International Big History Association

Members' Newsletter

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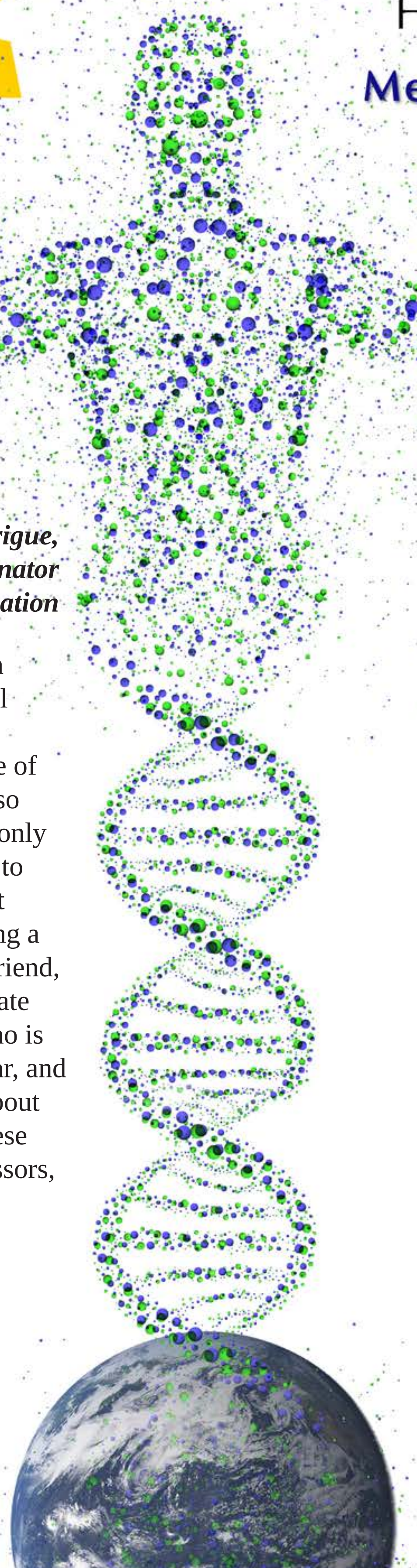


Promoting Big History in East Asia in 2013

Barry Rodrigue,
International Coordinator
International Big History Association

In the spring of 2011, when my role on the IBHA board shifted to International Coordinator, I decided to focus on Big History in East Asia. This region is one of the world's most important, but it is also where new forms of Big History have only a tentative foothold. Another goal was to discover prototypes of Big History that already exist there. Since I was planning a sabbatical, I asked our physician and friend, Zhao Mei, to help identify an appropriate university with which to work. Dr. Zhao is from China and lectures there each year, and we had been engaged in discussions about complexity study and traditional Chinese medicine. She contacted several professors,

Barry Rodrigue, Zhao Mei, Penelope Markle, Dimitri & Sakura, Maine 2010.

In this edition of the IBHA Members' Newsletter, we highlight Barry Rodrigue's work on Big History with East Asian scholars (on pages 1 - 10),

an essay on Big History and Big Politics by Lowell Gustafson, who is the IBHA Secretary (11 - 24),

the Students' Big History Research Conference at the University of Amsterdam in June (25-26),

the August 2014 IBHA Conference at the Dominican University of California (27)

and the highly anticipated first edition of *Big History: Between Nothing and Everything* by David Christian, Craig Benjamin, and Cynthia Brown, available August 30, 2013 (28)!

including Sun Yue at Capitol Normal University.

Capitol Normal University, in Beijing, hosted the 20th World History Association conference in July 2011. The IBHA convened seven panels and two roundtables about Big History at this event, along with independent presentations. At the opening banquet, I overheard one historian ask another: “What is Big History? – they’re everywhere…!” I hope his question was answered, since Big History, Global History & World History are important siblings!

WHA Conference, Capitol Normal University, Beijing, July 2011. President Liu Xincheng of Capital Normal University making the keynote speech.

Sun Yue, China’s leading big historian, at Capitol Normal University, contacted Qi Tao, Minister of Education in Shandong Province. Professor Qi is an historian with an interest in Big History, which correlates with his studies of natural catastrophes as shapers of human history. Qi arranged for me to be a visiting scholar at Shandong Normal University, which reportedly has the best History Department in the province. Shandong is also an ancestral homeland of the Han people, as well as of Confucius.

Statue of Confucius at Shandong Normal University, Jinan, March 2013.

Sun Chao with a copy of Ma Shili’s text on World/Big History, Jinan, 21 March 2013.

Zhao Wenjing of the Office of International Exchange & Cooperation coordinated my visit. In the process, I learned that, although an institution might be called a “normal university,” they are often, as in this case, a comprehensive university that has just kept their original name. Sun Chao was my academic liaison. He had graduated from the celebrated Nankai University in Tianjin with a Ph.D. in World History, and had also attended Cambridge University. While at Nankai, he had studied with Ma Shili, an historian who had developed an approach to World History that included some aspects of Big History.

I developed four one-hour power-point presentations, which were essentially a mini-course on Big History. The first was an introduction to Big History – its development and historiography. The second, third and fourth each covered: 1) Formation of the Cosmos and Earth, 2) Evolution of life and human society, 3) Challenges faced

Barry Rodrigue & World History students, Shandong Normal University, Jinan, 28 March 2013.

in the present and projections for the future. Each presentation included appropriate examples of Big History research and methods. They were delivered to Sun Chao's students in the World History program over a two week period.

I had arranged for Roland Saekow to make a presentation about the online Big History tool, ChronoZoom, at Shandong Normal University and Capitol Normal University. In Jinan, it was hosted by the Department of Information Science & Engineering, where Roland spoke to 60 professors, students and staff. That evening, Zhou Lianyong, Director of the Office of International Exchange & Cooperation, hosted a banquet for us, with his section chief Zhao Wenjing, and Zhu Yafei, Dean of the Faculty of History & Social Development. A photo-essay of Roland's presentation appeared in the last IBHA newsletter.

Banquet at Shandong Normal University, Jinan, 20 March 2013. Left to right Zhao Wenjing, Zhu Yafei, Barry Rodrigue, Zhou Lianyong, Roland Saekow.

Duan Huichuan, a computer science professor in the Department of Information Science & Engineering had attended Roland's presentation and expressed an interest in working on Big History and ChronoZoom. We discussed potentials for cross-disciplinary co-operation between the IT and History departments. I also made a presentation to 50 graduate students, as well as faculty and staff of the general academic community. Two professors from Shandong University of Arts attended and offered their assistance in promoting Big History – communications professors Zhang Bin and Liu Xiangyu.

Barry Rodrigue poster and speaking to World History graduate students & professors about Big History, Shandong Normal University, Jinan, 29 March 2013.

Conference, Shandong Normal University, Jinan, 31 March 2013.

A conference was held with five professors from the History Department and Professor Duan from the IT Department, as well as professors Zhang and Liu from Shandong University of the Arts. About ten graduate students also participated. It brought together those who had a genuine interest in Big History for an initial meeting.

Shandong University of the Arts, Jinan, with Dean Liu Jialiang, Professors Zhang Bin and Liu Xiangyu, and students 10 April 2013.

As a result of such encounters, professors Zhang and Liu arranged for me to make a presentation about Big History at Shandong University of the Arts, in their Department of Art & Culture. The Dean, Liu Jialiang, and about 50 students attended. It was followed by a tour of their program facilities in public history and museum science, and then further discussion.


Archeology & Museum Laboratory, Shandong University of the Arts, Jinan, 10 April 2013.

It was a great pleasure to work with the Chinese students. They were very interested in the material, and were friendly, curious, open to inquiry, very, very smart and dedicated to learning! A half dozen graduate students would regularly get together with me to discuss history and world affairs. I assisted them with research – helping them identify sources, as well as connect with materials and scholars online. They, in turn, offered constructive advice and provided background for developing the Big History presentations. Zhao Beiping, began to translate my comprehensive power-point on Big History into Chinese. The students and I also socialized and made excursions together, such as climbing Thousand Buddha Mountain (Qianfoshan).


Atop Thousand Buddha Mountain, 22 March 2013. Barbecue, 9 April 2013.

