

Origins

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Big History faculty at Dominican University of California, the site of the 2014 IBHA Conference, reflect on teaching the new field.

John Paton on
Nothing, in Particular

A Note from Dominican's Resident Big Historian

Cynthia Stokes Brown
Professor Emerita

I have had the deep satisfaction of experiencing the emergence of Big History at Dominican University of California. It arose from the first course I taught in 1993 and developed through the group of courses that I co-taught with Phil Novak and Jim Cunningham until it has become the centerpiece program of every student's first year. Working with the Big History faculty I have both shaped and been shaped, especially by our program director, Mojgan Behmand, and by our philosophers.

(At one point I wished that philosophy could be eliminated from the disciplines included in Big History, but now I'm grateful.) Apparently conditions at Dominican were optimal for Big History, some by long tradition and some by immediate contingency. Here's hoping that optimal, Goldilocks conditions for Big History are arising in many places around the world.

Teaching Big History: a New Pedagogy Resource

Thomas Burke
Department Social and Cultural Studies

A new Big History pedagogy resource will be available this fall. Dominican University's Big History faculty came together to produce U.C. Press's forthcoming (November 2014) *Teaching Big History*. More than twenty faculty contributed to the book. Edited by Dominican's founding Big History and First Year Experience Director, Mojgan Behmand and fellow faculty members Richard Simon and Thomas Burke, *Teaching Big History* offers practical classroom approaches (including engaged activities and assessments), thoughtful essays on the questions posed by Big History and on implementing a year-long program, and advice on the place of Big History in a liberal twenty first century education.

The book unfolds in sections devoted to Big History's origins at Dominican and how that story can be useful to other institutions, a practical and engaged pedagogy for a semester-based course, essays by non-Dominican international authors, and works on such varied questions as the place of religion in the course and how to look at the course as a whole. It culminates in an extensive annotated bibliography of source materials.

The heart of the book, the practical approaches section, goes through each of the eight Thresholds (as identified by David Christian) individually. For each it provides an overview of teaching that Threshold including key concepts and ways that complexity is illustrated in the threshold. Learning activities in each Threshold are included; the activities are outlined and explained so that any teacher could use and adapt them. Learning outcomes and assessments of outcomes for each threshold are articulated.

Academics from the Netherlands and South Korea contributed essays. These works illustrate

Behmand's idea, the book came about when she noticed that the Dominican faculty, in its initial year of implementing a Big History program for all first year students, was developing a storehouse of innovative methods and activities for the sometimes vast and daunting content of Big History. Other teachers at other schools, she mused, might find these things useful. Mostly non-experts, from disciplines in arts, letters and sciences, this faculty shared and critiqued the ways it was teaching and thus the book was born.

international methodologies and experiences with the content. They provide context for the work being done at Dominican. Thoughtful pieces by Dominican authors examine the ways this content can serve as a scaffold for a liberal education today.

Included are essays about some of the big questions, questions about meaning, that have emerged from teaching young adults this exciting content. Students and faculty are shown to grapple with questions about religion and science. One author asks readers the question: do you teach Big History or do you teach about Big History?

In the works for three years the book draws on

the growing experience of and assessment by Dominican's faculty and students. Three summers ago we three editors were beginning to work on this book. Mojgan Behamnd was in Hong Kong at a conference, Richard Simon was in San Francisco and I was in my father's ancestral village in Ireland. We emailed back and forth with questions, comments and excitement about the project. In different "world zones" we were connected to the ideas of Big History. Our communications went through our celestial neighborhood via satellite. That excitement has culminated in a highly collaborative work, informed by several disciplines, that will be useful to any teacher, at any level, who engages in the work of Big History.

Big History through the Lens of Health and Healing

Debbie Daunt

Department of Nursing

Second semester Big History courses are designed to expand on the foundations of the first semester through an exploration in a defined area of study. At Dominican University the most populated academic major is nursing. We also have a large number of pre-med students and occupational therapy (OT) majors and recently started a general health science major. As a nursing professor I wanted to offer a course that would apply the concepts of Big History to the interests of healthcare majors, that would be broad enough to appeal to students from any discipline, and that would encourage students to think.

Students in healthcare majors (especially nursing) learn to memorize facts and regurgitate information on multiple-choice examinations. The knowledge base must be strong in order to comprehend the concepts of professional practice. Students come to Dominican with honed skills of knowledge acquisition but often lack the confidence and experience of synthesis. My goal in creating "Big History Through the Lens of Health and Healing" was to move students beyond the simple work of attaining factual knowledge, to force them out of

their comfort zones, and provide them with the opportunities to explore for themselves and to think. Anyone can follow an algorithm and come up with a probable diagnosis but the moral decisions and ethical challenges that are a part of professional practice demand the ability to move beyond mere facts. To advocate for others you must know yourself and your values. You must know where you stand on controversial issues but have the ability to respect and even support the decisions of others while bracketing personal opinions. This exploration is best done prior to entering practice. Now is the time for promising professionals to begin their journey.

I delight in the first day of class when I look upon a room full of obedient students with notebooks open and pencils poised, ready to do the easy work writing down what the professor says. The expressions on their faces quickly turn to an amusing blend of shock, confusion, and glee when I tell them "No notes – no tests. In this class you are going to think. Put your notebooks away." The

structure of the class is meant to offer a respite from the challenges of prerequisite science courses. Each student, or small groups of students are assigned to lead a daily discussion on sections of the assigned reading.

The course begins with selected essays from *Hidden Histories of Science* (Silvers, 2002). The intent is to demonstrate that noted scientists are thinkers and even philosophers. There is commonality between the humanities and the sciences. We then move through time guided by McNeil's *Plagues and Peoples* (1977). Students choose threshold groups and the groups present an introduction to each threshold. The course has two papers and a final timeline presentation that may take any creative form. I do not take roll but collect a small class assignment each day. These may be short written responses to a discussion question or notes from the students' presentation of their assigned readings. The class discussions are broken up with additional activities such as a plague simulation, ethical dilemma exercises, and structured debates.

Just like the students I am pushed out of my comfort zone in teaching Big History. It is a rare nursing professor who moves beyond the teaching of bedside practice to venture into new realms but I encourage the adventure. Big History is all encompassing. The study is not limited to any specific discipline and there is room for all. I urge any brave soul, who shares my desire to move students beyond simply gaining factual knowledge, to create a second semester Big History course. You will be rewarded. I have grown as a person, practitioner, and as a teacher. I am discovering my own place in the universe. I thoroughly enjoyed creating and teaching "Big History Through the Lens of Health and Healing" and highly recommend the experience of teaching a second semester course.

