Addendum: Košice, Slovakia, March 5, 2018**: "Origin of the Universe: Chance or Purpose?"**

This is my "The Big Bang, the Origin of the Universe, and God" talk with a bit more said about the apparent fine-tuning of the basic physical constants.

After starting the lecture with Genesis 1:1 ("In the Beginning God created the heavens and the earth") I raised the question as to whether this is in conflict with current science. I then had a slide with 3 theses:

Thesis A: *The Big Bang accords well with God as creator*.

Thesis B: *The origin of the universe remains a problem for the naturalist* (one who believes that all that is real is physical).

Thesis C: *The values of the basic physical constants seem fine-tuned for the possibility of complex organized physical structures (and hence for life and intelligent life)*.

Because the title was framed up with "Chance or Purpose" I moved the slides that I had on the apparent fine tuning of the laws of nature (basic physical constants) to the beginning of the lecture, addressing Thesis C first (see Stephen Hawking quote below*).

After that, I addressed Thesis B. The strategy in my argument here was, first, to suggest that one consider two possibilities: (a) the universe had an absolute beginning, and (b) the universe did not have an absolute beginning, and then, second, to argue that on either position there are serious difficulties for the naturalist. ("Universe" here = all physical reality, including a multiverse, if there is such.) (As an aside I noted that Stephen Hawking's view doesn't actually fit neatly into either of these possibilities and said that I could be asked about his view in the Q&A. [No one asked me about it.])

(a) <u>An absolute beginning</u>: This is how the original big bang theory was formulated. Naturalists who embrace this position typically account for this by saying it was an uncaused quantum event.

I inserted here a couple of slides to explain the idea of an uncaused quantum event. Particular quantum events do not have a prior cause dictating that they occur; rather they simply happen. The likelihood of their occurrence is, however, be specified by a probability. The idea that the big bang might be a quantum event out of nothing is motivated by the fact that particles (actually, particle/antiparticle pairs) can pop in and out of existence in empty space. (There is strong evidence confirming that this happens.) The proposal, then, is that the origin of the universe (the big bang) was a quantum event out of nothing. (A book by physicist Lawrence Krauss is entitled *A Universe from Nothing*.)

However, there are two problems here: For one, in this theory the big bang does not emerge out of *absolutely* nothing because the "nothing" is describable by physics. Something describable by some form of quantum physics is not absolutely nothing. (They are looking for a quantum theory of gravity which we don't have yet.)

Another problem is that quantum mechanics in its essence depends on probabilities. E.g. there is a certain probability that a proton and antiproton will pop into existence in a specified volume of "empty" space and over a specified period of time. But if there was no time and no space out of which the big bang arose, the concept of probability is stripped of all meaning. Hence quantum mechanics is stripped of meaning when applied to the big bang.

(b) <u>The universe did not have a beginning</u>: There are several proposals for how the universe may not have had a beginning, but rather may have always existed.

(i) Steady-state theory (ii) A cyclical universe (iii) A branching universe

The first proposal I won't describe because it has been shown to be false. I'll note, however, that it was first introduced by atheists who viewed the big bang as looking too much like Genesis 1 and who therefore were looking for a way in which the universe might have forever existed.

The second proposal initially took the form of cycles of big bang followed by "big crunch" followed by big bang / big crunch … without end or beginning. However, we now know that the rate of expansion of the universe is actually increasing, and we know of no physical law or force that could reverse the expansion into a contraction.

A more recent cyclical universe proposal is that by physicist Paul Steinhardt. Using string theory, Steinhardt proposed that when the mass/energy density of the university gets low enough (due to cosmic expansion) the "membranes" to which strings are attached will eventually collide, creating another big bang.

However, a problem with any cyclical theory is that, given the 2nd law of thermodynamics, entropy will always increase in a closed system. If there is outside energy input such as that from the sun to the earth, it is possible for entropy to decrease, which means order/usable energy increases). However, in any cyclical theory of the universe there is nothing outside the cycles which would lower entropy to its original level with each cycle. I.e. each cycle should have higher entropy (less usable energy) than the previous cycles. And this would mean that over a finite number of cycles the universe would have near maximum entropy and life could not exist. If the universe has always existed, there is an infinite number of cycles prior to our cycle. A universe with our level of entropy would therefore be impossible. (I asked a physicist who specializes in string theory what Steinhardt says about

this problem. He replied that Steinhardt thought he had gotten around the problem, but, he added that most physicists don't think he has.)

