



Welcome to the fourth and final session of **Big History – A Closer Look!** Thank you for coming back. **Let's Pray!**

I was asked last time whether there was more material available from Big History than the videos alone. The answer is that there is a great deal more. This includes a "series of articles and essays by eminent scholars and BHP staff", activities, infographics, and a set of historical and informational illustrations.

According to their website, all "the material is free, open, and online. All lessons are instantly accessible, evaluated and updated regularly, highly customizable, and free to learners and educators everywhere. More than 1,600 teachers and 80,000 students are teaching and taking the course each year."

There are also teacher's guides, blogs, and course plans. I have not evaluated all of this material, but I have checked out the guides and some of the other coursework. The Course Teaching Guide makes the following statement:

"The Big History Project (BHP) is a technology-based course, but it is not a self-taught course. BHP assumes a teacher is available to discuss content with students, and to evaluate student work. The course relies heavily on a series of videos, including talks from Big History founder David Christian and other noted scholars. While the various articles and graphic content may be printed and shared in hard copy, it would be very difficult to teach BHP without showing the videos. At the same time, the Big History Project does not require every student to have a computer in the classroom. Many schools teach Big History by showing the videos in class and distributing hard copies of readings for use at home."

Hence, I think it is relevant to discuss the merits of these videos as we have been.

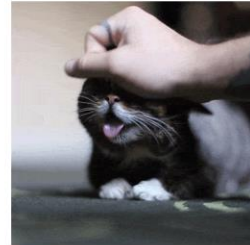
I have prepared a list of resources that I have utilized in this course. I will distribute the list to anyone that is interested. If you want the list emailed to you, just put your name and email on the sign-up sheet. I also have a few hardcopies with me.

So now, let's take a look at the video for Threshold 5, "Life on Earth".

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Life on Earth

- Metabolism
- Homeostasis
- Make copies by Reproduction
- Information in molecules can change causing living things to slowly Diversify



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Threshold 5 starts with a question, “What is Life?”

The video then proceeds to not answer this question directly. Rather, the video presents “qualities” that are shared by “all living things on Earth”.

We are told about metabolism, homeostasis, and reproduction. And these are basically accurate descriptions. There is no explanation for where these “qualities” came from, how long they took to develop, or even the likelihood that these qualities could develop in the so-called “early” Earth environment.

We are then told that the “information” in the RNA and DNA molecules that make up living things can change so that “later generations may be slightly different”. This we are told is how living things diversify. But, diversification is not defined.

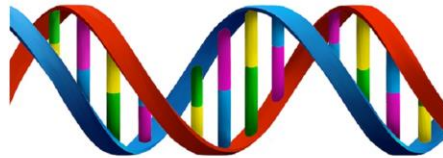
In this section of the video we are shown different owls. The inference is that starting from the initial owl, the later owls are the result of modifications to the RNA and DNA. However, we don’t know anything of the kind. We don’t know that either of the later owls was a result of a change in the DNA of the earlier owl. Owls, like other living things, can produce a variety of offspring. Their offspring are still owls.

What we do not see is owls giving birth to any other non-owl lifeform.

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Threshold 5 Ingredients

- Great variety of complex chemical compounds
- Including DNA and RNA



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The video announces the ingredients for life “are a great variety of chemical compounds including DNA and RNA”. This statement is absolutely stunning in its brevity!

That is all the video says about the ingredients for life. Well, it may come as a surprise, but as far as we understand this is true! You do need to have access to a great variety of chemical compounds. And you absolutely need DNA and RNA.

The problem is where do the ingredients come from? We are simply not told. This is a little like saying the way to get an automobile is to have a car chassis, engine, power train, electrical system, etc. without explaining where each of these systems comes from. Except DNA is vastly more complicated than an automobile. And no one thinks that automobiles just appear in a finished state.