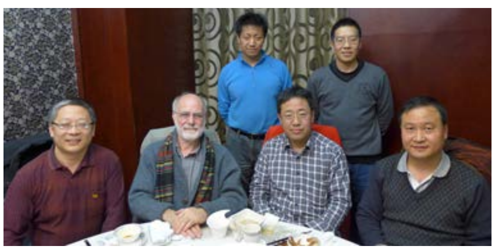
I came to realize that, although ChronoZoom had entered China on the back of Big History, Big History would probably have to become become part of China's curriculum on the back of ChronoZoom. ChronoZoom appeals to all disciplines and levels of history. Its content is useful for specialists as much as for big historians. Since ChronoZoom uses a Big History scale, it also invites specialists to engage with a Big History paradigm.

Since we had a group of professors interested in Big History and ChronoZoom, we established a working group – Professors Sun Chao (History Department), Duan Huichuan, Liu Xiangyu, Liu Naiwen, Ma Xueqiang, system administrator/engineer Sun Haitao (IT Department) and graduate student Zhao Beiping (History Department) from Shandong Normal University; Professor Zhang Bin and Liu Xiangyu (Department of Culture & Art) from Shandong University of the Arts; and Sun Yue (Global History Center) at Capitol Normal University in Beijing. Thus, we now have an interdisciplinary team working together at several universities in China.

Donald Brinkman and his team at Microsoft Research is assisting them develop a Chinese version of ChronoZoom. This is a complex task, as several constituent systems do not work in China, such as YouTube. There are Chinese versions, but ChronoZoom has to be reconfigured. It is a cooperative effort. For its part, ChronoZoom lacks East Asian content, which the historians on the Chinese team will develop.

Professor Duan Huichuan (Computer Science) and Professor Sun Chao (History) with Big History literature, Shandong Normal University, Jinan, 10 April 2013, and with Barry Rodrigue, right. Professors Zhang Bin and Liu Xiangyu, Shandong University of the Arts, 29 March 2013.

An important conference of the Comité international des sciences historiques (CISH, the International Committee for Historical Sciences) will take place in Jinan in 2015. It is hoped that this project can move along such that a presentation about it can be made at this event.



Capitol Normal University, Beijing, 11, 15 April 2013. In the first photo: Sun Yue, Barry Rodrigue, Xia Jiguo, Wang Yongping, in the back, from left to right, Fang Lin and Yue Xiukun.

I gave a presentation on Big History at Capitol Normal University in Beijing with Professor Sun Yue and Xia Jiguo, Director of the Global History Center who organized the 2011 WHA conference. As in Jinan, I had excellent encounters with the graduate students. Throughout all of these activities, Yang Lin, a professional facilitaor in Beijing was of great assistance.

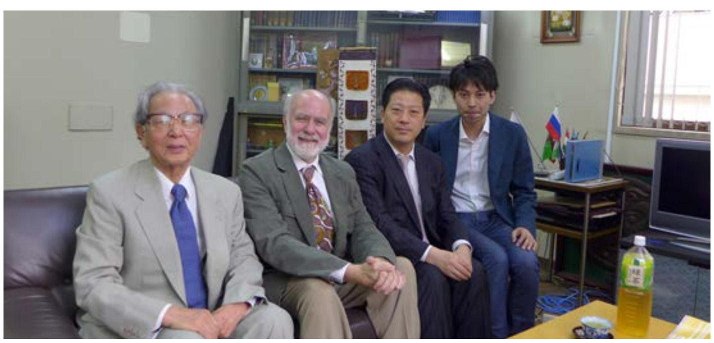
In addition to the work in China, I also engaged with educators in Vietnam and Japan. Vietnam is updating its curriculum and teaching methods over the next few years. They are studying new pedagogies around the world. Part of my discussion was about a telescoping method of history that ranges from the micro (Local History) to the macro (Big History), along with new strategies, such as community service, oral history, and non-curricular activities.

I met with the Dean of the History Faculty, Dao Tuan Thanh, and then made a presentation to about 25 history professors at the Hanoi National University of Education. I had lunch and a discussion with Hoang Thanh Tu,

With Dean Dao Tuan Thanh and the History Faculty at the Hanoi National University of Education; History faculty & students, including Hoang Thanh Tu and Tran Cong, at the University of Education (Vietnam National University); Relaxing with students; With my host, Tran Cong, psychologist and social studies scholar. Hanoi, Vietnam, 10–11 March 2013.

the professor in charge of teaching methods at the University of Education (Vietnam National University) and then spoke to her students. Afterwards, I met with the associate dean, staff and faculty.

In April, I met with Osamu Nakanishi, founder of Universal History in Japan and retired Dean of Soka University. At the meeting were his previous graduate students, Kunio Okada and Nobuo Tsujimura, as well as his assistant, Kazuko Ohta. Mr. Tsujimura is a creative artist as well as a Big History scholar. Mr. Okada is executive director of the Japanese-Russian trade organization, Rotobo. Both Professor Nakanishi and Mr. Okada are Russia specialists. Mr. Okada was accompanying the Prime Minister of Japan to Russia in May and then travelling with Professor Nakanishi to Russia in June. So, I put them in touch with our colleagues at the Eurasian Center for Big History & System Forecasting at the Oriental Institute (Russian Academy of Sciences) in Moscow, and a meeting has been set up.



Meeting with Osamu Nakanishi, Kazuko Ohta, Kunio Okada, Barry Rodrigue and Nobuo Tsujimura, 17 April 2013. Supper and discussion about Art & Big History with Nobuo Tsujimura at a Kyushu tavern, 19 April 2013. Tokyo, Japan.

Meeting John Clammer, United Nations University, 18 April 2013.

The next day, I met with John Clammer, an anthropologist and professor at the United Nations University in Tokyo. Originally from England, he has spent 25 years teaching in Asia. He also has strong connections with macrohistory colleagues in India and has developed the concept for an Earth Institute. We discussed Big History. I put him touch with Sun Yue, and they met on 25 April to discuss Big History, when he was in Beijing at a conference. I also connected him with Professor Nakanishi and Mr. Okada.

My third day in Tokyo, I met Mr. Okada to discuss the Caucasus region, where his organization is entering into trade. I put him in touch with my colleagues in Chechnya and Dagestan, and explained how I use Big History as a vehicle to promote cross-cultural understanding. That evening, Nobuo Tsujimura and I met for a good discussion about art and Big History.

A secondary activity of this work was to visit ecological and heritage sites as a way to think about how to link such field sites into a Big History educational network, such as with the Coldigioco Geological Observatory in Italy, where the IBHA was founded in 2010.

Paleontological Fossil National Geo-Park in Chaoyang, Liaoning Province

In 2011, I first visited the Paleontological Fossil National Geo-Park in Chaoyang (Liaoning), in north-east China, along the Inner Mongolian frontier. Chaoyang is famous for its dinosaur fossils. Their museum, under construction at the time, houses what is essentially an interactive Big History program. It includes presentations about the natural world and its developmental history, from the Big Bang to the present. One exhibit was a diorama and documentary film of the 2008 Sichuan earthquake, linking the tragedy to geological history. It also has in situ exhibits at the fossil excavation sites.

Museum of Ethnography, Hanoi, Vietnam, March 2013.

In 2013, I twice visited the Vietnam Museum of Ethnography, as another potential field site for Big History education. Of interest there were a collection of bamboo lunar calendars and exhibits highlighting human expressions of contact with the universe.

Climbing Taishan, 3–4 April 2013

In the midst of my time in Jinan was the Qingming Festival, so Zhao Beiping and I made a three-day trip to scale Taishan, one of the four sacred mountains in China. We took the wilderness trail up the back of the mountain, where we saw what I believe was a Pallas cat (Felis manul), which is a near threatened species.

Big History has great potential to unite East Asia as well as other regions of the world in a common story of our existence. Osamu Nakanishi in Japan was among the first big historians in the world to begin telling this unified story. Sun Yue has done a remarkable job in assessing the ancient and modern threads of Big History in China, as well its links to World and Global History. The modernization of education in Vietnam is unfolding in dynamic ways. Our interconnecting teams of scholars in Shandong, Beijing, Tokyo, and Hanoi are cooperating in this effort. Thus, there is room for exciting optimism.

Big History and Big Politics

Lowell Gustafson
Professor of Political Science, Villanova University

IBHA members are familiar with how Big Historians place the written record of the human past within the natural record of the entire past. By drawing on the natural sciences, the Big Historians have revolutionized a field that in academia has normally been placed within the Humanities or Social Sciences. They have studied light, rocks, bones, and blood as well as written texts, and then rethought the narrative of time and the human place in it. They study nature to tell a story of the entire past from which humanity has emerged and remains embedded. This provides a context for understanding the present and options for exerting constructive influence in the future.