Silvers, R. *Hidden Histories of Science* (2nd ed.). New York Review Books: New York, 2003.

McNeil, W. *Plagues and Peoples*. Anchor: Harpswell, ME, 1977.

The Beauty in Big History

Thomas Burke
Department Social and Cultural Studies

Is Big History beautiful? What exactly is beauty? How do we know if something in the universe is beautiful? These questions elicit quizzical looks, and the odd groan, from my students in the first day of the course, *Beauty through the Lens of Big History*. One of several semester two courses in the Big History curriculum at Dominican this exploration uses aesthetics, the philosophy of beauty, to re-examine the ideas and the narrative of Big History. By the end of the semester students have engaged with and debated the above questions and more.

Students read classic theorists on beauty, such thinkers as Plato, Kant and Ruskin. To try to understand the theories, they begin to apply them to concepts from each of Big History's eight Thresholds and the future. Posing such questions as would Plato find the death of a star beautiful or would Ruskin see early human beings as beautiful, students revisit the

Big History narrative and expand their ideas about that narrative.

The first few class sessions can be bumpy. Aesthetic theory, even by the best writers, is dense stuff. For most first year students, this is their initial encounter with it. At the beginning students frequently say variations of 'beauty is in the eye of the beholder.' I find myself saying, "read on and trust the process," frequently. Within about two weeks, when students begin to apply theories, the groaning subsides and the mysteries about aesthetics begin to fall away. As they look at now familiar--to them--Big History topics, students' learning is deepened. Indicative of this deepening, one student, an English major, said,

“I resisted the science of Big History last semester. I knew that stuff. I did not want to go over it again. This semester, with these ideas, I see new things. An atom can be beautiful. I wish I could tell my September self [herself at the beginning of the prior semester and the general Big History course] to be patient and to pay better attention.”

The course culminates with looks at the future and discussions about the purpose of beauty in the universe. Students are asked to articulate their own theories of beauty and to examine the place of beauty in our universe. Most become convinced that beauty is important, that beauty has uses in both the near and distant futures.

Big History through the Lens of Big Literature

Marianne Rogoff

Department of Literature & Language

In summer 2013, I attended Big History Summer Institute (BHSI) at Dominican University for the first time, in preparation to teach in our First Year Experience Big History Program. I’d always wanted to take such a course, to gain a more expansive overview of how we came to be here: What exactly happened “between nothing and everything?”

I entered the room like a freshman student, a novice again after twenty years of teaching graduate and undergraduate courses in writing and literature. This encounter with the science of history felt both exciting and incomprehensible to me, as those of us in the humanities supposedly have “different kinds of minds” than those attracted to science and math. And perhaps we do; yet my recent PhD in Transformative Studies had offered me an integral, transdisciplinary perspective on best-method pedagogies in higher education. This research introduced me to complexity and chaos theory; combined with my studies of depth psychology and archetypal patterns, which interest me as a creative writer, my intuitive sense of the interconnectedness of all things was confirmed.

I arrived at BHSI open to listening, learning, and continuing to explore the “other side” of my brain as I struggled to comprehend the mind-boggling physics, astronomy, chemistry, biology, geology, archeology, cosmology, and math that constitute the very nature of our existence. Listening and reading, I also came to see that the Big History narrative includes as much knowledge of what is not known as on what is. This fact — how much we still don’t

know — became the guiding concept behind the course I ended up proposing, and then taught in Spring 2014: “Big History Through the Lens of Big Literature.” Where science leaves off, literature steps in to fill out the narrative and keep posing questions, along with its cousins, philosophy, religion, psychology, and the arts, which rely on realms of imagination and faith as much as on logic and proof. Big History: Between Nothing and Everything, our text, notes that all origin stories are poetic. “Whenever humans try to describe the indescribable, they must resort to metaphors, stories, parables, to language that tries to convey more than can be conveyed in simple, direct prose” (Christian et al 12). Reading this was my “Aha” moment, as I had found myself scribbling titles of novels and names of poets in the margins of my BHSI readings, as a way-in for me, with my kind of mind: I was layering new knowledge (of history and science) atop the foundations of what I already knew very well (literature, psychology, philosophy, the arts). I thought, some of our students must have minds like mine and could come to understand the essence of Big History as I was starting to do, and make connections via this other kind of lens.

“Big History Through the Lens of Big Literature” is organized around key concepts from each of the nine Big History thresholds. Selected works of literature, including plays, poetry, short stories, essays, and novels, are used to exemplify and re-examine these

concepts in the context of our present situation, as we try to make meaning and conduct our lives in the face of all we don't know. Literature takes on the void and dark matter that remain after the known scientific facts of Big History have been explored, embodying the Big Questions in concrete terms, via human characters in specific settings facing particular internal and external conflicts.

Our 2014 IBHA Conference panel "Big History for All Kinds of Learners," a pedagogy workshop on teaching second-semester Big History courses "through the lens" of specific disciplines, will demonstrate how focusing on beauty (Thomas Burke), human cultures (Cynthia Taylor), or literature (Marianne Rogoff) can move students to integrate their first-semester introduction to the Big History narrative and connect it to their own lives and sense of purpose.

Christian, David, Cynthia Brown, and Craig Benjamin. Big History: Between Nothing and Everything. Columbus, OH: McGraw-Hill, 2013.

Mythology through the Lens of Big History

J. Daniel May

Department of Literature and Language

Dominican University of California requires all incoming Fall freshman to take a one-semester course covering the entirety of the Big History narrative. In their Spring semester, freshmen follow up with a second Big History course that concentrates on a specific discipline or topic. Seeing a specific topic "through the lens of Big History" (the title format for most of these courses) reinforces the material from the first semester and makes Big History more meaningful for many students. More than a dozen different special topics have been offered, including human cultures, power and politics, myth and ritual, health and healing, music, philosophy, religion, and a range of literary and visual arts. For the last three years I've had the pleasure of teaching a course on mythology in a depth and breadth only possible because I knew the students already had the solid foundation of Big History.

"Mythology through the Lens of Big History" examines how earlier cultures envisioned their own versions of cosmic origins and evolution, using Big History as the organizing principle of the course. Myths from every continent are examined, starting with myths that address what we would call cosmology and astronomy, and proceeding in the "mythical chronology" to myths that address topics

we would classify as geology, biology, and cultural studies. Rather than approaching mythology as a traditional study of literature, classroom lecture and discussion incorporates material from multiple disciplines, including archaeology, art history, linguistics, anthropology, and psychology. This models the multi-disciplinary approach that students will be expected to employ in their individual and group research assignments.

