

# Origins

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# Table of Contents

## Star Gazing to Sustainability: Science Appreciation and Big History

*Jonathan Yavelow*  
*Rider University* ..... page 3

## Big History Goes Back to Jail

*Lowell Gustafson*  
*Villanova University* ..... page 7

Letter to the Editor ..... page 10

IBHA Board Elections ..... page 10

New Big History Association in UK ..... page 11

New and Returning IBHA Members ..... page 12

2016 IBHA Conference ..... page 13

Dear Members of the International Big History Association,

With 2014 drawing rapidly to a close, the IBHA extends its greetings to you with the hope that the past few months since our Dominican Conference have been productive, and that you are looking forward to a relaxing and enjoyable holiday season. The Board of the IBHA thanks you all for your continuing support of the Association, which is absolutely dependent upon your membership dues to maintain its many activities in support of the field of Big History. In addition to maintaining your financial membership of the IBHA, we ask you to also **please consider making a tax-deductible contribution to the Association before the end of the year.** Such contributions could be made by sending a check to the IBHA office, or through

our **[secure PayPal link on the IBHA website](#)**. Our office will send a letter of acknowledgment to each contributor for tax records. Thank you all sincerely for considering this.

With very best wishes on behalf of the Board of the IBHA,

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# STAR GAZING TO SUSTAINABILITY

## SCIENCE APPRECIATION AND BIG HISTORY

BY JONATHAN YAVELow  
RIDER UNIVERSITY

### Gazing at a Vocation in Science

**J**ONATHAN YAVELow, Ph. D. in Cell and Molecular Biology, is a member of IBHA and participated in the IBHA 2014 conference. He has been a biology professor at Rider University for 32 years. He does research in breast cancer, funded by NIH as well as other cancer research foundations. He has taught science and non-science majors, as well as many team-taught classes with colleagues from both the sciences and the humanities. These team-taught classes have expanded his perspective on science to include viewpoints from philosophy, political science, and literature. He recently was one of a few senior faculty to participate in a year-long program aimed to improve college teaching. Dr. Yavelow's teaching begins with seeing his students where they are, rather than where he would wish them to be. He finds that unfortunately, many of today's college students read very little, have short attention spans, and are constantly interrupted by their smart phones. It is with this in mind that he has written *Star Gazing to Sustainability: Appreciating the Scientific Process* ([Kendall-Hunt](#)).

*Star Gazing to Sustainability* is a short (30,000 words) science story showing how evidence discovered through research in the major science disciplines may be combined into one comprehensible account, the science portion of Big History. The story celebrates the beauty and power of scientific thought. It is written for non-science majors enrolled in college science core courses. It differs from traditional scientific textbooks in that it includes all of the sciences and seeks to elicit science appreciation by drawing on them to present a history of the universe, from the Big Bang through the evolution of life. Descriptions of experiments, together with data from each of the science disciplines, is set off in boxes so as not to interrupt the flow of the book. These sections focus on how we know certain scientific facts rather than just what we know. This story not only shows our common origins; it also shows how embedded nature is in us. We are that part of the known universe that can reflect on itself - and can choose to help sustain our small portion of a vast universe.

The process of writing *Star Gazing* began in the summer of 2010, when I enrolled in a course on a new science-based cosmology at Genesis Farm, Blairstown, NJ, taught by Sister Miriam MacGillis. This course emphasized that a sustainable future requires people to feel that they are a part of nature. As a follow-up to this course, I team-taught two different classes. The first class (Fall, 2010), taught with an environmental activist/community organizer, was titled “The Environment: A Conflict of Interests.” It became clear while teaching this class that many students were conflicted between scientific and religious points of view about their role in the world. When the scientific viewpoint contradicted their religious viewpoint, they just ignored the data. This class focused on how to use objective thinking to prioritize various points of view, and many students viewed it as an epiphany in their own lives. The second class (Fall, 2011) was team-taught with a chemistry professor and was titled “From the Big Bang to the Origin of Life.” Students in this class were primarily music majors who related to science as a collection of facts. Focusing on the question “where do we come from?” made the class more relevant for them and was a way of integrating the scientific information into their lives.

During the 2011-2012 academic year, I was a visiting scholar at the Institute for Advanced Study (IAS) in Princeton, NJ, invited by the well-known physicist and mathematician Freeman Dyson. While researching this book, I expanded beyond my own field of biology into astronomy/physics, chemistry, and geology.

While at the IAS for the academic year, I wrote *Star-Gazing to Sustainability*. I spent about half of my time teaching and half working at the Institute. Feedback on various drafts of this book from both first-semester college science students and non-science majors in the Baccalaureate Honors Program was particularly helpful to me.