Not only does the work of Big Historians challenge their own discipline to redefine itself, it does the same for other disciplines, including Political Science. The physical sciences and Big History, sometimes also called Cosmic Evolution, offer much to those who focus not as much on time as on politics. In one way, this is nothing new. The famous ancient Greek philosopher, Aristotle, wrote books such as one on *Physics* and another on *Politics*. In the latter, he wrote that humans are by nature political animals. In the European medieval period, Thomas Aquinas developed Aristotelian thought on natural law; he argued that humans were created within a politically constituted community. By the seventeenth and eighteenth centuries, such State of Nature political philosophers as Thomas Hobbes, John Locke, and Jean Jacques Rousseau postulated human politics before or without such institutions as the state. They wanted to determine how to construct states so that they helped resolve the basic problems of human nature. For all of their differences, they all saw human politics as rooted in nature. None of them had the same understanding of nature as has developed since Darwin, Einstein, Hubble, and others in the past couple centuries.

Big History and contemporary physical sciences lead us to new understandings of political science and human nature. The emergent complexity of sustained, structured relationships that incorporate earlier ones in new combinations and with new properties is possible due to access within pockets to high quality energy. The second law of thermodynamics would lead us to expect entropy, or transitions from greater to lesser order rather than emergent complexity. However, from the Big Bang to our current period of partial globalization, we can observe in certain places a process of increased complexity. If we can resolve our current energy crisis in a sustainable way, and if we have the imagination, this process may continue. However, there was no uniformity in emergent complexity in the past and is no guarantee it will continue in the near future.

Baryonic Matter

Please consider the Big History narrative through the lens of politics. Nothing turned into something 13.82 billion years ago, and began expanding from an infinitely hot and dense point without mass into our universe. It may be that nothing is always pulsating and is regularly turning into a variety of forms of something. Perhaps we live in a popcorn multiverse with an infinite number of Big Bangs going off all the time in ways we cannot detect or imagine. Other universes may be sharing our space or off in other locales. Or maybe our own yo-yo universe has an infinite set of cycles of trillions of years. We used to think there was only one galaxy. Then we wondered if there were other inhabitable planets. We now know there are great numbers of both. Why should ours be the only universe? However, for now we will prosaically restrict our attention to our own universe.

The infinitely hot and dense radiation immediately after the Big Bang was dramatic, but largely as uniform a situation as has existed in our universe's history. If America was one nation formed by 13 former colonies and could adopt the Latin motto, *e pluribus unum* (from many one), the universe might adopt the opposite of from one many (*multa ab uno*). Incredible variation would emerge after the radiation period immediately after the Big Bang.

All but immediately after our own universe's Big Bang, when energy first congealed into normal or baryonic matter, six types of quarks appeared. They can appear again if protons and neutrons are smashed into each other at sufficient energy levels. Four of them led extraordinarily brief lives before returning to energy; they did not go on to form more complex forms of matter. However, two of them – the up and down quarks – did form relationships as they appeared. This will be a pattern. Some things go on to participate in emergent complexity. Many do not.

At least those quarks that survived formed relationships. For a billion and one bits of matter that appeared, a billion bits of anti-matter with opposite spin did as well. Rather than playing well together, matter and anti-matter annihilate each other. This mayhem is a rather good thing from our point of view, since if all the matter that appeared survived, the universe would have been just too crowded to ever have developed into us. And plenty remained. Enough matter to eventually make a hundred billion galaxies each with an average of a hundred billion stars all have been formed by the leftovers of the great annihilation. Destruction can be very creative.

The lucky surviving quarks did not exist in isolation; they always exist in threesomes. Their relationship is structured by the strong force that is mediated by the exchange of the charmingly named gluons. Two up quarks and a down one form a positively charged proton; two downs and an up form a neutron. Why is the strong force exactly as strong as it is and not weaker or stronger? Is it different in other universes? Who knows? It is just the way we do things in our universe. But if it differed at all, we would not be here and neither would anything else that we know of.

The quarks do not merge into one undifferentiated blob. Each proton and neutron is constituted by two different types of quarks. They relate to each to other through the strong force, but they keep their distance as well. Relative to their own size, quarks have a rather pronounced need for personal space. Each of these three move in a constant dance around the others. They are always related, always moving, always distinct. Nature at rest is hard to find. Nature is spinning, moving, and restless.

The protons and neutrons that were formed quickly after the Big Bang are with us still after almost 14 billion years. In fact, they are us, and everything else that we can see or feel. The structured relationships among individual quarks have been remarkably sustained. As inventive and creative as nature is, it also keeps certain things around for a long time. If liberalism is about change and conservatism about keeping things the way they are, we can answer an interesting question. Something came from nothing at the Big Bang. That is change. Quarks can maintain their relationships for tens of billions of years. Can't get much more of a status quo than that. So is the universe liberal or conservative? Every inquiring political scientist wants to know. And the answer is – yes.

About three hundred thousand years after the Big Bang, when the universe had expanded enough to cool sufficiently, the electromagnetic force mediated by the exchange of photons could structure a sustained relationship between protons and electrons. Atoms appeared. Hydrogen, with one proton and one electron, appeared in the greatest numbers. If you add up their mass, about three quarters of all atoms in the universe are still hydrogen. If you count atoms by number, they constitute about 90% of all atoms. They also constitute 63% of the number of atoms in your body (10% by mass). As has been said, hydrogen is an odorless, colorless gas that, given enough time, becomes you. And me. And Congress; it's not the quarks' fault.

Helium, with two protons and two electrons each, formed about a quarter of all atoms' mass that then existed (9% by number). There was also a dash of deuterium, or heavy hydrogen (one proton, one neutron, and an electron), helium isotopes, and lithium (three protons and electrons). Vast primal clouds of hydrogen and helium atoms, millions of light years across, still majestically float in certain areas of space nearly 14 billion years later. Some have gone on to form greater complexity; many have not. As Eric Chaisson has pointed out, "Far many more atoms are alone and isolated; only ~0.4% of the universe comprises bound atoms within complex, structured systems, roughly ten times that is loose baryonic (yet still normal) matter, which floats amidst the intergalactic beyond (all else, i.e., the remaining ~96% is "dark"-- and uncooperative, at least to our senses.)" Sometimes complexity emerges; more often it doesn't.

Once formed, and left on their own, these atoms tended to keep their distance. While the strong force bound quarks together and protons and neutrons together within atoms, these atoms left to themselves generally liked their own company. They might approach each other as they moved about, but usually swerved off, avoiding connections with each other.

We sometimes hear about an "atomistic society." This usually refers to a rather asocial condition in which individuals have little to do with each other. The analogy might be a billiard table, with hard billiard balls usually sitting by themselves, but occasionally knocking into each other, sending each other off in various directions. Atoms may be the basic building blocks; in our experience, blocks usually just sit there by themselves. We are each made of about $6.7*10^{27}$ atoms. What are we then like at our most constitutive level? Are we like the individuals discussed by Hobbes in the Leviathan? Do we live lives largely isolated from others? By nature, are we as asocial as atoms? Should Libertarians seek out new sympathizers among the universe's vast majority of unaffiliated atoms? If we seek to form relationships, do we need to find ways to overcome our natural proclivity for individualism? Are atoms the ultimate existentialists, destined to live lives of lonely desperation and then die alone? On a dark, rainy night. And since we are built from atoms, is that what we are really like, all niceties aside?

But what if the story is one of emergent communitarianism rather than individualism? Recall that even the simplest of atoms – those that have only one or two protons and are still the most abundant in the universe – are each a set of sustained, structured relationships. Quarks which just moments before had not existed, started to be related through the exchange of gluons mediating the strong force. Atoms, which had not existed before the Big Bang plus 300,000 years, added a relationship between protons and electrons. Atoms are sets of sustained, structured relationships.

At our most constitutive core, we are built more from relationships than from building blocks. Quarks and electrons are more fuzzy than blocky. Their "hardness" comes from forces defining their relationships. What exists between things is as real as the things themselves.

Stars

But what about atoms naturally avoiding each other? Relationships within atoms are fine, but beyond that, they naturally stay at a distance. Well, atoms are not left to their own devices. They exist within a larger framework that acts upon them.