As with the course structure, Big History is the organizing principle for student research and writing. Each student selects a particular culture that will be the focus of their individual study throughout the term. Before addressing mythology directly, students write a research essay establishing the regional context in large terms: Where did the myths originate? What geological processes shaped the region? What does the fossil record reveal about the plant and animal life? When did the first human beings arrive? What is the earliest archaeological evidence for agriculture? For permanent settlements? Etc. In a second paper, students examine the regional mythology itself, again organizing the myths according to the Big History narrative.

As the semester progresses, more intensive study is directed to three bodies of mythology: the Mesopotamian stories of King Gilgamesh, the Greek and Roman myths, and the legends of King Arthur. Although parts of these stories strike students as alien and bizarre, students also discover much that they recognize, often finding an eerie familiarity in stories that connect directly to their own European cultural background.

Of particular interest to many students is *Metamorphoses*, in which the Roman poet Ovid directly states his intention to produce “my continuous song from the birth of the world to this my own time.” A Roman Big History, indeed! Ovid’s account is startlingly modern in parts, beginning with “chaos” and “inharmonious atoms,” and moving to the differentiation of Earth according to the density of “elements.” Though much of the middle portion of *Metamorphoses* depends on the actions of gods and goddesses, the poem also demonstrates that people may have a worthy idea long before experiment and technology can validate it. Without assigning agency to deities, nor to any hypothesized cause, the final section of the poem details geological observations accumulated over many generations: islands that have collided with the mainland; cities that have sunk below the sea and are still visible in the shallow coastal waters; rivers that have changed course; volcanoes; and settlements that one could walk to in the past but now can only be reached by boat. The observations are accurate, though the Romans had no theory of plate tectonics

to provide an explanation. Likewise, two thousand years before Einstein produced $e=mc^2$, Ovid (giving voice to Pythagoras) asserts that “all things change, the parts may vary, but the great sum remains the same.” With such examples before them, students develop patience with promising-but-unproven concepts of modern science, such as “dark matter” and “gravitons.”

For the final assignment, students are placed into groups according to geographic zones, usually corresponding roughly to the continents. Europe is excluded, as it is for the individual research assignments, because much of the shared classroom reading assignments address European myth and legend. Building on the knowledge acquired for their individual research essays, the groups (usually about five students each) put together a final oral presentation, in effect becoming each other’s instructors at the end of the course.

Students engaged in close reading, discussion, and research of ancient texts develop an appreciation of the insight and intelligence of pre-modern peoples, as well as a new perspective on current scientific efforts. The course requires study of many details from many disciplines, and could potentially become overwhelming, but the students enter on the first day of class already equipped for success with a coherent intellectual framework: the Big History narrative. Now that I’ve taught mythology to students who are already familiar with Big History, I wouldn’t want to do it any other way.

Human Cultures through the Lens of Big History

Cynthia Taylor

Departments of History and Religion

“Big History” is the First Year Experience curriculum for all incoming freshmen at Dominican University of California. Since its inception in the fall of 2010, I have been part of a collaborative and collegial team of fifteen professors from various disciplines dedicated to teaching first year college students the 13.8 billion year history of the universe. In the first semester, all my colleagues have agreed to teach from a common syllabus in order to acquaint freshmen students with the Big History narrative as articulated by David Christian, Cynthia Stokes Brown and Craig Benjamin in their book *Big History: Between Nothing and Everything*. For the second semester, professors have

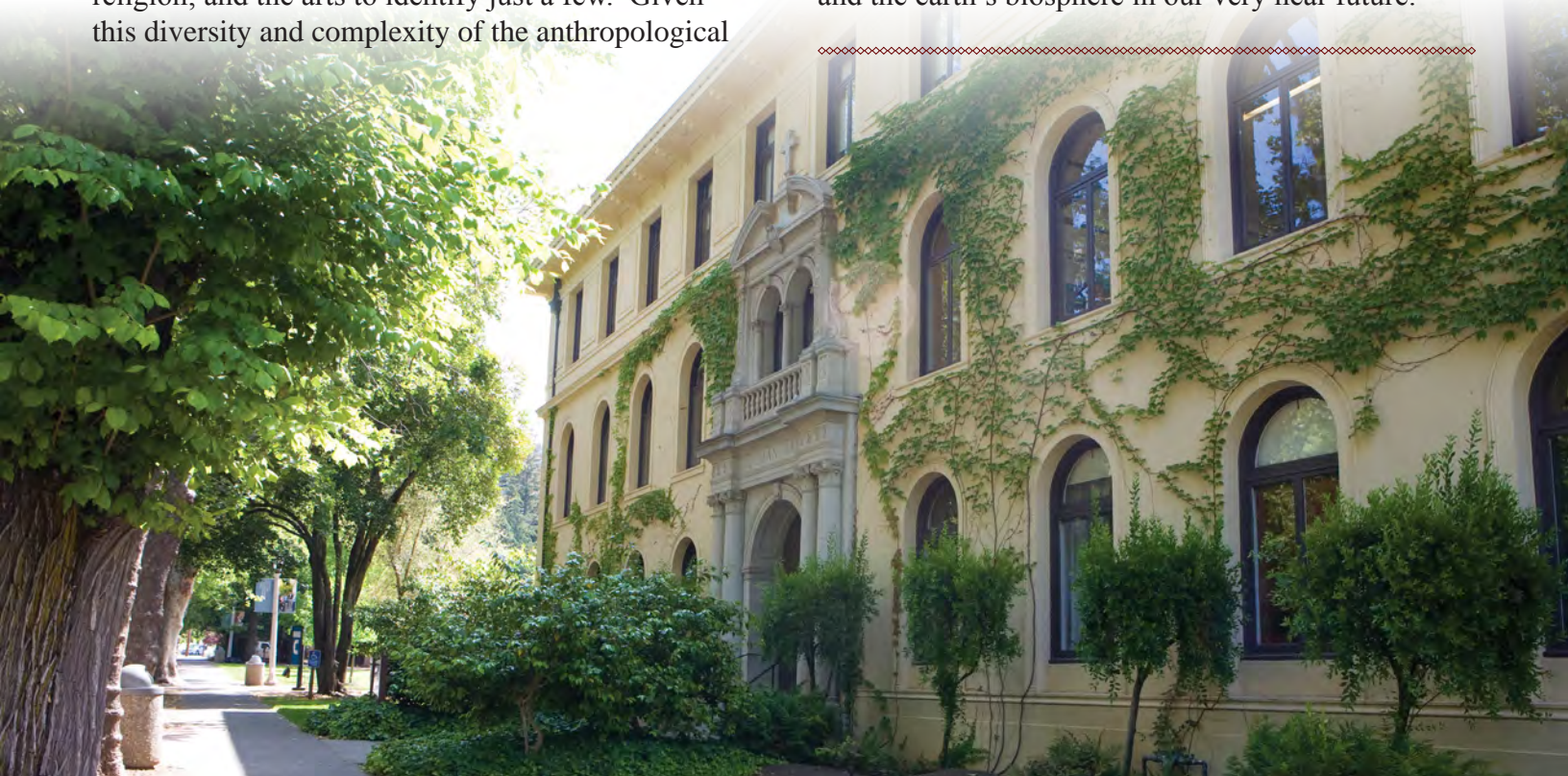
more freedom to develop their own Big History course “through the lens” of their disciplinary interests and strengths, including literature, creative writing, poetry, trade and business, gender studies, religion, art, political science and human cultures, to identify a few of the possible disciplinary approaches.