## Reflections on a Book

There is a crisis in both science appreciation and science literacy, both in students and in the general public. This crisis undermines the ability of society to deal rationally with its societal and environmental problems. Science appreciation precedes science literacy. There is both joy and insight in science. I wanted to capture both through an account that unified all the science disciplines.

My book, *Star Gazing to Sustainability*, describes the history of the universe, basing the account on the evidence discovered through scientific research. Beyond the knowledge of facts and methods, science literacy requires empowering yourself to think critically. This has political as well as scientific value. If people become science literate and are confident in asking, “how do you know . . .?”, then we will build a stronger participatory democracy.

**“One thing I have learned in a long life: that all our science, measured against reality, is primitive and childlike – and yet it is the most precious thing we have.”**  
*Albert Einstein*

When many students hear scientific words, even those describing the various fields of science such as physics, astronomy, chemistry, geology, biology, or sustainability, they are already turned off. Often, their experience is that learning science and reading science books are impossible, boring, and exhausting activities. They would like to learn about their place in nature, but they feel inadequate. This book is for individuals who are open to giving science another try. It presents science within the framework of the Liberal Arts. A love of science may begin for some with learning about their place within the universe story. As the first sentence of the book suggests, “Stories bind people together.” Our individual lives are bound together with all others and indeed with the entire universe.

The world in which we live can defy our senses. The Earth spins at 1,000 miles/hour, yet it doesn’t feel to us as if it is spinning at all. In addition, the Earth is traveling at an average rate of 66,000 miles/hour around the sun in one year. Again, we don’t feel



that we are moving, but we are. Scientific insights from astronomy, chemistry, geology and biology yield a story. It begins with the stars and the origin of the chemical elements, progresses to a supernova explosion and the subsequent formation of our solar system and the Earth as a dynamic planet capable of sustaining and evolving life.

What is sustainability and why should we behave sustainably? It involves more than recycling and planting trees. It is a mindset linking our understanding of the global ecology of the natural world with good planning for the future. The science-based story of the universe and our origins leaves no doubt that we are intimately part of nature and the environment is part of us. Plants take in carbon dioxide from the air and release oxygen; animals take in oxygen and release carbon dioxide. Our burning of fossil fuels (coal, gas and oil) sustains our energy-rich life styles and increases the carbon dioxide in the atmosphere. Even though this is hard to believe -- we are affecting the global climate.

Why can we believe a scientific fact more than a random guess or a whim? The process of criticism, debate, theoretical understanding, and experimental verification adds to the credibility of scientific facts. Credibility is not just from the scientific method of observation, hypothesis, experimentation, and conclusion. It is also from the community of scientists, who verify the observations and debate the conclusions. After many years, the information continues to accumulate so that scientific theory becomes scientific fact. The scientific process is always open to falsification; at some point in the future, we may generate data that will require us to change our thinking. The history of science shows this to be true. To quote Albert Einstein:

*"One thing I have learned in a long life: that all our science, measured against reality, is primitive and childlike – and yet it is the most precious thing we have."*<sup>1</sup>

Good teaching conveys both information and knowledge. For example: when students look at identical gene sequences between humans and whales, they learn the details of the experiments but often they don't appreciate the significance of our evolutionary relationship to whales. It is not sufficient to review what we know and how we know it; we must also reflect on this information and ask how it affects our world-view. The connection between learning and true understanding is rare in science education. Many students talk about the scientific details, but often they don't integrate the significance of the data into their personal lives. This book is an effort to address that issue.

Let's take the following information at face value –we

**"...We matter because we are rare and we know it... The joint realization that we live in a remarkable cosmic cocoon and can create languages and rocket ships in an otherwise apparently dumb universe ought to be transformative. Until we find other self-aware intelligences, we are how the universe thinks. We might as well start enjoying one another's company."**

**Marcelo Gleiser**

are on a tiny planet (Earth), racing and spinning through space in a huge universe that is expanding at the rate of thousands of miles per second. How does that make you feel? Insignificant? Meaningless? So, shall we reject the scientific facts about our universe because they make us uncomfortable? Marcelo Gleiser, professor of philosophy, physics, and astronomy at Dartmouth College, has argued "we are a rare accident and thus not pointless." Gleiser reminds us of the difference between life and intelligent life:

*"... We matter because we are rare and we know it... The joint realization that we live in a remarkable cosmic cocoon and*

*can create languages and rocket ships in an otherwise apparently dumb universe ought to be transformative. Until we find other self-aware intelligences, we are how the universe*

*thinks. We might as well start enjoying one another's company."*

*Star Gazing to Sustainability* presents scientific information by using the unique approach of integrating what we know, how we know it, and how it affects our perspective on the world. Science is an iterative process; if data are obtained that disprove a hypothesis, then the hypothesis needs to be modified. This is humbling to the scientist, but also empowering to anyone who practices critical thinking.