As it says in Wikipedia, “Deoxyribonucleic acid (DNA) is a molecule composed of two chains (made of nucleotides) which coil around each other to form a double helix carrying the genetic instructions used in the growth, development, functioning, and reproduction of all known living organisms and many viruses.” DNA and RNA are the essential building blocks of life.

In the May 2006 volume of Nature it says, “the DNA in the largest human chromosome, chromosome number 1, consists of approximately 220 million base pairs”. So, this is not some simple molecule that formed by atoms bumping into each other in a gas cloud.

Scienceforum.net states that, “there are about two thousand enzymes, and the chance of obtaining them all in a random trial is only one part in 10 to the 40,000 power”! Mathematicians consider anything greater than 10 to the 50th power as impossible. So just where did the DNA come from to create life?

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Where did DNA come from?

- Internet search does not reveal an answer
- Dr. Matthew Powner tried to synthesize RNA
- Science does not have an answer



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Since DNA is a necessary ingredient for life, it would seem logical for Big History to at least mention how we got this vital polymer.

The most likely reason it is not mentioned is because science does not know how DNA was formed.

Do an internet search for “Where did DNA come from?” and see what you get.

Quora.com, reference.com, and most references I checked talk about DNA and RNA and their properties, but don’t speak about how they originated.

Answers.com gives the following:

“It is currently unknown how DNA originated. It came from RNA but how RNA formed is also unknown.” However, it is entirely speculative to assume that DNA came from RNA.

TheScientist.com gives a reference to Matthew Powner, Ph.D., who in 2012 synthesized some components of RNA in his lab based upon what he said could have been in the environment of the early Earth. The inference being that RNA could have formed spontaneously leading to the formation of DNA.

However, synthesizing components of RNA in a laboratory from chemicals you think were present in some early Earth, is far different than having an unsupervised environment somehow produce complex molecules from constituent chemicals that might not be in any readily accessible form.

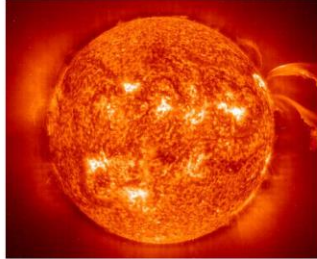
I was not able to find anything further regarding Dr. Powner’s work after 2014.

At a minimum you should see that Big History is ignoring the Big Problem that DNA poses for their narrative.

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Threshold 5 Goldilocks Conditions

- Just the right amount of energy



- Liquid water

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The video tell us that, “Two Goldilocks conditions provide ideal environments for these chemical compounds to combine in many different ways”.

First, we are told, you need just the right amount of energy to fuel the chemical reactions. Too much energy would blast the molecules apart.

Second, we are told, you need a liquid, “because it is hard for molecules to link up in gases where they are too far apart or in solids where they can’t move very much”.

Now, you may have noticed that there is something wrong with these last two statements. They completely contradict Threshold 4 where these complex compounds are supposed to come from.

In Threshold 4 we had gas clouds and various elemental particles readily combining via accretion to create entire planets! In Threshold 4 we were not told how difficult it is to have elements combine when they are in a gaseous environment, and there was no concern about too much energy from the birth of a star blasting apart the newly forming molecules. We were not warned that since there was no liquid present, that the clumps would not form. We were also not told that harder, icy environments would inhibit the creation of planets like Neptune.

Instead, we were told that some rocky planets or moons are just the right distance from their suns to have lots of liquid water. In our solar system we know of one such planet.

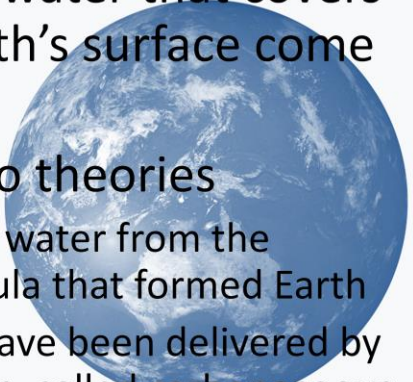
We are then told that 4.5 billion years ago the Earth would have had almost “perfect conditions for some of the most complex chemistry you can imagine. That chemistry led to life.”