My paper for the second IBHA conference will explore three pedagogical challenges of teaching one of these Big History “lens” courses, especially from the disciplinary lens of anthropology and the study of human cultures. The first challenge the teacher faces is to maintain a Big History theme without lapsing into a more traditional world history class with its emphasis on the political and cultural development of nation-states. The Big History text by Christian, Brown and Benjamin read in the first semester does a good job in providing students with this useful type of information but it does not need repeating in the second semester.

The second pedagogical problem the teacher needs to face is just how to narrow and focus on the already broad and various topics of human cultures. This problem is evident by reviewing any anthropological textbook. There are many ways to study human cultures: work and economic systems; kinship ties and non-kin based forms of association; marriage, family and domestic systems; social ranking and stratification, political systems and social control; religion; and the arts to identify just a few. Given this diversity and complexity of the anthropological

study of human cultures, the challenge remains to find a topic that best illuminates the Big History perspective that spans 13.8 billion years from the Big Bang to the remote future.

The final aspect of my paper will examine a possible solution to the first two pedagogical challenges. After several semesters of teaching this particular second semester Big History course, it dawned on me that food gathering ways were a basic and yet universal aspect of all human cultures around the world; and at the same time, this focus could serve as an effective way to teach my second semester “Big History” course regarding human cultures for several reasons. By exploring the evolutionary biological process of how humans extract energy from their environment, the course can better connect what Christian, Brown and Benjamin identify as thresholds five and six, the emergence of life on earth (3.8 billion years ago) and the eventual circumnavigation and domination of the human species on earth (beginning about 250,000 years ago.) This approach allows the teacher and student to examine a primary theme of any Big History course: that human cultures, are part of and not separate from, the earth’s biosphere. It requires young students to think more critically about how, since threshold eight and the emergence of industrialization, humans have been extracting energy from their environment at alarmingly higher rates which detrimentally affects all human cultures and the earth’s biosphere in our very near future.



What role has nothingness played in Big History?

Nothing, in Particular

John Paton
Amsterdam University College

The concept of nothingness is a slippery subject; it is very difficult to define or even describe. For example, consider Figure 1. A naïve response would be to consider this a picture of nothing, simply a blank space. However, after brief consideration one might conclude that although the area is unmarked, it is nonetheless a page. Perhaps a more appropriate depiction of nothingness would be to cut away this area of the paper, although the effect would be lost on an electronic copy of this essay. Still, even in this somewhat more extreme example, the space would not truly represent nothing. Molecules of nitrogen and oxygen would fill the space, driven by the surrounding air pressure. Even in the vacuum of space, virtual particles constantly appear and annihilate, piercing the nothingness with their quantum mechanical existence. All this begs the question: does nothingness even exist?

From nothing we came,
to nothing we shall return,
and in the end,
the meaning of it all is:
nothing.
James Paton



Figure 1: Nothing. Or is it?

Before attempting to explore the concept further, it is prudent to pause and consider, regardless of the challenges, a definition of nothingness. It is proposed here to define the concept within the context of its usage, making it relative to the surroundings in which it appears. This is necessary since while the typist would contend that Figure 1 is an example of nothingness, the paper mill worker would clearly disagree. As with so much in life, context is everything. The relative measure with which I propose to define nothingness is complexity.

Complexity is in itself difficult to define, but it is a very useful comparative tool. Thus, nothingness will henceforth be defined as the minimum complexity achievable within a given system or context. Continuing with the example, typographical nothingness could be a blank page, while the nothingness of paper could be simply the lack of paper, or even the lack of wood and other supplies from which paper is made.

Another important consideration is the prerequisites for nothingness to exist: the Goldilocks conditions. Since it has been defined relatively, it follows from the definition that nothingness can only exist as the consequence of the existence of some other form of complexity. In other words, nothing cannot exist without something existing. It seems that the Goldilocks conditions for the existence of nothingness then are gradients of complexity, where nothingness occupies the lowest end of the complexity spectrum, and ‘something’ fills the rest.

The remainder of this essay will trace the thread of minimal complexity through Big History, from the beginning of time to the present day. The beginning of time took place, of course, at the Big Bang. Since this was the starting point for time, it is impossible (if tempting) to speak of a time ‘before’ the Big Bang, at least in the regular sense of the word. The Big Bang is often described as ‘something coming from nothing.’ In this sense, the universe arose out of the purest form of nothing imaginable. And yet, at this instant of first appearance, that nothingness was destroyed. For the remainder of history, up until the present day, the universe was filled with matter, radiation, and energy. It has complexity. Pure nothingness was destroyed before it ever even began.

Although gradients are typically thought of as a

spatial phenomenon, the Big Bang is an example of a temporal complexity gradient, with the minimum at the very earliest instant of time. Thus the Goldilocks circumstances for pure nothingness do exist, in that the required complexity gradients are present, but the nothingness itself has since vanished. It can only be considered by examining all of time; in the present day it is no longer accessible to us.

Of course, to say that the central topic of this essay no longer exists and leave it at that is not very satisfactory. So we press on, examining nothingness in its less pure forms. As the debris of the Big Bang settled, it gave rise to increasing complexity. However, this complexity was not uniformly distributed throughout the universe. A measure of this inhomogeneity is the Cosmic Microwave Background (CMB), which is the remnant of the ‘first light’ in the universe, released when the universe became optically transparent following the formation of atoms. This light, which humans can image and measure, represents the earliest picture of the universe, and is displayed in Figure 2. The dark blue areas, corresponding to lower temperature and thus higher density regions of the universe, are thought to be the seeds which started the process of galaxy formation, eventually leading to the formation of our own solar system.

