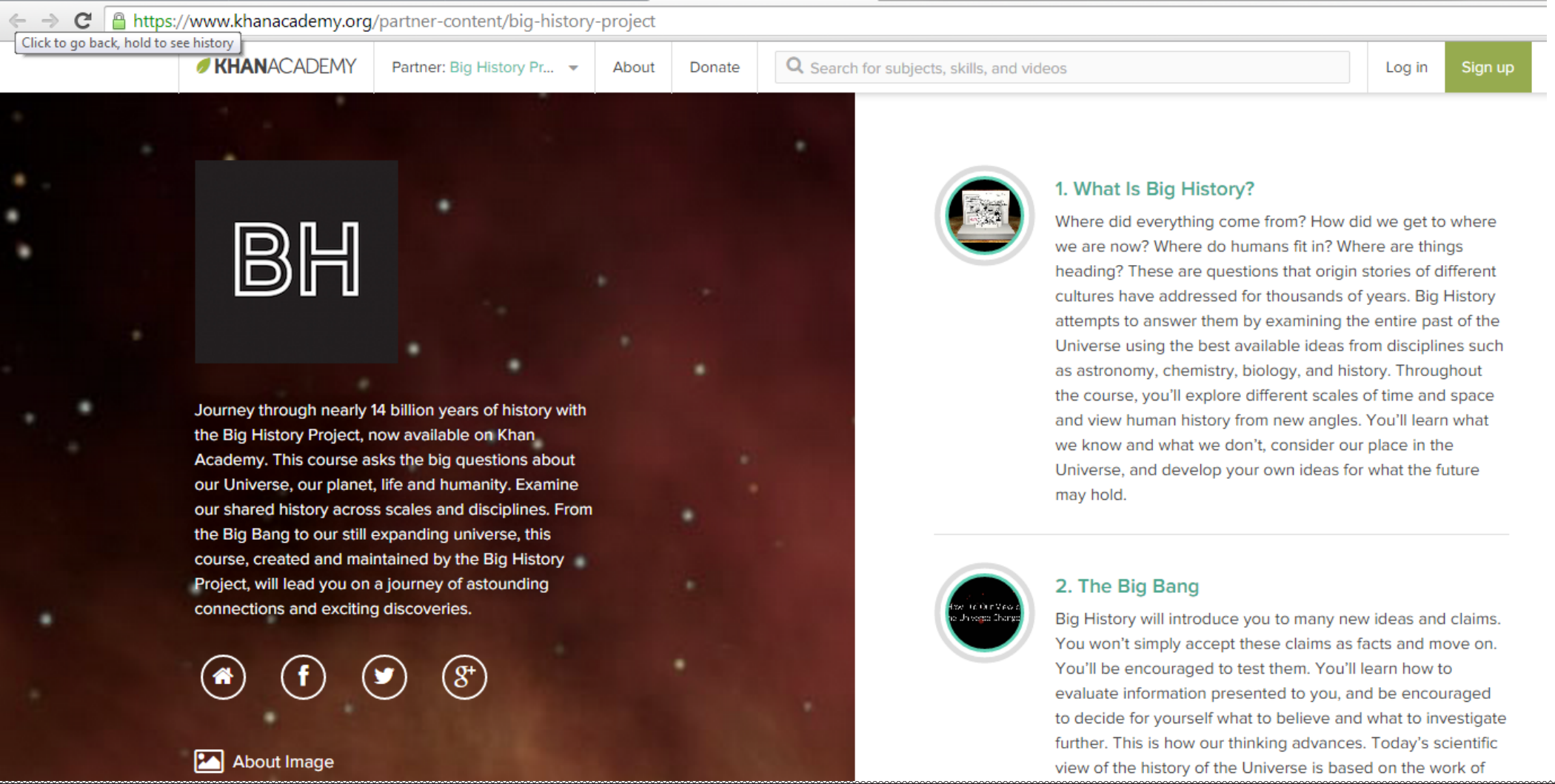
An electronic election for new Board members will begin on July 1, 2015, and end on July 31, 2015.

We welcome your active engagement in this important process.

The new Board will be announced in August.

Big History at the World History Association 2015 Conference?

The 24th annual conference of the World History Association will be held at the Hyatt Regency Hotel in Savannah, Georgia from June 30 to July 2 2015. If any members of the Big History community are interested in participating in the conference, please contact IBHA Treasurer (and WHA President) Craig Benjamin, who will help organize potential panels or roundtables. Craig can be contacted at: benjamic@gvsu.edu



Big History on Kahn Academy

Journey through nearly 14 billion years of history with the Big History Project, now available on Khan Academy. This course asks the big questions about our Universe, our planet, life and humanity. Examine our shared history across scales and disciplines. From the Big Bang to our still expanding universe, this course, created and maintained by the Big History Project, will lead you on a journey of astounding connections and exciting discoveries.

IBHA Conference July 14 - 16, 2016

University of Amsterdam

The Board of the IBHA is delighted to announce that our **third conference will be held in the beautiful and historic European city of Amsterdam from July 14 - 16, 2016**. This will be the first IBHA conference held outside of the United States, and we are looking forward to working with our colleagues at the University of Amsterdam to stage another unforgettable event.

The Conference Planning Committee is already hard at work investigating suitable University of Amsterdam buildings, nearby hotels and hostels (at a range of prices), walking and other pre-conference tours of the city, and a post-conference tour that will visit many of the leading scientific facilities in Europe. We will keep all members fully informed as plans for the third IBHA conference evolve, but for now please mark the dates of July 14 - 16 on your calendars, and start planning to join us in Amsterdam in 2016!

See the notice on the Euroclio site.

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