Ignoring for a moment that there is no way for anyone to know the conditions on the Earth 4.5 billion years ago, there is a very important question that has been left unasked and unanswered.

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The Question of Water

- Where did the water that covers 70% of the Earth's surface come from?
 - Science has two theories
 - Held onto some water from the proto-solar nebula that formed Earth
 - Oceans would have been delivered by ice-rich asteroids, called carbonaceous chondrites
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Where did the water that covers 70% of the surface of the Earth come from?

Once again, scientists don't know. There are two main theories.

The first theory proposes that the Earth held onto water as it formed in the “proto-solar nebula” that supposedly formed the Earth and the planets. The belief here is that there would have been ice in the proto-solar nebula. Of course they don't explain why there would have been ice or how the forming earth would retain it in such a large amount.

The second theory boils down to having ice-rich asteroids deliver the water to the Earth. This is supported, scientists feel, by the presence of levels of deuterium, or heavy hydrogen, in Earth's oceans that closely matches asteroids. This is not conclusive because the deuterium should not have remained for billions of years. They have also found opals in meteors, and opal requires water to form. Also, they have found evidence of water on some large asteroids.

There is no explanation for the effect one or more asteroids, large enough to deposit this much water, would have when they struck the Earth. There is also evidence in Canadian rocks that indicates the isotopes do not look like asteroids. This leads some scientists to think it may be a combination of methods.

However, none of these theories really explains the presence of so much water on the Earth. And there is an even more important problem with life arising in the oceans.

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Water Prevents Chemical Evolution

- Almost all the important chemical structures in living cells are long-chain organic polymers 
- Proteins are polymers consisting of hundreds or thousands of amino acids
- If there is either too much water or polymer hydrolysis breaks the polymer back to amino acids
- There is a lot of water in the oceans

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Water actually prevents chemical evolution.

Polymers are high molecular weight compounds that are composed of smaller, identical molecules (called monomers) linked together. Proteins, for example, are polymers that are composed of hundreds or thousands of amino acids.

The reaction that joins the amino acids together to form a chain is called a “condensation reaction”. This is a two-way reaction, meaning it can go in either direction, depending on the concentration of the ingredients. If there is an excess of amino acids, then the reaction will produce polymer and water. However, if there is either excess polymer or water, then the reaction will breakdown the polymer into amino acids. The backwards reaction is known as hydrolysis.

Therefore, if you have the presence of sufficient water, it will cause the breakdown of polymers and not their creation, and it will prevent polymers from forming. Please note that there is a lot of water in the oceans.

There have been various attempts by scientists to figure ways around this problem, but they have been unable to do so.

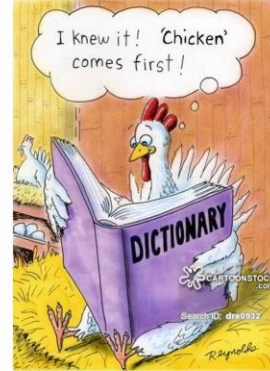
Huber and Wächterhäuser succeeded in getting some amino acids to join up in solution, but these efforts required operator interventions. In reality the only thing these experiments have demonstrated beyond a doubt is that the process does not occur spontaneously.

Big History does not address any of these issues.

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Which Came First ...

- Did water or land come first?
- Scientists say the dry land came first and then the water
- The Bible says that the waters came first and then the dry land



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Once again we see that there is a stark difference between what we are told by science and what the Bible tells us.

We are told by science that the Earth was formed, and then the water came by another process.

However, the Bible in Gen 1:9 says that the God gathered the waters together and then had the dry land appear.

You may wish to believe the so-called scientific explanation, but you should know that it does not reconcile with the Biblical account.

Now, let's move on to the last video of our four-part series. This is Threshold 6, "Humans & Collective Learning".