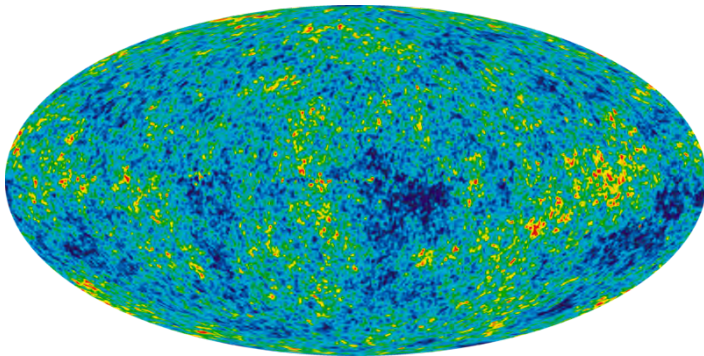


Figure 2: The Cosmic Microwave Background. Red areas represent higher temperatures, blue lower. Image from Wikipedia article “Cosmic Microwave Background.”

The clumping of matter into comparatively small regions of space left vast swathes of the universe relatively matter-free. Although all of space is permeated with various particles, fields, and energy, these intergalactic regions became the new havens of nothingness, the new zeros of complexity. The

solar system similarly contains such steep density gradients, with the majority of matter concentrated in the Sun, a minority in the planets, and very little in the spaces in between. The steepness of these gradients – the stark difference between dense matter and the vacuum of space – provides excellent Goldilocks conditions for nothingness. It seems that the steepness of a complexity gradient, as well as the ‘distance’ between its extremes, is a measure of the quality of the Goldilocks conditions. If, for example, the planets were much more diffuse and matter extended much further into space, slowly decreasing in density, it would be much more difficult to identify the nothingness. It would be less obvious or pure. Until now, the spaces between planets are the purest form of nothingness that humans have been able to access. For the average person however, interplanetary space remains well out of reach, so the remainder of this exploration will focus in on the place in the universe that all humans have access to: Earth.

Within approximately 1 billion years of Earth’s formation 4.5672 billion years ago, life had appeared on Earth. The emergence of life was the biological parallel to the Big Bang. From a biological standpoint, the minimum of complexity is non-living matter, so life is another step away from ‘maximal nothingness’. Biological nothingness has the interesting property that it can be returned to. Matter cannot return to physical nothingness since it cannot be created or destroyed (save for in small amounts during nuclear reactions or particle-antiparticle annihilations), but all life eventually returns to a non-living state. In fact, all biological complexity requires matter and energy to prevent (or more accurately, delay) its descent back into nothingness.

The complexity gradients in biology aren’t particularly steep, in the sense that there are many organisms which fill all levels of the complexity scale. It is difficult to accurately place organisms of similar complexity, but it is nonetheless useful to think of the spectrum of biological complexity, from the human brain to the smallest microbes. There is one point at which the complexity curve suddenly dives to zero, however. A collection of chemicals in a jar – even the chemicals needed for life – are not considered to be

alive. There is a sharp divide between the living and the non-living, and this divide provides the Goldilocks circumstances for biological nothingness. Evolution tends to select those organisms which can keep themselves from returning to nothingness long enough to reproduce, and thus species on the whole also tend to move away from nothingness. Of course, it is possible for species to become extinct, but the course of evolution in general seems to be one of increasing complexity. Thus, though individual organisms are constantly returning to nothingness, life on the whole seems to be moving farther away from it.

While the matter which comprises the Earth may not share life's temporariness, the information about it does. Humanity's knowledge of the evolution both of life and of the Earth itself is largely based on the geological record. This record can be thought of as a column of layers, deposited as sediment or lava over billions of years, capturing information about the era in which it came to rest. What was the climate like? The composition of the atmosphere? What kind of life was in the area?

Using various dating methods, the ages of exposed layers of rock can be determined. Layers of rock which are at Earth's surface (or which are manually extracted by humans) can thus be aligned, placing layers deposited at similar times next to one another. In this way, despite no single example of layers dating from now all the way back to the early Earth existing, such a continuous column of information can be constructed from the disparate layers which are accessible. However, the deposition process is not perfect, and fossilization even less so. These imperfections create gaps in the record, periods of time about which we know comparatively little. This is an example of informational nothingness: simply the lack of information.

The complexity gradients which provide the Goldilocks circumstances for this informational nothingness are generated by depositional imperfection. The amount of information contained in one layer will not necessarily be equal to another. Interestingly, this implies that the informational complexity of the geological record is intricately

tied to human technological advancement and understanding. If information is inaccessible, can it really be said to exist? When a new technology is invented which can extract more information, a new dating method for example, is new informational complexity being created?

Some layers can be missing from the record entirely, providing the zero for this complexity scale. Although rock layers are very durable, over geological time scales they can be eroded or destroyed in geological processes. They can even be reabsorbed into Earth's hot mantle via plate tectonics. This is the sense in which geological information shares life's temporariness before a descent back into nothing, but unlike life, this information has no means with which to delay its eventual demise.

Because of these effects, information about specific time periods is often limited. Informational nothingness – gaps in the record – typically lead to speculation. While extrapolation of data can often be carried out with some degree of certainty, it is impossible to be 100% certain of the results. Furthermore, differences in methodology between those doing the speculation will often lead to different outcomes. The resulting arguments can be bitter; the current debate over climate change being just one example. The nature of long term climate change and thus the impact human activities may have on it must be inferred from the geological record. Disagreements over human impacts on this climate change rage in the media, to the extent that scientific findings may be misconstrued or ignored entirely. All this uncertainty is the manifestation of informational nothingness.

As time passed, Earth became an increasingly complex place. Adaptive radiations of life – sudden spurts of evolutionary activity that led to large scale speciation – facilitated complex, interdependent ecosystems. Organisms themselves also grew more complex, improving their effectiveness at delaying their descent into biological nothingness and passing on their genetic material. Sensory organs developed which could interpret the world at large. New methods were developed for moving, attacking, defending, and behaving, all facilitating the continuation of biological

complexity. After millions of years, about 4 million years ago, a new form of biological complexity emerged which would change the face of the planet: humans. Humans are set apart from other animals by a number of features, including control of fire advanced communication techniques and tool usage, and the degree to which they shape the environment around them. Humans are thought to have first appeared in the savannas of East Africa, and human efforts to recreate this environment – or at least its climate – have resulted in widespread changes in global ecology.