When they did form, atoms were not perfectly distributed, if by perfect you mean absolutely equally. They were a little more densely distributed here, a little less there. This asymmetry, unequal distribution, or imperfection was another very fortunate occurrence. Gravity has no force at the relatively small distances between quarks. However, the space between atoms can be just enough to let it start operating. A clump of atoms here can exert gravitational attraction on a smaller clump there. If all atoms had been equally distributed, their gravitational attraction on each other would have canceled it all out, and they would never have been drawn to each other. However, with the asymmetry, the denser regions could start drawing in the slightly less densely packed atoms. Gravity kept pulling them together, increasing their density and heat. As they were pulled closer together, they began to spin faster like a figure skater drawing in her arms. Once sufficient density and heat developed, with atoms moving about more and more quickly, the atoms overcame their preference to stay away from each other. Hydrogen began fusing. They not only ran into each other, hydrogen nucleii could stick to each other, forming helium, with its two protons and two neutrons, all held together by the strong force. Gravity was the great matchmaker for atoms that on their own would have stayed standing awkwardly along the wall at the middle school dance.

But the newly joined atoms were less than the sum of their parts. Each new helium atom weighed slightly less than the hydrogen atoms which had combined to form it. The missing matter had turned into energy. The fusion caused energy to burst out. Gravity kept trying to draw the atoms in. The equilibrium between these two forces resulted in the formation of stars. The black sky began twinkling.

As the helium was formed, gravity drew it in more, until it heated up enough for it to start fusing into heavier elements, such as nitrogen. This released energy and permitted gravity to draw the newly formed elements further in, until they too began to fuse, forming carbon and neon. This was repeated as oxygen, magnesium, silicon, and sulfer were each fused. The largest stars with enough mass to permit gravity to keep drawing the newly fused elements further in developed an onion like structure, with the lighter elements on the periphery; the heavier ones successively formed layers closer to the core. Not only can there be new things under the stars, the stars themselves were something new. The strong force, electromagnetism, gravity, and fusion formed relationships between atoms within the structure of a star.

Gravitational attraction between stars and dark matter formed galaxies or groupings of stars in distinct patterns. Galaxies formed relationships due to gravity in local groups and even larger patterns. The theoretical work of Fr. Georges Lemaître, confirmed by the evidence collected by Edwin Hubble, demonstrated that not only were there more galaxies than our own Milky Way, but that once they got to be further away from each other than those in the local group, they are racing away from each other. It may be that dark energy or anti-gravity is causing the galaxies to keep falling out, with space and the universe expanding at ever faster speeds the further from each other they are.

When the largest of the stars began to make iron with its 26 protons, energy was consumed rather than released. The equilibrium between gravity and fusion was broken. Almost immediately, the star exploded in a supernova. The sudden increase in temperatures during the explosion permitted the almost instantaneous formation of all of the elements with more than 26 protons per atom, all sent streaming into space at incredible speeds, often mixing with pre-existing clouds of hydrogen and helium that had been floating since the Big Bang.

Molecules

Atoms form in such a way that electrons orbit protons in shells. The innermost shell is full with two electrons, the second with 8, the third with 18, the fourth with 32, the fifth with 50. Hydrogen, with its one electron, has a vacancy sign out in its only electron shell. That shell seems to want one more electron to form a full house. Oxygen, with its 8 electrons, has 2 in its first shell and six in its second. This leaves two vacancies in its second shell. This is a match made in the heavens. If two hydrogen atoms hook up with an oxygen atom, each sharing their electrons, each hydrogen atom can have two electrons in its only shell and oxygen can have 8 in its second shell. Everybody is happy because a new relationship between atoms is formed: H_2O – water. This molecule has a new property. At the right temperature, it has the property of wetness, which did not exist before. Water, which is abundant throughout space, is not the only molecule that forms. Dozens of molecules with 2, 3, 4, 5, or more atoms evolve naturally. Many atoms due to the way electron shells work lead to the formation of these new relationships called molecules.

Not all atoms are anxious to form molecules. Helium has two electrons in its only shell and has a No Vacancy sign well lit. It is called a noble gas. Having all they need, nobility does not require additional relationships with the lesser types that are needy. Relationship added to relationship is not much part of helium's story. While hydrogen becomes us, helium often just goes floating off into space. Not everything is social. Not everything forms polity, or sustained, ordered relationships. We saw that same aloofness with four of the six quarks. A subatomic particle formed in nuclear fusion, neutrinos, are much the same. Like photons, they go shooting from stars off into space, but almost never interact with anything. They can sail through twenty miles of lead and never hit anything. It has taken extraordinary measures to detect them at all. History and polity are not built on the backs of two thirds of quarks, neutrinos, helium, or other asocial phenomena. They are indeed the rugged individualists of the universe. The story of emergent complexity is not uniform.

Earth and the Emergence of Life

After a nearby supernova shot its star dust out into neighboring space, disturbing pre-existing clouds of hydrogen and helium, gravity again began pulling together the mixture of elements and molecules. A second generation star with mostly hydrogen and helium but also with traces of heavier elements in it – including oxygen, carbon, neon and iron – eventually began shining as our sun 4.6 billion years ago. It is not big enough to permit gravity to create densities high enough to fuse elements heavier than helium. This is good for us, since huge stars live fast and die young. Our sun goes along at a nice leisurely pace of fusing 600 million tons of hydrogen each second, turning it into 596 million tons of helium and more energy than mankind has ever produced in our species' entire history. It is because of all their mass that makes stars like our sun produce so much heat and light. Surprisingly, once you get down to the energy released bit by bit, the energy density flow is about the same as a reptile's metabolism.

The sun's rate of consuming its stock of hydrogen will permit it to continue shining for a total of about 10 billion years, meaning it is at mid-life now. Its five billion year history has provided energy and the time for earth to develop. We've got billions more years before the sun turns into a Red Giant, evaporates the oceans and engulfs the earth. There is time before anyone needs to get tickets for a trip to another solar system.

While gravity drew together 99.86% of the total mass of the Solar System to make the sun, the left over debris went to good use. On the outskirts of the spinning disk that eventually ignited as the sun, these leftovers from part of the supernova started accreting through the power of gravity. Chunks of iron, nickel, silicon, and bits or gold, silver, uranium and other elements and molecules bumped into each other and stuck together. All this knocking together that created kinetic energy, not to mention the radioactive decay of uranium and other such elements, made for a molten, hot planet that formed its own structure from thousands of molecules and the minerals they produced. Heavier iron and nickel sunk into a dense core that is still as hot as the surface of the sun. Silicon and other lighter elements rose to the top. Eventually, a thin layer made of the frothy basalt and granite could cool enough to permit land to form. Lighter, cooler outer layers spinning around denser iron and nickel produced a magnetic shield around the planet that protected it from solar winds that might otherwise blow away earth's atmosphere.

The process of chemical evolution that had begun in space continued on earth. The most common elements on the surface of the earth continued to combine in many ways. Hydrogen, carbon, nitrogen, oxygen, sodium, magnesium, phosphorus, sulfur, chlorine, potassium, calcium, iron, and other elements on earth interacted to form over 4,700 minerals. Around black smokers at the bottom of the oceans where tectonic plates separated and mineral rich heated waters bellowed up, or on sun soaked pools of water on rocky beaches, the process of chemical evolution continued. Lipids that created films formed, eventually forming membranes. Carbon, with its four electrons in its second orbit and a total of six overall, was able to combine with many other elements, and was central to the Krebs cycle which spins off amino acids. These molecules continued to combine until they integrated membranes, metabolism or access to energy, and rna and dna that permitted reproduction with variation in response to environmental changes. The Last Common Universal Ancestor – LUCA – was combined in the most complex relationship in universal history to date – that we know of. The first prokaryote cells were earthlings, formed of the commonly available chemicals and elements on earth's surface. They were also children of the universe, with elements forged in stars that had died long before.

Biological Evolution

It has been said that the dream of every bacteria, the simplest of cells, is to become two bacteria. Reproduction has to be important for any species that plans on surviving, since the death of any given individual is part of the way life works. Sustained relationship is not eternal relationship. The nice thing about being a bacteria is that your dreams can come true about every twenty minutes. Reproduction with variation in response to environmental changes is a skill perfected by prokaryote cells. You just can't argue with success. They live in virtually any setting, however extreme the condition on earth can be. From deep underground to thermal waters, prokaryotes are there. There are more bacterial cells in and on your body than there are cells that constitute your body. They help you digest food. And when you die, they will digest you. These types of cells have survived for almost 4 billion years. They will be on earth long after humans have vanished. Many prokaryote cells follow a plan that isn't broken and doesn't need fixing, although they do keep adjusting to new conditions such as antibiotics. They evolve quickly, but as a group, they have not become fundamentally more complex.

However, after a couple billion years of happily reproducing at their same level of complexity, some did become more complex. About two billion years ago, eukaryote cells developed with a membrane covered kernel in which more complex dna was kept. It also began hosting a mitochondrial cell, which provided an ability to burn carbohydrates and permits us to enjoy eating donuts.