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Humans & Collective Learning

- First living organisms appeared at least 3.5 billion years ago (early single-celled life forms)
- Diversified and evolved over next 3.5 billion years
- 600 million years ago some began to combine *over time* to create multicellular organisms like trees, mushrooms, frogs, dinosaurs, and the first small mammals
- The primates showed up and eventually about 200,000 years ago became Homo Sapiens

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After the amazing leaps of Threshold 5, the Threshold 6 presentation almost seems casual by comparison. After all, in Threshold 5 we have DNA and RNA, and complex chemical compounds and molecules are popping out like Jiffy Pop.

We are told in Threshold 5 that the Earth was formed 4.5 billion years ago. This number was derived in 1956 from a comparison of isotope ratios in meteorites. While this might seem to have nothing to do with when the Earth was formed, scientists think that it is all part of the solar system forming from the circumstellar disk. Nevertheless, Threshold 5 told us that 4.5 billion years ago the conditions were “perfect” for the creation of complex chemistry that led to life.

However, according to Threshold 6, it took a billion years for that complex chemistry to create life.

It then took 2.9 billion years for these simple life forms to reach a point where some combined over time to make multicellular organisms. You may think that this was a long time, enough to create trees, mushrooms, frogs, dinosaurs, and mammals, but we will see that it is not enough time at all.

Somewhere in the next 600 million years primates evolved. So evolution sped up considerably, since it took less than 21% of the time for multicellular forms. But that is nothing!

A mere 200,000 years ago Homo Sapiens appeared. That is seven hundred thousandths of the time it took to create multicellular life. At that rate of change, shouldn't we be seeing significant evolutionary changes around us all the time?

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How Long Does It Take?

- 3.5 billion years is 3.5×10^9
- Mathematicians consider 1 in 10^{50} to be impossible
- Hemoglobin is made up of four strands of amino acids.
- Richard Dawkins estimates that the probability of randomly creating one strand of hemoglobin as 1 in 10^{190}

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I said on the last slide that 2.9 billion years was not enough time to bring about multicellular life forms, and neither is 3.5 billion years. Why would I say that?

Let's examine the probability of creating life by random chance. 3.5 billion years is 3.5 times 10 to the 9^{th} power. As I said earlier, mathematicians consider probabilities of 1 in 10 to the 50^{th} power as impossible. That is a one with fifty zeroes after it.

For our discussion we will use Hemoglobin. Hemoglobin is a protein that transports oxygen in blood. Hemoglobin is composed of four strands of amino acids. But, we will only consider one strand for this discussion.

The question then is what is the probability of creating one strand of Hemoglobin by random chance?

Richard Dawkins, yes that Richard Dawkins the atheist, in his book "The Blind Watchmaker", includes this estimate. "Dawkins calculates that the odds of one single hemoglobin molecule strand forming randomly when the proper building blocks are intelligently and mechanically isolated and in close proximity is 1 in 10^{190} ." That is a one with 190 zeroes after it.

How does that relate to 3.5 billion years? Well, suppose that we had one reaction a minute in pursuit of Hemoglobin. We would then have 525,600 reactions a year. This would mean that we would only have about 1.84×10^{15} reactions in 3.5 billion years. This is a drop in the bucket compared to the time it would take to produce one of the four strands of Hemoglobin.

And Hemoglobin is only one protein that we need. There is simply no statistical case for randomly created life forms.

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Threshold 6 Ingredients

- Powerful brains



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The video then focuses on humans as the pinnacle of evolutionary progress. Interestingly, both Big History and the Bible agree that man is “the most powerful species ever”, although the Bible does not use the term species.

The video states that humans have become the most important force for change on the Earth’s surface. As a Christian, I take issue with this statement.

The video then asks, “What makes us so different?” We are then given the ingredients for Threshold 6.