To encourage critical reading and to engage the reader, reflections are incorporated in the book. These reflections are from non-science major students who have read drafts of this book. Adding the voice of students to the book both adds to the readability of the text and anticipates questions and thoughts that may be in the readers' minds. Here are two examples of student reflections:

**Science appreciation precedes science literacy. There is both joy and insight in science. It is one outcome of studying Big History.**

*"For the average person, what is most important about science is outlook. The ideas presented came about through imagination, observation, experimentation, and analysis. This is a thought process labeled as the scientific method. From what one can observe, most people don't use this process outside of school unless they become scientists. For shame! This is a terrible way to go about living. Mankind has this thought process for a reason. Humans are not like*

*other animals. We can plan ahead. Unlike a rabbit, which can't see what effect it has on the environment, people can see. All it takes is a little knowledge, scientific thought, and open-mindedness. If there is one common thread among the vastly diverse disciplines of science, it is about being open-minded and questioning as much as it is about new discoveries.*

*"Even though it took 9 months to create you, it took millions and millions of years of mutations and evolution to create humans.*

*"It's crazy how something as minor as winning the lottery has the same chance as the Universe and life being created."*

Earth is our only home. We are deeply attached to our home environment. We need thought leaders to see the world as it is. Then we can more effectively work together to build a better future. We will need to find solutions to scientific and technological challenges and then overcome problems at the level of implementation. The scientific method is a path forward. This is a slow, patient and deliberate process. Leave your bias at the door, and I believe the wings of creativity and the potential of the human mind are up to the task. Here is a final student reflection:

*"There is no reason for us as a nation to not approach the environmental crisis with the same open-mindedness as demonstrated in all of the disciplines of science."*



*Rider University*

# Big History Goes Back to Jail

*Lowell Gustafson  
Villanova University*

Graterford, Pennsylvania's largest maximum-security prison, is about a half hour's drive from where I usually teach. There are no direction signs, but I learned quickly to turn at the red barn and continue over the hilly, winding road to a long entrance road running through a large field. Eventually, grey concrete walls topped with barbed wire and tall light poles appear. I park, leave my cell phone in the car and make sure that the windows are closed securely. (Any visitors found with cell phones in the prison cannot return; and, I was warned about being framed for drugs slid surreptitiously into my car through a partially opened window.) Taking the Graterford-issued lanyard with its attached whistle and chip-inserted photo id, I walk through the parking lot noticing the guard towers that crown the 1929-constructed building's high concrete walls. Graterford held 1,600 prisoners in 1978 and now holds 3,500.

Inside the front door, I scan my id. When the light turns yellow, I place my finger on the sensor until it changes to green indicating that my fingerprint is accepted. A steel door opens to a security check point where a guard stamps the back of my hand, attaches a wrist id tag and ushers me through an airport style personal scanner. Another steel door opens; a different guard escorts me down a long hallway with barred windows on the left, which reveal inmates in exercise yards. On the right, other inmates work in shops. Passing by a series of blocks, I see reinforced door windows looking onto hallways lined with cells. I continue past groups of prisoners led by guards to various destinations.

After signing in with the educational hallway guard, he opens the door to my classroom – a rectangular space with tan cinderblock walls, dirty barred windows and irregularly hung dusty grey curtains. The walls are bare -- no pictures or maps. A fan perched on a desk moves the stiflingly hot air as I begin teaching

30 male prisoners dressed in identical jumpsuits stamped with "DoC" on their backs. The students' ages range from somewhere in the late 20s to the 60s. Some have been in prison for several years, others for decades. Most are African-American but a few are Hispanic or Caucasian.

Previously, at a daylong orientation session, I was told that "fraternizing" (including individual discussion) with students is unacceptable. Giving them anything, even a pencil and some paper, is prohibited. "Don't get conned by the cons." No technology is available -- no videos, projectors or electronics. Many prisoners have never seen a cell phone or an Internet-connected computer.