A more complex set of relationships within the cell led to more complex relationships among cells. Films of bacteria on the surface of the ocean or accretions of them in rock like formations of stromatolites in tidal pools were steps towards multicellular life forms. Another step in multicellular cooperation came with creatures like the sponges. These are formed by the same type of cells that could still specialize in serving different functions. Some cells drew in nutrient rich water, others expelled nutrient drained water. Same type of cells; different tasks. Push these cells through a sieve so that they are separated as they fall to the bottom of a tank, and they scoot back together to form another new sponge. These are cooperative cells, not hardy individualists.

Relationships among increasingly complex body structures formed by different types of cells are seen in such examples as cnidarians, or jelly fish, first seen about 800 million years ago. They have little harpoons that can inject prey with poison, have such structures as a mouth / anus, and have two layers of tissue. Their nervous system is pretty uniformly spread out throughout the animal. Jelly fish are still around and doing fine. The Scarecrow in the *Wizard of Oz* seemed to get along pretty well without a brain, and so have the cnidarians. They have existed 4,000 times longer than homo sapiens have. They see no reason to develop more complexity.

Still, there were additional mutations that worked out in the environment of the time. Flatworms introduced a body plan about 590 million years ago with a right and a left side, an up and down, and a front and a back. Sense organs were put up front, along with a ganglia of nerve cells to interpret the incoming data. Chordates like the currently existing hagfish put a cord along its back to protect the flow of information from the ganglia to the rest of the body, as well as putting the mouth up front and an anus in the rear. About 525 million years ago, vertebrates started breaking that cord into bony segments, offering better protection and definition. The first animals to venture out from the seas onto land, such as Tiktalik, had wrists to help scoot on land and a neck to help look around. About 360 million years ago, the first amniotes could recreate the watery world in which reproduction had originally taken place, and start producing eggs with a protective shell and watery interior. About 360 million years ago, mammals first appeared, which had, among other things, a more complex auditory system with more parts that helped them hear better. The story of evolution is in part a story of increasing complexity of body structures, with more complex relationships among greater numbers of parts.

It is worth recalling a few things: First, part of the reason for this development was in response to the bitter competition between and among species. An arms race of those seeking to eat others and those seeking not to be eaten was good to select which individuals would survive to reproduce the next generation. Increasingly complex relationship was spurred in part by harsh competition. Secondly, there was no steady rise from simplicity to complexity. Five major extinction periods between 450 mya and 65 mya caused huge interruptions. This is only part of the reason why over 99% of the species that have ever existed are now extinct. We may be going through a sixth (self-induced) extinction period that we hope does not conclude with our own species' disappearance. It would be a shame to be a mere 200,000 year-long flash in a pan.

Relations among animals and plants

Relationships among quarks, protons and electrons, atoms, molecules, cells, and body parts were followed by increasingly complex relations among and between species. Edward O. Wilson's *The Social Conquest of the Earth* offers a brilliant discussion of this phenomenon. From quorum sensing of bacteria to schools of fish, bee hives, ant colonies, flocks of birds, herds of bison, troops of chimpanzees, and many other examples, animals often live in groups and groups often form ecosystems.

Not all animals live in groups. Many seem to exist in splendid isolation for most of their lives, coming together just long enough for reproduction without any care for offspring after birth. Mother guppies and sharks would just as soon eat their babies. Sea turtles lay their eggs on the beach, return to the sea, and may hope for the best for their offspring, but likely don't think about them. Crocodiles help their offspring out of their eggshell and out of the nest; after that, the kids are on their own. Childcare is of course more of an issue for various lengths of time for many species. From weeks of care to a couple years is common. Mothers, fathers, and others are involved in different ways, depending on the species.

By the time we get to hominids, our ancestors' survival strategy and increasing sociability went hand in hand. Australopithicus and its ancestors were likely more often the hunted than the hunters. They may have scavenged, eating bone marrow of leftover carcasses, but gathering fruits, nuts, tubers, and leaves likely provided a main stay of their diet. Other than that, they tried to stay out of the way of predators. They had few natural weapons. Their teeth were no match for those of lions. Their speed was no match for cheetahs. They had no shells for defense nor wings for flight. No wonder that there do not seem to have been huge numbers of hominids, that most species went extinct, and that our own ancestors came close to extinction. They just did not have that much going for them.

Bipedalism, for whatever reason it was adopted, did permit more use of the arms, hands, and opposable thumbs. A parent could hold a child and pick fruit all at once. But it also altered the skeleton, restricting the birth canal, making child birth that much more dangerous. This became a greater problem once the hominids' greatest weapon did finally start to develop. Brain size from australopithicus to homo sapiens tripled, with Neanderthals winning the brain size competition. (Brain size for Australopithicus averaged between 375 and 550 cm^3, Homo habilis from 500 to 800, Homo erectus 750 to 1225, Homo Sapiens 1200 - 1750, and Neanderthals 900 - 1880.) Hominids couldn't outfight competing species, but they could start to outthink them. Brains rather than brawn would eventually win the day.

Even with only partial brain development and soft skulls at birth, delivering children had become highly risky. To permit time for the brain to develop to maturity, grow a bony skull, and learn all that they required to survive, childhood for hominids took years. Breastfeeding and childcare-giving mothers developed close relations with offspring over long childhoods.

Child mortality was still likely high. For a handful of children to reach sexual maturity, birth would need to be given to a number more. Especially with life-spans in the 30s or so for adults who got through childhood, this meant that most or all of a female's adult life was involved with pregnancy and childcare. Working mothers were the norm. They likely provided the bulk of the calories through gathering and carried out many other important tasks. Still, they would have needed support as they did the primarily important work of getting children to adulthood so the species could survive. Long term relations between mothers and children and between child care-taking females and males were necessary for the fat-headed hominids to survive.

It is one thing to get together briefly to copulate. That is all sharks need to do since child care is not a problem. It is a wholly other set of problems to stay together for many years to raise children, a problem that hominids did have to figure out if they were to survive. Resolving the issues of food, shelter, and other necessities for a kinship group over years takes problem solving and relationships to a whole different level. The increased demands of a long childhood and the long term adult relations it required selected for an increased ability to figure out how to live together for many years at a time. The gender relations made necessary by being a big brained bipedal species is a root of hominid polity. Sexual politics has changed markedly recently with longer life spans and lower mortality rates. Mothers no longer spend their entire adult lives dealing with pregnancy and childcare, and have the time and energy to do much else.

As Michael Duffy, who writes within the Montessori tradition, notes that as we go through evolution, "organisms produce fewer and fewer offspring and require longer and longer periods of care, leading to more important and deeper relationships. Fish produce thousands of eggs and rarely care for their young, reptiles produce hundreds of eggs and have only limited contact with their offspring, most mammals produce only a litter of a half dozen young and care for them for a long time through nursing, and humans have one or maybe two babies at a time and produce the most parent dependent creatures on Earth!"

Many species have long developed their own ways of developing and maintaining relationships. Baboons groom each other, checking for parasites in the fur. Frans de Waal discusses how bonobos use sex for much the same purposes. Social primates, who were not genetically identical like ants within an colony are, developed a "theory of mind;" they could understand each other's reactions. They could even sometimes "feel for each other," or empathize. The law of the jungle, as de Waal argues, includes the social practices and understandings that would later be self-consciously developed into ethics.

Picking lice out of children's hair and having sexual relations has forever been part of hominid mothers' lives as well. Hominids' survival strategy led to developed abilities to relate to each other. For their relations to develop, they would need to exchange a lot more than just gluons and photons. If you thought physics was hard to grasp, just try politics.

Memory, Imagination, Symbolic Thinking, and Exchange

Memory is an incredibly complicated topic. Virtually all species remember, although in very different ways. The long childhoods in which each person remembers their period of dependency creates long term memories of caretakers. Hominid adults still remember their own childhoods and their caretakers. They remember how these important experiences were carried out by those who are now old or dead. What was so important is now gone, but remains important in memory. Memories of what is no longer may be pondered while going about present tasks..

Child bearing for hominids also entails the expectation of repeating a long term set of relationships. I am going to have to do for my children what was done for me. This baby will require years of nurture to get it to sexual maturity. What is a baby now will in a number of years become an adult if I do what I need to do to help it survive. I can imagine a long term future which does not yet exist, but which I can help create. Memory, imagination, planning, and execution go hand in hand.