The first ingredient we are told is a powerful brain. While the term “powerful brain” is not defined, I think we all have a sense of what is meant. However, we are then told that it is not just a matter of brains. We are told that there are other brainy species, including dolphins, chimpanzees, and crows. So let’s examine them for a moment.

According to research, “Dolphins can mimic humans, develop an understanding of symbols and syntax (two of the main elements of human language), and are one of the few animals that can recognize themselves in a mirror. Like humans, dolphins exhibit empathy and altruism, and they even mourn their dead. Their brain size compared to their body size is second only to humans”

I thought this picture of a chimpanzee looked a lot like me. Chimpanzees are considered very intelligent and have some of the abilities of humans. Some publications, such as Business Insider in 2017, have said that this is due to chimpanzees having 99% the same DNA as humans. However, this is simply not true. Only 69% of the chimpanzee X chromosome is similar to human, and only 43% of the Y chromosome. Genome-wide, only 70% of chimpanzee DNA is similar to human under the most optimal sequence-slice conditions.

It may or may not come as a surprise to you to find out that crows are very smart. Scientists say that crows are smarter than the average five to seven-year-old child. Crows are excellent problem-solvers. They make and use tools, including forming knives from blades of grass. They use the knives to create other tools. Knife-wielding crows sounds like a horror movie to me. Crows understand complex principles, they plan, they are adaptive, they have incredible memories, and they are able to communicate with each other, even to the extent of warning other crows about specific humans that have harassed them.

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Threshold 6 Ingredients

- Precise and versatile symbolic language



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The Second Ingredient, according to the video, was the development of symbolic language. “This enabled humans to share their ideas with each other very efficiently.”

The video gives us no understanding of how or why symbolic languages would develop. If evolution occurs via random mutations, then how would vocal abilities develop along with the necessary cognitive functions to utilize those abilities? The steps to creating meaningful languages are even more difficult to imagine.

According to one article symbolic language, “entails relationships between signifiers (e.g. words) and what's signified (e.g. objects or ideas), where what's special is the construction of a system of relationships among the signifiers themselves, generating a seemingly unlimited web of associations, organized by semantic regularities and constraints, retrieved in narrative form, and enabled by complex memory systems.”

This same article brings out the difficulties from an evolutionary standpoint of how symbolic language developed. Some scientists believe that language developed about 100,000 years ago, while others believe that language has been around for a million years so there would be time to have the dramatic cognitive integration that is seen in humans.

Among other unknowns for how language developed, the same article poses this question, “the synergy of language systems requires the cooperative functioning of component brain systems, but this synergy would presumably need to have already been in place before selection could hone it for language. How is this paradox resolved?”

The video gives no explanations for the development of these language capabilities in humans. The Bible does. In fact, God made people with the ability to communicate via language.

The article on language development ends with a fascinating paragraph: “Thus, because of symbols and with the aid of symbols, Homo sapiens has constructed and adapted to a niche unlike any other that ever has existed. We have been made in the image of the word.”

To a Christian this is very poignant. John 1:1 says, “In the beginning was the Word, and the Word was with God, and the Word was God.” And we know that we were made in God’s image.

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Threshold 6 Goldilocks Conditions

- Interactions between individuals and communities



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The Threshold 6 Goldilocks condition is “Interactions between individuals and communities”. The video says that symbolic language permitted interaction between people. And then the video says that, “Human communities grew and interacted creating the perfect conditions for something new ... the ability to learn collectively instead of just as individuals.”

This is the point in our examination of Big History, where we can recognize that we are in fact talking more about history than speculation.

Yes, the growth of communities and the accumulation of knowledge has permitted humanity to make considerable advancements. This has not always led to good behavior or beneficial interactions, but that was not the purpose of this examination.

The goal was to show that what is taught to 9th and 10th graders is far from settled and in some cases is simply wrong. We should be concerned that succeeding generations learn the truth.

So for now we will leave Big History. We hope it has been worthwhile, and we thank you for participating..

Questions?