Most days I teach at Villanova, a private university on the "Main Line" in suburban Philadelphia, in a very different environment. Before teaching Big History at SCI-Graterford in 2012, I had never been inside a prison, so I wondered how the inmates would respond to classes about the Big Bang, nuclear fusion, accretion of earth, origins and evolution of life, and development of human culture -- classes that would draw on physics, astronomy, chemistry, biology, anthropology, and other Liberal Arts disciplines.

During the first class, a guard delivered two boxes of books, which I had mailed weeks before to ensure pre-



approval. (Contraband can be hidden inside books.) I gave copies of Fred Spier's *Big History and the Future of Humanity* to the students. Each pupil also chose one of 30 other books by authors such as Leon Lederman, Robert Hazen, Neil Shubin and Richard Dawkins. The additional reading helped to develop various themes introduced in the common text.

One person eagerly chose Lederman's *Physics for Poets*, because he had "long been fascinated by quantum mechanics." Another, captivated by the origins of ethics, chose Frans De Waal's *Our Inner Ape*. The books went quickly.

discussed the Shubin's team discovery of Tiktaalik (the amphibian with wrists and a neck that first ventured onto land 380-to-363 million years ago during the Mid-Devonian period in what is now called the Canadian arctic). He spoke of the discovery's scientific significance and vividly described what he imagined as he read. He could feel the hard rock as researchers laid on it, chiseling. He sensed the heaviness of their layers of weather-protective clothing in the frigid air. Careful reading and imagination enabled him to live both the tedium and excitement of primary research. It freed him to travel to Canada, Proxima Centauri, the Andromeda galaxy and the event horizon. His imagination had no boundaries;

education was freedom.



Fred Spier happened to be in our area when I first taught in fall 2012. He agreed to meet with my class. Students had carefully studied his book and given presentations. (One's [typewritten outline](#) is attached here.) Having an author from the University of Amsterdam visit and talk with them hugely affected each student. They kept Fred busy the entire two hours, which easily could have extended for hours more. Fred says

Students came well prepared to class. They carefully wrote individual presentations on their personally selected second books. The sessions were peppered with questions about weekly assignments in Fred's book. There was often chatter before class began about an NPR show, Nova special or History Channel series featuring our class activities.)

Presenting on Neil Shubin's *The Universe Within: The Deep History of the Human Body*, one student

it was one of the best Big History discussions he's ever had.

These Graterford students were intelligent, curious, diligent, articulate, and good-humored. Many were unfamiliar with the course material beforehand, but they read, studied and considered all of it. Challenged by religious beliefs, some devout Muslims and Christians struggled with responses to the material. Nonetheless, they worked hard to understand it on



its own terms. Our two-hour class periods provided insufficient time to address all of the questions and issues that arose, but there is no staying after class.

After the 2012 course concluded, I was eager to return and am pleased to again be teaching at Graterford in the fall of 2014. This time I began without misperceptions and apprehensions. I expected the curious, serious, articulate, savvy students I got. When this course ends in December, I will look forward to teaching here again as soon as possible.

Villanova began offering courses at Graterford under the Pell Grant program in the 1960s. After Pell Grants were eliminated, the University, itself, continued sponsoring a few courses each semester. Persistent prisoners who take a couple classes every semester for 15-to-20 years are able eventually to earn a BA. Two or three students receive degrees in the prison's annual graduation ceremony where my University President, Fr. Peter Donohue, often speaks.

The words of the founder of the order that established Villanova University are realized at Graterford: "For this feeling of compassion is so strong that, when our listeners are touched by us as we speak and we are touched by them as they learn, each of us comes to dwell in the other, and so they as it were speak in us what they hear, while we in some way learn in them what we teach."

Prisoner education has substantial practical value. It is an effective solution for recidivism, offering released prisoners the greatest chance of not returning to jail. Educational programs also are much cheaper than incarceration. These are good reasons for

such programs. However, my personal motivation derives from the invigorating exchange of ideas and interpretations with fascinating people who fully engage in investigating and examining evidence.

Graterford students live in a gated building on a relatively small blue orb that few of us will ever leave. However, they (like the rest of us) can learn about and imagine a universe of stunning expanse. They can envision the astonishing events of millions and billions of years past, and the probability of equally astounding future phenomenon. By reading about the Big Bang, life since LUCA and that every human ascends from a sturdy band of Africans who lived some 200,000 years ago, they can appreciate the common origins of everything. Graterford students can take pride in being among the most complex beings that we know of in the universe. They have excellent reasons to be pleased with what they are learning about themselves and everything that has happened over the 13.82 billion years that produced humanity.