Being able to remember what no longer is – and imagine what is not yet – is facilitated by symbolic thinking and language. Vervet monkeys will make one call for threats from above such as an eagle, another for threats in trees such as snakes, or those on the ground such as big cats. When one monkey makes such a call, others in the troop look in the right direction. One screech signifying eagle causes other monkeys to look up. A sound and an expressed / perceived meaning is linked correctly, helping the group's survival. However, the monkey does not make the sound in the absence of the threat. They do not discuss how to better prepare for a future threat. Vervet monkeys do not sit around at night discussing that day's eagle attack. They do not draw pictures of eagles. They do not intellectually manipulate or exchange symbols.

The development of syntax or grammar and vocabulary went along with that of symbolic thought. Being able to consider words and meaning in the absence of immediately present referents, adjust them, move them around and think of alternative arrangements, was facilitated by language. Being able to communicate these ideas in novel yet understandable ways meant that new meanings could be created.

Remembering and imagining in the absence of the referent is a source of symbolic thinking, planning, and eventually realizing possibilities. The road from the communication of monkeys to the symbolic thinking of hominids is long, complex, and still not exactly understood. But that it took place seems clear. By over two and a half million years ago at the Gona River in Ethiopia, Australopithecus or Homo habilis was making stone tools. Other species use tools as well. Crows, wolves, chimps and others will use stones and sticks to achieve various purposes. However, the Gona River chipped tools were fashioned by toolmakers. They had to first select which type of rock they wanted to alter. Some types of rock are too soft to make good tools. Then they had to be able to imagine the tool that was in the right kind of rock, to imagine how it could be made into a cutting, scraping, or digging tool. Then they had to carry out a series of steps to create the tool. This was probably done with others looking on and learning how to do this as well. And remember, all of this was going on over two million years before Homo sapiens appeared.

Tool-making was added to older tool-using skills when symbolic thinking and imagination was possible due to eye – hand and brain development, relative to earlier species. Those who had emerged from nature now began to adjust what they found in nature. Nature in these complex pockets called hominids could begin to select what helped them survive and live better. Evolution could begin to be not only in response to environment, but determinative of it. Nature became partially self-selecting in hominids.

Nature had long exhibited how creative it is. There was nothing and then there was something. There were not protons and then there were. Same with atoms, molecules, stars, terrestrial planets, and life. The transition from one to the next are times of change and natural creativity, but there were long periods of stasis in between each one. Relative to these periods, the time it took for hominids to develop their tool making was rather quick, even if it seems to be agonizingly slow to us. By the Oldowan period from about 2.6 to 1.7 million years ago, australopithicus and / or homo habilis had developed more sophisticated tools. By the Acheulean period about 1,650,000 to 100,000 years ago, tools had become bifacial, larger, and more varied. The oval or pear shaped tools were not only functional, they also have shapes that are pleasing to us and perhaps to their makers. Natural emergence had become hominids' creativity. The road from physics to art was being paved.

Adjusting nature was done in various ways. Eating meat and tough tubers was hard on the digestive track of early hominids. Cooking them made them easier to digest and taste better. Exactly when this began is not certain, although it seems to have started between 1,500,00 and 790,000 years ago with the fire altered stones at Gesherbenot-Ya'aqov in Israel. The transition from scavenging to hunting had been made at least by a half million years ago, as indicated by spear points and skeletal wounds in prey found at Boxgrove, England and Kathu Pan 1 in South Africa.

Burials indicate a new level of relationship. Other species such as elephants will clearly mourn dead members of the group. But the careful burial of the dead is a human activity. Again, exactly when this began is not clear, but there are burials from 80,000 to 120,000 years ago in Qafzeh, Israel. Here, we have living members of the group remembering the people who had died and imagining they have an obligation to them even after they die. Burial is a relationship with the dead, requiring memory of what is no longer. What is real in the present is only part of what matters. Memories of the past – kept in the electrical / chemical relationships among neurons – can be more important than the hard stuff that one can feel now in the present.

Hunters had long understood the difference between life and death. Causing an animal to bleed from wounds transformed the beast from one running through the woods to one lying on the ground. Did the hunters begin to think symbolically about the "life" being in the blood that sank into the ground? Does the life of the body go into the earth looking for a new form to inhabit? Is the spirit of the dead animal believed to be angry at the hunter, planning to return to the surface world to make trouble if proper steps of propitiation are not taken by the hunter?

Once grave goods become included in the burials, we seem to also have imagination of the future added to memory of the past. Burial goods suggest that people thought they could indeed take it with them. Everything had a spirit: people, mountains, rivers, pots, weapons, etc. The life or spirit of the dead person will need the spirits of various tools or weapons in the next life. Members of the group were socially close to those now dead. They remembered them and valued these memories. They wanted to imagine that their beloved would live on, and that proper actions by the living could help the dead live well. Ancestor worship may be one origin of religion. This seems to indicate the powerful social attachments our ancestors had with each other.

The discoveries at Blombos cave in South Africa from about 75,000 years ago include an etched, rectangular rock. A net or diamond like design is scratched, with diagonal and parallel sets of lines. This is not just aimless doodling. This is done by a person interested in perceiving and creating patterns. What other patterns were being perceived and analyzed? Seasons? Plant growth? Movements of animals? Behaviors of fellow members of the group? Did the patterned lines have symbolic meaning of some sort in a way that etched crosses, six pointed stars, or crescents often have for us?

Shells with drilled holes were also found at Blombos. The cave is near the coast, and a diet of sea food sustained them. Did they wear the shells as a way to offer the spirits of the dead animals a place to live after their bodies had been ingested? Did they wear necklaces of shells out of a sense of beauty made possible by using or improving on what nature offers? What do these artifacts indicate about their symbolic thinking?

By perhaps 48,000 years ago, at the El Castillo Cave in Spain, an artist painted animals and designs from dots and lines on the walls. This was the case later as well at Chauvet, Lascaux, and elsewhere. The animals that were painted were not modeling for them. The artists worked from memory. What purposes did they have in painting these animals and designs underground? What were the artists thinking about the animals and designs they painted? It is hard not to speculate. Was the cave where the spirits of dead animals went to live after their blood drained from their bodies? Were these spirits looking for new bodies to inhabit? What was the meaning of the paintings for those who drew or first viewed them? The artists also spit painted the outline of their hand multiple times. Were they leaving their signature, wanting those who would view the painting in the future to know who painted them? Were they touching the rock behind which the spirits of the animals they painted lived?

The importance of reproduction and fertility is made explicit by the so-called Venus figures found at Hohle Fels in Germany from the Upper Paleolithic period, the Woman of Willendorf from about 24,000 years ago, the Woman of Laussel from about 20,000 years ago and many others. These palm size statuettes of women with exaggerated breasts and hips may have offered comfort to mothers going through pregnancy or delivery, or had any number of other possible meanings. Whoever made the statues did so while thinking about fertility and sexuality rather than engaging in sex. These statues demonstrate symbolic thinking about sex in the immediate absence of sexual behavior.

The Big History and Politics of music is noteworthy. The hardware necessary to transforming the waves through a medium such as air into perceived sounds in the brain began with early land dwellers feeling vibrations in their bones. Sight is great, but you can't see around the bend or over the hill. Sound provides crucially important information. The patterns and tones of sound provide important information about the environment.

Many species produce sounds as well as perceive them. Some birds will sing to announce territorial claims or attract mates. Whales and others too will sing to communicate over long distances. Sounds can convey information to others.

With the malleus, incus, and stapes as part of their auditory system, mammals became able to hear in ways that reptiles cannot. Listening to the sound waves caused by ocean waves, lion roars, chirping crickets, and howling winds all had important meanings for hominids. Hearing and responding to a dependent babies cry, parting the lips and calling "Ma" with various inflections of tone elicited powerful responses among caretakers. Different sounds would have elicited other profound emotional responses, such as fear or sexual desire. Rhythmic music and drumming would have enhanced group identity during kinship groups' dances. Eventually, fife and drums communicated information and bolstered courage during battle. Campaign theme songs would identify candidates. National anthems would stir patriotism. Perceiving and making music has a long history of the relationships between animals and their environments, and animals such as humans with each other.

Symbolic thinking and imagination made combination beyond natural referents possible. A wonderful example of this is the Löwenmesch or Lion Man from Germany from about 30,000 years ago. A bipedal man's body with a lion's head was not something the artist had ever seen. This was work not from memory alone but from imagination and combination. This indicates the ability to manipulate symbols separate from natural perception. It also indicates a crucially important political ability of combining what had not yet been combined in nature. Nature had combined much in the past through increasingly complex relationships. Quarks, atoms, molecules, minerals, cells, body parts, animal groups, and ecosystems all kept putting thing together in larger and novel combinations. Now, humans could do this at a faster pace and self-consciously.