This leaves branching theories. An example of a branching theory is that by physicist Lee Smolin. He has proposed that every black hole gives rise to a big bang, a "white hole." Thus, our universe seeds myriads of big bangs, which in turn can seed myriads of big bangs. A different theory is that by the Russian-born physicist Andre Linde. He suggests that the universe (all physical reality) is undergoing "inflation" and that "bubble universes" arise out of this ongoing inflation.

[An aside: I did not try to clarify his view in the talk, the reason being that the problem that I raised for all branching theories did not require an elaboration of it. However, I'll say here that inflation is the proposal that in the first fraction of a second after the big bang the universe entered into an exponential expansion which was so rapid that a universe far larger than our whole visible universe was formed. The claim, then, is that the state of inflation was unstable and that at some point it ended. The result of this ending of inflation was a universe with the kind of expansion we currently observe. Linde proposes that this breaking out of inflation did not include the whole of inflating space. In the inflating space that did not stop, other universes could arise, like bubbles of slower expansion. The result is vast numbers of other "universes." Since the inflation is far greater than the expansion of the bubbles, the bubbles (other "universes") never collide with each other. If one calls this a "branching universe theory," it is more like universes branching off from a tree trunk, than branches giving rise to further branches. (I am not sure, but I think that Linde proposes that the inflating universe has always existed. If that is not the case, then one would be left with the problem of an absolute beginning of inflating universe.)]

The problem that arises with respect to branching universe theories (and Linde's theory) is how to account for the low entropy at the moment of the big bang or of any big bang/bubble.

Physicist Victor Stengor (book: *Not by Design*) has proposed that big bangs start with maximum entropy but that the expansion of the universe raises the ceiling for maximum entropy, and the universe has ever since been rising toward that much higher level of possible entropy. The physicist/mathematician Roger Penrose, however, (book: *The Emperor's New Mind*) contends that such an explanation will not suffice. Penrose then gives a calculation as to what the likelihood would be of our big bang starting with a low enough entropy to give rise to the entropy we currently observe. The improbability of this as he calculates it is 1 over 10 to the 10^{th} power and that power raised to the 120^{th} power.

Compared to almost any other probability, this is an absurdly small probability.

It is worth noting that Penrose *does not* propose to account for our universe by appealing to an infinite number of universes. Namely, he doesn't argue that with an infinite number of universes one will find universes with even this low a probability. Rather he suggests that there must be some as-yet-unknown law of physics which dictates that big bang events start with such low entropy.

[In the talk, after I quoted Stephen Hawking, I noted that his solution to the apparent fine tuning is to appeal to a multiverse in which all physically possible universes are included. I also said that if people would like to know more of my critique of such an appeal they could raise the question in the Q&A. (Again, it didn't arise in the Q&A.)]

This then brings me to the conclusion in the talk, namely that whether the universe had an absolute beginning or not, the origin of the universe remains a serious problem for naturalism. I then reiterated that the origin of the universe accords well with the affirmation of God as creator as asserted in the beginning of Genesis. I added that the Bible doesn't address the question as to whether God may have created a multiverse and hence does not preclude that possibility, but its simplest reading points to a *creation ex nihilo*, a creation of the universe out of nothing.

I then added that Christian belief does not rest principally on the proposal that there is a cosmic mind who has brought our universe into being; rather, it rests principally on God having revealed himself in human history, in human experience, and most clearly in the person of Jesus Christ. In the talk I noted that although I had not given an argument for the credibility of such claims, it is worth investigating further, and that a good place to start is to look at Jesus in the Gospels. (IFES Slovakia (VBH) is starting up Bible studies right away, using investigative Bible studies from the Book of John called *Uncover*.)

In publicizing the talk, the VBH students used two clear plastic jars representing the two responses to the question, Was the origin of the universe a matter of chance or purpose? White beans went into one jar "purpose," and dark brown beans went into the other jar "chance". The votes by students were a little less than 2 to 1 for purpose over chance.

*Stephen Hawking quote:

"The emergence of the complex structures capable of supporting intelligent observers seems to be very fragile. The laws of nature form a system that is extremely fine-tuned, and very little in physical law can be altered without destroying the possibility of the development of life as we know it. Were it not for a series of startling coincidences in the precise details of physical law, it seems, humans and similar life-forms would never have come into being."

[Hawking (& Mlodinow), *The Grand Design,* (Bantam Books, 2012) p. 161]