One of the earliest methods of ‘environmental engineering’ is thought to have been undertaken by early humans once they had control of fire burning landscapes. Humans are better adapted for life in grasslands than in forests, so burning these less favourable environments to make way for grasses would expand the humans’ Goldilocks conditions. In doing so, they would have caused a great number of organisms to return to biological nothingness, but made room for others to grow. This wholesale destruction of certain ecosystems could be thought of as returning them to ecological nothingness. Since an ecosystem typically exists in a confined area of land, it is easy to see that the complexity which makes up that type of ecosystem has the necessary gradient to create Goldilocks conditions for ecological nothingness.

Ecological nothingness, however, is quite unlike other forms of nothingness encountered so far, in that one form of ecological nothingness is almost by definition mutually exclusive to another form. For example, when a forest gives way to a savanna, it is easy to consider walking from the forest to the savanna as experiencing a decline in the forest’s complexity, and thus witnessing it descend into nothingness at its edges. However, at the same time the observer would witness an ascent from nothingness of savanna complexity. It appears that our definition of nothingness has given rise to a sort of paradox: can the existence of one type of nothingness preclude the existence of another type? It seems more likely that this situation is simply pushing the limits of applicability for this definition of nothingness.

As humans evolved and spread around the world,

their interactions with each other and with their environment became more complex. Eventually, they began to explicitly select which plants and animals grew in certain areas, creating new ecologies by hand. This was the dawn of agriculture. By domesticating those species which were useful and eliminating those that were not, humans improved their own Goldilocks circumstances. At the same time, however, they aided in the descent of many species and even entire ecosystems into nothingness. By today, a significant fraction of the global ecosystem is dominated by agriculture. This is a great simplification of the global ecology, a step down in complexity. Thus, according to our definition, agriculture has brought the world closer to global ecological nothingness.

Agriculture is not intuitive; it must be learned from experience and from the experiences of others. It is clear that informational nothingness will once again make its presence felt here, and this type of nothingness will continue to impact human history until the present day. Many human activities can be seen as attempts to eliminate informational nothingness, especially among those individuals who are secure enough to be less concerned about their return to biological nothingness. A very early example of this can be seen in the rise of agrarian religions, which often attributed natural processes and cycles to unseen spirits or other supernatural forces. This is another example of informational nothingness leading to speculation in an attempt to artificially eliminate the nothingness.

As human interactions became more complex, enforced social structures began to develop, with hierarchies of power and decision making. Eventually states emerged; a group of individuals would claim monopolies on the use of force and the ability to raise taxes. This situation left some individuals with much more power and resources than others. Thus a new gradient emerged: influence. Moving up the influence gradient can be achieved in a number of ways, including acquiring resources, being appointed into an official position of power, or developing relationships with those who are in such positions. Those with more influence have a greater ability to exert their will over those with less influence.



Figure 3: The Waldseemüller map. Dating from 1507, this is the earliest map to name America.
 Image at http://memory.loc.gov/cgi-bin/map_item.pl

Of course, the development of a new gradient came along with a new nothingness at its minimum: influential nothingness. Those who experienced influential nothingness were typically farmers, workers who were tied to the land and thus unable to relocate. For a long time these people had very little choice but to accept their circumstances and do their best to stave off biological nothingness. In time, efforts were made to level out the influence gradient, by involving more people in the decision making process. Democracy can be viewed as an attempt to give all individuals an equal say in the decision making process, thereby eliminating influential nothingness. However, those with more resources inevitably have more influence even if it comes about by swaying public opinion, so until now some form of influence gradient remains in every society.

One way of helping to level the influence gradient is the dissemination of new ideas. This was greatly aided by the emergence of literature. With literature, new concepts could be discussed in depth, both metaphorically and explicitly. Literature presumably

allowed for the deeper exploration of new concepts than would have been possible using conversation alone. It seems plausible that abstract concepts like nothingness first took the spotlight within the context of literature. Because literature is a physical representation of information, its emergence greatly slowed the process of cultural forgetting, as records could be consulted without any individual needing to remember their contents. In other words, literature was a key weapon in the struggle against informational nothingness.

Of course, written literature is not the only physical representation of information. Early cave drawings may have been examples of information represented pictorially. Modern infographics and scientific plots are other examples. But probably the best known examples of visually encoded information are maps. Today most maps are very similar to one another, and are very widespread. Historically, however, map making was greatly hampered by informational nothingness. An example of this is shown in Figure 3. Although the outlines of the continents are

recognizable, any modern observer can clearly see how much speculation was involved to compensate for the informational nothingness encountered by the map makers.

In another effort to combat this informational nothingness in cartography, sailors would explore new areas of the world, making measurements of their location to try to fill in the edges of the map. These men were literally sailing into nothingness; they had no idea what might lie on beyond the edges of their maps. Unknown areas in these early maps were often filled with bizarre creatures and supernatural phenomena as map makers speculated on what could lie in the unexplored waters.

While the sailors sailed across seas of informational nothingness, they often turned their gaze to another form of nothingness, the purest form of it that exists today: space. Of course, the sailors were not interested in the nothingness itself, but in the islands of complexity found within it. Although they did not have a complete understanding of the stars, their speculation was sufficient to have appreciable predictive power. Instruments like the astrolabe helped to encode this information, allowing sailors to make observations of their position, even when maps failed them. Such navigational equipment was the primary tool in the sailors' arsenal against informational nothingness.

By this time, various states had come into contact with one another, establishing a gradient of influence not between individuals, but between entire states. These states jostled to try and move up this gradient, primarily either through wars or by acquiring resources through trade. As international trade became more important, the search for new trade routes led to the discovery of many new lands and the advancement of map making. Especially in Europe, those in power, furthest from influential nothingness, began to realize (or be convinced by those around them) that areas which were once obscured by informational nothingness could now be exploited for resources. The ensuing quest for influence saw nearly the entire world be colonized by Europeans. They firmly established themselves at the top of the influence gradient, while

indigenous populations generally descended or were forced into influential nothingness.