Placing value on symbols for their own sake was exhibited by early artists as well. For example, there is a beautiful ivory horse sculpture from Vogelherd, Germany from about 32,000 years ago. The artist did not try to include all the musculature of a real horse. Instead, it is an idealized shape with a series of flowing curves. This is not so much a representation of a physical horse as an ideal one expressing a sense of beauty. The artist took delight in abstraction. Plato was a bit of a Johnny-come-lately with his theory of the forms.

Relationships through the exchange of words, music, and symbols developed human relationships. Exchange of goods did too. This too has a long history, going back to sharing food to enhance group relations. Specialized tool production homo habilis sites relatively far from sources of rock that were used indicates trade as much as two million years ago. Trading routes become increasingly extensive and established, until by 14,000 years ago the obsidian trade in the Near East and then the famous Silk Road establish what some see as a central core political system.

Political Development

Kinship

The growth of symbolic thinking and exchange of goods, words, glances, gestures, musical sounds, and artistic images facilitated political development. We have discussed the importance of kinship groups. Long term bonding of child care givers required sophisticated relationships demanding lots of exchanges. Kinship groups within a scavenger / gatherer and then hunter / gatherer economy likely became complex, but were still limited in size to perhaps fifty or a hundred persons. Larger trading routes would have permitted development of complexity of relationship. Family groups needed to exchange offspring for mating in the next generation. This led over generations to complex sets of inter-kinship relations. Terms such as "second cousin once removed" start to indicate such complexity.

In kinship relationships, lineage is important. Loyalties are to caretakers and common ancestors. Family and kinship remains important in our own day. The powerful resonances are indicated by larger groups attempting to appropriate kinship relations. Nationalists sometimes have referred to their country as a Motherland. In the United States, George Washington is referred to as the "Father of the Country." Members of the Roman Catholic church call their priests “Father.” Larger, non-lineage groups often seek to call upon the powerful forces of kinship. One of the values of Big History is its scientific story of the real lineage of all persons, going back to a small group in Africa about 200,000 years ago; of all life to LUCA, and the Universe to a single point. It turns out that we really do all have a common background. Big History is the scientific story for a period of Human Politics.

Agriculture and Villages

One of the major thresholds of Big History is the Agricultural Revolution. The transition from hunting and gathering to growing crops and raising certain animals is of crucial importance. It also entails a stage of political development. Hunting / gathering went along with kinship polities. With agriculture came settled villages of increasing size, beginning to include different kinship lines. This presented the village with an enormous political problem: how to establish a sustained, structured set of relationships beyond kinship.

One way to do this was to create dynasties; village lineages that all could be persuaded or forced to adopt. Lineage now became a symbolic political category rather than a biological one. In many regions of the world, mounds and other monumental burial sites enshrined the lineage of the village. Those within one lineage might still have the right to rule, but all needed to exchange the symbols that helped nurture loyalty to it.

The political leaders of these settlements or villages during the early agricultural era were sometimes those who had access and control over the best growing areas. We start to see increased social stratification and inequalities in wealth as the agricultural era proceeded. Some residences and some graves are noticeably more grand than others. Hierarchy in the hunter / gatherer era was more likely based on strength, size, or cunning. In each period, leadership could also be exercised by those we call shamans, or those who could impress their fellows with their special insights and relationships. When some went through fasting, whether by choice or necessity, carried out rhythmic dancing while listening to repetitive rhythmic music, added various hallucinogens, and perhaps inflicted self-flagellation, they likely could report any number of special insights and experiences. Shapes would have shifted, experienced as traveling in other realms. These were similar to dream like states. Dreams while sleeping and trances while awake offered symbolic connections with what was beyond normal referents. Imagined relationships with abstract designs, ancestors, and the supernormal by some could have impressed others and established a claim to leadership.

Village identity could be developed and expressed through styles of clothing, certain verbal expressions, or other identifiers. Stories about the village could be told at gatherings. It took enormous effort and creativity to incorporate loyalty to the family within loyalty to the village.

Cities and Empires

Monumental, ceremonial architecture reinforced the claim by some of symbolic leadership that legitimized claims to leadership. Standing in awe not directly of the universe, but of some people’s special connections with it were impressive. From Watson Brake in Ouachita Parish in Louisiana from about 5400 hundred years ago to Imhotep’s Saqarra in Egypt about 4,700 years ago, grand burial sites began to announce the emergence of full time leading families. Large, stylized burial mounds called attention if not of the gods, at least of the humbled onlookers who stood before them during ceremonies. Equivalents in modern America are the tall, stiff obelisk in honor to the Father of the Country, or the Jefferson or Lincoln Memorials in which political pilgrims can stand reverently in front of larger than life leaders who have mythical meaning and personify the presidential succession that leads to the current national leader.

Large, monumental architecture also announces the emergence of new political units of cities with larger populations and relations of cities within regional associations and nations or empires. Eridu, Uruk, Ur, Çatalhöyük, Jericho, Damascus, Mohenjo-daro, Tenochtitlán, Teotihuacan, Xi’an and other great cities represent a transition to larger, more complex political units. Sometimes these became the hubs of empires; sometimes they were combined with other cities within empires such as the Akkadian Empire of Sargon the Great from 2,400 BCE, the 15th century BCE New Kingdom of Ancient Egypt ruled by Thutmose III, the Assyrian empire of 2000–612 BCE, the Median Empire in Persia by the 6th century BCE, the Achaemenid Empire from 550–330 BCE, the Mauryan Empire from 321 to 185 BCE, the Roman, Han, Byzantine, Qing, Mongol, Arabian, Ottoman, Ashanti, and Mughal empires.

The modern European empires were transformative through their incorporation of the Industrial Revolution. The British, French, Dutch, German, and Japanese empires were built from steel, oil powered ships, railroads, gasoline powered vehicles. The Russian and American empires combined these in the Information Age with nuclear power and nuclear weapons.

Empires have survived for various lengths of time, sometimes lasting for a number of centuries. Imperial overstretch often exhausted them. This happened most recently with the Soviet empire, which broke up as many of its satellite states gained independence. It may be happening now with the American empire, with a state that is quickly becoming hopelessly indebted. Hundreds of US military bases add to a military budget that is equivalent to those of the next twenty states combined – and to US budget deficits that, along with entitlements and the interest on previous borrowing, add to the skyrocketing of American borrowing.

The struggles for power within empires and between some of them are the stuff of traditional history. The endless lists of battles and army flanks can make for a depressing account of the human past. Homer's account of the Trojan War is heroic enough, but it is also just another deadly battle scene. And things don't seem to have improved much. We started the twentieth century with a war to end all wars, followed by a horrific Second World War twenty years later. Since the end of WWII, there have been about 250 wars with over 50 million people killed, tens of millions more wounded, and countless made homeless.

Big Politics?

What will replace America's unipolar moment after the end of its empire? Will it be replaced by another empire? A return to a multipolar world such as existed in Europe in the nineteenth century? Are we within a transition to a new level of complexity which incorporates relationships among quarks, atoms, molecules, cells, body structures, families, villages, cities, nations within a more closely related humanity within our common environment?

Some find hopeful evidence for such a transition occurring. The research into missiles starting in the Second World War and continuing through the Cold War is responsible for much of the technology that produced the Earth Rise photo, a banner for globalism ever since it was first taken by astronaut William Anders in 1968 during the Apollo 8 mission. Steven Pinker argues in *Our Better Angels* that we have experienced a promising trend of decreasing use of force. Humans are indeed capable, he argues, of exercising their self-control, empathy, morality, and reason. We have seen the emergence of government claiming a monopoly on force and violence. Many regions of the world have robust treading and financial relations. We have seen increased literacy, urbanization, mobility, and access to mass media. These have led to greater familiarity among cultures. There has been some increase in the rule of various forms of democracy. As bad as the many wars since 1945 have been, there has been no civilizational ending nuclear war. Twenty years separated WWI and WWII; we have gone 68 years since WWII without any WWIII. There is no reason for complacency yet, of course. It was a century between the Napoleonic Wars and WWI; so we have yet to equal the successes of the nineteenth century. Still, there may be come collective learning about how to keep the peace.

The threat of environmental degradation, pollution, and climate change may have become more pressing that the threat of war. Decreasing reserves of fossil fuels and the carbon emissions from the use of those we have combine in an energy crisis. If this crisis cannot be solved in a sustainable way, the consequences could be negatively transformative.

On the other hand, within the past generation, environmental concerns have gone from marginal to central for great numbers of people.