# Letter to the Editor

Thanks for all the work that went into putting the November 2014 Origins together. My response to the controversy over originators and appropriate focus of Big History is, there is nothing more common in our corner of the universe than the male ego seeking a position of prominence within its relative field of human cognizance. Almost all of us who are males fully understand the hunger for an appraisal of self-importance at some scale, any scale, from the human tribe. The short history of science is littered with males struggling for acknowledgement of their unique self-importance. From a biological and/or Big History perspective, the individual ego

almost certainly evolved to optimize survival and reproductive potential, after which it is swept away into the collective dust bin of Big History. The U.S. Department of Defence is working assiduously to protect our alpha male egos, which should free the IBHA to move on to more penetrating stories of our collective journey.

Sincerely,

Dana Visalli  
Twisp, WA



## Nominations for IBHA Board of Directors

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

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

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

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

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

We welcome your active engagement in this important process.

The new Board will be announced in August.



# Big Historians from Britain form *Big History UK*

A group of Big History enthusiasts from Britain have recently formed *Big History UK*. They have released a website at [www.bighistory.org.uk](http://www.bighistory.org.uk), and welcome more active members. Our first major activity will be manning a stall and networking with other delegates at the Universe Story Event to be held in London in March 2015. More details about this event at [www.greenspirit.org.uk/uni-story-event](http://www.greenspirit.org.uk/uni-story-event)

## Big History UK

[Home](#) [About](#) [Join BHUK](#) [News](#)

Home

1 2 3 4 >>

### ALMA Telescope Delivers Astonishing Image of Planet Formation

Posted on November 12, 2014 by WykenSeagrave

Stars form within clouds of gas and dust as they collapse under gravity. Over time, the surrounding dust particles acquire icy mantles which stick them together, forming icy snowballs which gradually grow to form larger-size rocks. Due to the rotation of the gas around the newly forming star, the gas and dust is flung out into a thin "protoplanetary" disk where asteroids, comets, and planets form.

Here gravity collects the protoplanets together into clumps which grow larger, sweeping up all the other dust close to them as they orbit the new star. Once these planets leave gaps in the disc, seen as dark rings, and collect the dust and gas into tighter and more confined zones.



ALMA image of the young star HL Tau and its protoplanetary disk. This best image ever of planet formation reveals multiple rings and gaps that herald the presence of emerging planets as they sweep their orbits clear of dust and gas. Credit: ALMA (NRAO/ESO/NAOJ); C. Brogan, B. Saxton (NRAO/AUI/NSF)

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#### Recent Posts

- ALMA Telescope Delivers Astonishing Image of Planet Formation
- Tickets Available for Universe Story Event 2015
- Big History UK Association Board of Management Established
- New fossils suggest mammals first appeared in the Late Triassic, 200 mya
- More Evidence that Earliest Dinosaurs had Feathers!

#### Big History Books

- 'Earthdance: Living Systems in Evolution' by Elisabet Sahtouris, evolution biologist & futurist
- A Walk Through Time, From Stardust to Us by Sidney Liebes, Elisabet Sahtouris and Brian Swimme
- Big History and the Future of Humanity by Fred Spier
- Big History, The Big Bang to the Present by Cynthia Stokes Brown
- Big History: Between Nothing & Everything by



# New and Returning IBHA Members

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

**Giuseppe Ferrone** – October 23rd – new member

**Lucy Laffitte** - October 23rd – renewal

**Margaret Venema** – October 26th – new member

**John Kneebone** – October 29th – renewal

**Bill Hammond** – October 30th – renewal

**Michael Hebel** – October 30th – new member

**Benjamin Bennett-Carpenter** – November 3rd – renewal

**Maarten Oranje** – November 8th – renewal

**Richard Bannister** – November 16th – new member

**David LePoire** – November 20th – renewal

**Christopher Corbally** - November 20th – renewal

**Jorge Medina** - November 22nd - new member

**Margaret Boone Rappaport** - November 23rd – renewal



# IBHA Conference July 14 - 16, 2016

## *University of Amsterdam*

**I**N 2012 THE IBHA convened its first ever conference at Grand Valley State University in Michigan, USA. Over 200 delegates attended a tremendously successful inaugural event, and enjoyed panels, roundtables, keynotes and other presentations on various aspects and interpretations of Big History.

The second biennial IBHA conference was held in August 2014 on the beautiful campus of the Dominican University of California, in San Rafael. This time almost 250 delegates attended and enjoyed another outstanding smorgasbord of Big History presentations, including dramatic interpretations and film showings.

With a tradition of high quality biennial conferences now firmly established, the Board of the IBHA is delighted to announce that our **third conference will**

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

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



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