Many of the resources acquired from those lower on the influence gradient were put towards booming new industrial economies. The advent of the steam engine spurred on mass production, scientific advances, and increasing efficiency in the work place. New machines carried out the most routine tasks in a factory, while humans handled more complicated tasks, including the maintenance of these machines. This meant that more output could be achieved with fewer workers. This process of automation is still ongoing, with increasing numbers of jobs being taken over by robots. Even outside of the workplace, new technology is constantly arriving to make human efforts more efficient. Will this eventually lead to a society where human 'work' is largely unnecessary? If so, this could represent a new form of nothingness, but one that does not easily fit into the current definition as the minimum of some complexity gradient. This new nothingness would also be the first we have encountered that has an overall force driving towards it, not away from it. However, although we may be moving closer to this strange new nothingness, it seems unlikely to ever come to fruition. Indeed, it is difficult to imagine a society where all work is performed by robots, and humans simply exist. This would likely be to the detriment of the humans, in fact.

This push of technology, which began with industrialization, has recently experienced a resurgence with informatization. In recent decades, computer technology has advanced exponentially in complexity and in reach. In Western countries it is now the norm to own a mobile phone and a laptop, both of which are connected to perhaps the most important product of informatization: the internet. Like the emergence of literature, the invention of the internet was a major step in the human battle against informational nothingness. More recently, it is also becoming a tool for the levelling of influence gradients. Masses of individuals empowered by the information available to them online are more aware than ever of the inequalities which make up the influence gradient, both within nations and between

them.

It seems clear that nothingness, while not often playing a direct role, provides an interesting new perspective from which to investigate Big History. Most forms of nothingness seem to have some driving force taking the relevant system away from them: the Big Bang was a burst away from pure nothingness, gravity clumps matter away from physical nothingness, evolution drives species away from biological nothingness, and, every so often, dissenting populations drive a large push away from influential nothingness. Much of human behaviour can be interpreted as the result of trying to eliminate, or at least minimize, informational nothingness, from the rise of religions to the exploration of the oceans, and even the development of novel new data storage techniques.

Different types of nothingness have different properties. Some, like informational or biological nothingness, have accompanying processes like

forgetting, erosion, death, or extinction to return systems to a state of nothingness. Others, like physical nothingness, appear to be here to stay. It is even possible for forms of nothingness, like the lack of different ecological systems, to be mutually exclusive, though this may be an indication of the limitations of the concept. A more refined investigation into nothingness' applicability as a concept in Big History would help to clarify this interesting new perspective. In conclusion, perhaps the opening quote to this essay could more accurately (if less poetically) have read:

From nothing we came, to complexity we shall go,
and in the end, the meaning of it all is: gradients.



John Paton originally wrote this piece as his term paper for Dr. Fred Spier's course on Big History at the Amsterdam University College.

INTERNATIONAL BIG HISTORY ASSOCIATION CONFERENCE

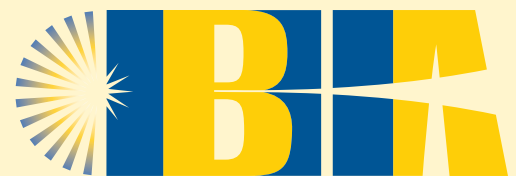
AUGUST 6 - 10, 2014

DOMINICAN UNIVERSITY OF CALIFORNIA
SAN RAFAEL (SAN FRANCISCO BAY AREA), CALIFORNIA

TEACHING AND RESEARCHING BIG HISTORY: BIG PICTURE, BIG QUESTIONS

The theme for the 2014 conference is “Teaching and Researching Big History: Big Picture, Big Questions.” The conference seeks to continue the dialog begun at the first IBHA conference in 2012. In addition IBHA seeks to create a forum for the articulation, discussion, and distillation of questions central to Big History. Among the topics that are to be addressed at the conference through a series of panels, roundtables, and discussions are:

- Big History and energy
- Big History in education
- Big History pedagogy
- Big History scholarship
- Big History research agenda
- Evolution of complexity
- Identification and analysis of thresholds
- Continuity and Contingency in our Universe
- Big History: interdisciplinary, multidisciplinary, or trans-disciplinary?
- Big History and the future
- Big History and meaning
- Big History outcomes and assessment
- Politics and Big History
- Little Big Histories



International
Big History
Association

The IBHA Conference will convene on the campus of Dominican University of California in San Rafael, which is located twelve miles north of the Golden Gate Bridge. Attendees will have the option of selecting from one of several hotels in San Rafael and the surrounding area or staying in on-campus accommodation.

San Rafael is a wonderful destination in Marin County surround by woods and beaches. For all things San Rafael go to <http://www.sanrafael.com>. For a complete guide to San Francisco and its many attractions, visit <http://www.sanfrancisco.com/>. And if you have more time to explore the larger Bay Area, see <http://www.visitcalifornia.com/Explore/Bay-Area/>.

Please find more details on the conference at www.ibhanet.org. We hope you can join us for this fantastic second IBHA conference!

Program Committee: Cynthia Brown, Lowell Gustafson, Fred Spier, Harlan Stelmach, Joseph Voros

Transportation to/from San Rafael

Flying into SFO

We suggest taking the Marin Airporter from SFO to Marin and disembarking at the Central San Rafael Transit Center. Approximate travel time is 1.5 hours. Buses pick up passengers at SFO every 30 minutes, on the hour and half-hour, beginning at 5:00 AM. The last bus of the night departs from SFO at midnight. Fare is currently \$20. http://www.marinairporter.com/schedules_sfo_to_marin.html

From the Transit Center in San Rafael, there are taxis available to take you to your hotel. If you are staying at the Four Points by Sheraton in San Rafael, it is approximately 3.3 miles from the Transit Center to the hotel.

Flying into OAK

We suggest taking the Sonoma County Airport Express to Marin and disembarking at the Central San Rafael Transit Center. Fare is currently \$26. Please refer to the Airport Express website for travel times and pick-up times. <http://airportexpressinc.com/schedules.php>

From the Transit Center in San Rafael, there are taxis available to take you to your hotel. If you are staying at the Four Points by Sheraton in San Rafael, it is approximately 3.3 miles from the Transit Center to the hotel.

Hotel

Four Points by Sheraton
1010 Northgate Drive
San Rafael, CA 94903

Central Reservations 1-800-325-3535

Hotel Reservations 1-415-479-8800

Callers reserving a room at the Sheraton should identify themselves members of “DU-IBHA” arriving on Wednesday, August 6th and departing Sunday, August 10th, 2014 to secure the special rate and receive their confirmation number. Callers should have a credit card ready to guarantee reservation.

~~Discounted Rate: \$114 (by 5pm local time, June 13th, 2014)~~ All discounted rooms are reserved.

Group Rate: \$139 (by 5pm local time, July 11th, 2014) A limited number are still available.

Reservations may be cancelled without penalty up to 24 hours prior to arrival.