The hopes of those who established the United Nations frequently seem illusory, given that body's actual performance since the Second World War. Yet, the nations of the world continue to belong to it and even make productive use of it at times. We are very long way from a world government, but also a long way from international anarchy. Still somewhere in between, we have various international organizations that achieve many purposes.

Where are we going?

What can we conclude from our 13.82 billion year journey so far in this universe? The access to high quality energy in certain pockets has permitted increased complexity in relationships between quarks, atoms, molecules, cells, animals, and humans within families, cities, nations, empires, and the world. Each of the earlier relationships continue to be part of our current ones, although often in transformed ways. You and I are the beneficiaries of the relationships that have been developed. We are made from the relationships among quarks, atoms, molecules, cells, and many intricately related body parts. We live within kinship groups, nations, and empires. Many of us are connected with others around the world through the almost instantaneous exchange of digital information. We have evidence for a common origin of all of us and indeed everything it the universe. All of us on earth have a common origin and ultimately a common destiny.

Will we continue to have access to high quality energy and remain as the pockets which continue to develop the most complex relationships of which we are aware in the universe? Can we use this energy without polluting our world and making it uninhabitable? Even if the energy crisis is resolved in a sustainable way, do we have the imagination to combine national, ethnic, and other types of groups within new and meaningful relationships? Can we be as creative as nature was earlier when it first combined protons and electrons, atoms in molecules, molecules in cells, cells in plants and animals, and animals in various groupings? Can we be as imaginative as the artist who carved the Löwenmesch, imagining the combination of lions and people? Or the shaman who imagined how to combine kinship groups in the village? Can the study of Big History be formative enough to teach us how to combine families, ethnic groups, cities, nations, empires, humans, and our environment in ways that protect all of them? Can this be done even while there are many in less complex relationships who show little or no interest in participating in Big Politics, who are satisfied with staying at their level of complexity? Can enough people make the transition to the next level of complexity? Can we fashion a more complex sustainable, structured set of relationships? A new Big Politics?

Or will entropy overtake us before it needs to?

This essay develops a paper written for the 2012 IBHA conference and a web presentation requiring Adobe Flash. Comments and suggestions for further development are welcomed at lowell.gustafson@villanova.edu.

Students’ Big History Research Conference

From 13 to 15 June 2013, the University of Amsterdam will host the first Students’ Big History Research Conference.

The conference will feature presentations from 19 participants, coming from universities in the US, Australia, China, Russia and the Netherlands. The topics addressed will range from geological, biochemical and biological ones to historical, philosophical and pedagogical ones, and will all be analyzed from the perspective of Big History.

Most participants will be students who are either currently pursuing a Big History graduate degree, are trying to give their graduate research in a more traditional field a Big History spin, or are trying to formulate a Big History graduate research proposal. Apart from these (future) graduate students, Chronozoom’s Roland Saekow will give a talk on Chronozoom and its newest personal timeline feature. Established academics like Dutch paleo-ecologist Henry Hooghiemstra and Big Historian Fred Spier will give keynote speeches. Henry Hooghiemstra will try to bridge the two cultures by explaining how he thinks climate change and changing environments have influenced human history; Fred Spier will talk to the first generation of Big History graduate students about the future of Big History research.

We are hoping that all these presentations, and of course all the informal discussions over lunch and evening drinks, will help us achieve several goals. First of all, we are hoping that Big History student conferences like this one will help create a global community of Big History graduate students. The formation of such a community would enable students to share information about Big History research agendas and research methods that are still in development. It would also enable them to discuss new kinds of problems that arise when trying to pioneer Big History research at the graduate level, such as how to justify dealing with 13.8 billion years of history in a 2 to 4 year project, and how to actually do that.

Secondly, the conference might help attract new people to the field. Several students who had expressed a desire ‘to do something with Big History’ in the past, have seized the opportunity to present their ideas at a conference to elaborate and sharpen these ideas and turn them into research proposals. Several others have registered for the conference just out of curiosity. The conference might inspire these students to use Big History to contextualize their own research, or even to eventually become big historians themselves.

Last but not least, we are hoping that the conference will help its participants to prepare for the next 'big' Big History conference at Dominican University in 2014. For this reason, one afternoon will be dedicated to a workshop on the theme of the Domincan conference, energy in Big History. During this workshop, participants will brainstorm about how they can link their own research to the energy research agenda. This might lead to some interesting ideas and perspectives that could be presented in 2014.

If all of this this made you curious about the upcoming first Students' Big History Research Conference, come and attend! If you don't live within cycling distance of Amsterdam, you can also catch a glimpse of the conference through our live broadcast. You will be able to find the broadcast at our temporary conference site at http://ibhastudents.wordpress.com. The site also contains more information about the conference, such as a detailed conference program. Also stay tuned for more: the next IBHA newsletter will include an extensive report on the conference.

Students' Big History Research Conference

Please plan on participating in the

IBHA conference

August 6 - 10, 2014

Dominican University of California

Wednesday, August 6, 2014
Registration
Chabot Space and Science Center Excursion
San Francisco City Tour

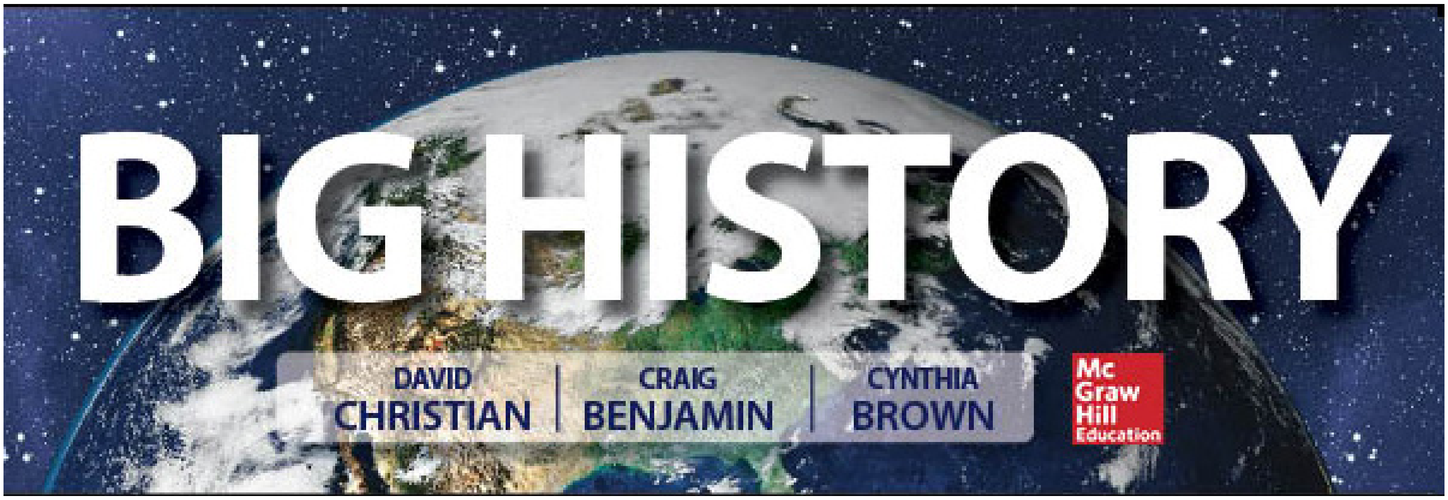
Thursday, August 7
IBHA Conference Day 1

Friday, August 8
IBHA Conference Day 2

Saturday, August 9
IBHA Conference Day 3

Sunday, August 10
California Academy of Sciences
Excursion Wine Country Tour

Energy Flows in Big History



McGraw-Hill Education is proud to announce the highly anticipated first edition of ***Big History: Between Nothing and Everything*** by David Christian, Craig Benjamin, and Cynthia Brown, available August 30, 2013!

What is Big History? Big History incorporates findings from cosmology, earth and life sciences, and human history, and assembles them into a single, universal historical narrative of our universe and of our place within it. The first edition of *Big History: Between Nothing and Everything*, written by the pioneers of the field, presents a framework for learning about anything and everything. It encourages students to think critically about our cumulative history and the future of the world through a variety of lenses.

Hear the authors discuss the first edition of *Big History: Between Nothing and Everything*! The focus of this webinar will be on introducing the content and helping you to teach Big History in your classroom.

Big History:
A BIG Course for the 21st Century Student

David Christian, Macquarie University
Craig Benjamin, Grand Valley State University
Cynthia Brown, Dominican University

Webinar Recording

Contact McGraw-Hill

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