Limited on-campus housing is available at Dominican for the duration of the conference (check in Aug 5th, check out Aug 10th). A maximum of 20 rooms are available for double or single occupancy (singles booking a room for themselves will have to pay the price of double occupancy). The price is \$50 per night per person in a shared suite (double occupancy). Each suite has two separate bedrooms and a shared bathroom. The suites do not include a kitchen, and the price does not include meals other than those already covered by the conference registration fee. Please contact [Donna in the IBHA Office](#) if you would like to reserve one of these rooms.

Wine Country Tour

\$120 p.p. Limited capacity: 56

Sunday, August 10th

9:30 am pick-up / 3:30 pm dropoff at Four Points Sheraton

* We will need to see if anyone staying on-campus signs up and needs pick-up

This tour includes visits to two distinct attractions in our local wine country. The first site is the beautiful Jacuzzi Family Vineyards where IBHA guests are invited to tour the winery, enjoy a tasting, and partake of a delicious and specially prepared lunch. The second site is Cornerstone Gardens, an ever-changing series of walk-through gardens, where IBHA guests are invited to tour new and innovative garden designs from the world’s finest landscape architects and designers. For more information, visit the websites at <http://www.jacuzziwines.com/> and <http://www.cornerstonesonoma.com/explore/about-cornerstone/>

Conference Registration

To register for the 2014 IBHA conference, please [click here](#), or click on “Conferences” at <http://www.ibhanet.org/>. The first registration window should pop up. Please let us know at ibhanet@gmail.com if this form gives you any trouble. Or print this form and mail your registration fee to:

LOH181

International Big History Association
Grand Valley State University
1 Campus Drive
Allendale MI 49401-9403
USA

Daily bus transportation, meals and evening events are all included with registration.
Guest registration includes evening events only.

Name _____

Address _____

City, State _____

Zip _____

Institutional Affiliation _____

Email _____

Guest Name _____

- Member Late - \$355.00 (USD)
IBHA Member Late Registration Rate (after July 19)
- Member Regular - \$325.00 (USD) (June 1 - July 19)
IBHA Member Regular Registration Rate.
- Non-Member Late - \$455.00 (USD) (after July 19)
IBHA Non-Member Late Registration Rate
- Non-Member Regular - \$425.00 (USD) (June 1-July 19)
IBHA Non-Member Regular Registration Rate
- Student Member Late - \$210.00 (USD) (after July 19)
IBHA Student Member Late Registration
- Student Member Regular - \$180.00 (USD)
(June 1 - July 19)
- Guest Registration - \$150.00

Total Registration Fee Included _____

Please make your check payable to the
International Big History Association



**Geological Tour of Land's End and Sutro Baths,
San Francisco**

\$50 p.p. Limited capacity: 20

Wednesday, August 6th, 1:00-5:00pm

1 pm pick-up at Four Points Sheraton
5 pm dropoff at Four Points Sheraton
* On-campus pick-up available

Enjoy a beautiful hike at Land's End at the northwestern corner of San Francisco, where stunning views will astonish you at every turn. Hillsides of cypress and wildflowers, views of shipwrecks and the ruins of Sutro baths provide the setting for a tour with a Big History perspective. Geologist Dr. Christopher Lewis will be your guide through Ocean Beach, the Sutro Baths, and Land's End as you learn how our California coastline came to be. Links to [Land's End](#), [Land's End map](#), [Sutro Baths](#).

Wine Country Tour

\$120 p.p. Limited capacity: 56

Sunday, August 10th

9:30 am pick-up / 3:30 pm dropoff at Four Points Sheraton

This tour includes visits to two distinct attractions in our local wine country. The first site is the beautiful Jacuzzi Family Vineyards where IBHA guests are invited to tour the winery, enjoy a tasting, and partake of a delicious and specially prepared lunch. The second site is Cornerstone Gardens, an ever-changing series of walk-through gardens, where IBHA guests are invited to tour new and innovative garden designs from the world's finest landscape architects and designers. For more information, visit the websites at <http://www.jacuzziwines.com/> and <http://www.cornerstonesonoma.com/explore/about-cornerstone/>

Contact [Donna Tew](#) in the IBHA office to reserve your place on these tours!

The IBHA is proud to announce that Jennifer Joy, a New York City writer/performer/comedian who draws her themes from Big History, will be performing excerpts from her hit show, *The Physics of Love*, in a special lunchtime performance at the upcoming IBHA conference.

She has performed to rave reviews in New York City and all over the country. She is currently touring *The Physics of Love*, a romantic comedy based on Big History, to colleges, universities and theatres across the country.

In this multi-character one-woman show, “Lisa” is a science teacher who revels in her nerdiness, seeing everything in her life through the lens of science’s Universe Story – from the chaos of her 7th grade class to her bumpy search for love. She is surrounded with quirky characters, including students, many bad dates and finally, The Right One. But will she be able to give love a chance? Filled with humor and intelligence, this show will delight and inspire you!



Critical Raves for “The Physics of Love” “...*(a) powerhouse performer, Jennifer Joy Pawlitschek has written and performs a multimedia piece involving quantum physics... Not only is Ms. Pawlitschek strikingly beautiful in her tall bearing, she’s highly articulate and bright, and puts on a captivating show.*”

- Mark Mardon, Bay Area Reporter

“Jennifer Joy combines humor, science and humanity in an excellent show about one life in a vast universe.”

- Lamont (Monty) Hempel, PhD.,

Hedco Professor and Director,

Center for Environmental Studies, University of Redlands

“There was amazing distinction between each character, with the voices and the body gestures. The science aspect played beautifully into the love story and I loved that it was not boom! Happily ever after. It was, ‘let’s try this again’. Jennifer is amazing!”

- Jack McKenna, SUNY Potsdam

“The Physics of Love” is a hit! It’s magic!

Don’t miss this special performance! Thursday, August 7th at 12:15 pm

expositions

INTERDISCIPLINARY STUDIES IN THE HUMANITIES



Academic Roundtable

Vol 8, No 1 (2014)

Introduction to the Roundtable: Big History

An Introduction to Big History

Lowell Gustafson

Big History

Bruce Mazlish

Slimmer, Brighter, and Nearly Perfect: The New Big History Textbook Is Here

Mojgan Behmand

We Are Stardust ... Concentrated by Earth!

Walter Alvarez

Big History's Risk and Challenge

Eric J. Chaisson

<http://expositions.journals.villanova.edu/issue/view/130>

Draft Program for 2014 IBHA Conference.

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