

A response to Hovind's

"100 reasons why evolution is so stupid"

This is a response to Kent Hovind's speech "100 reasons why evolution is so stupid" from June 4th 2001. The entire speech can be found on YouTube,^[1] but I will only consider the material presented in its first 20 minutes in this text. In the first section I will briefly explain the scientific theory of evolution, known as evolution by natural selection. The next section covers the relationship between evolution, naturalism and theism, before I start assessing Hovind's speech in the third section. At the end, I will make a conclusion about the merit of Hovind's arguments, before putting him in a larger context by presenting the views on the relationship between faith and science of some influential contemporary and historical Christians. Some of my comments on Hovind's material are taken from or based on the videos of the YouTube-user Logicked, which can be found on his YouTube channel.^[2]

For the sake of clarity, I will briefly tell about myself and my biases before starting. I am a Christian and a supporter of theistic evolution, which means I do not share the view of the young earth creationists, like Hovind, namely that the earth is about 6000 years old and that the theory of evolution by natural selection is false. After seeing both Hovind's video and Logicked's response, I was surprised by how bad and misleading many of Hovind's arguments are. Bad arguments need to be debunked no matter how old the earth is or whether evolution is true. Even if Hovind's conclusions are ultimately true, his arguments can still be flawed. I am assessing the arguments as an amateur. I have no expertise on evolution, or any of the topics covered by Hovind, but I have a general interest in science, and especially physics, as well a basic background in science as an engineering student. I have my personal presuppositions and standards that come into play when I evaluate the arguments, so it is impossible to be completely objective, but I have tried my best to be fair and open-minded in my evaluations.

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This is for my friends in Glasgow, Albert and Olena. I did not know how to respond when you told me of Kent Hovind, so I decided I had to write you a response. Hope you find it useful. Thanks to Boje Aunsmo, Bjarte Boge, Karolina Brodin, Graeme William Campell, Bjørn Are Davidsen, Håkon Johansen, Ben Normann and Håkon Ruud for proofreading and giving feedback.

-Carl Andreas Veie, September 23th 2017

Reviews from proofreaders:

Håkon Johansen: “Every statement from Hovind’s presentation has been presented in a fair manner, been examined thoroughly, and have citations to back up every claim. It’s easy to reach the same conclusion as Carl if you are willing to take the time and read everything that is written in the paper.”

Evolution by natural selection

One of the big problems in the evolution-creation debate is that people mean different things when they say the word “evolution”. Kent Hovind operates with six meanings of evolution spanning from cosmology and astrophysics to biology. I will get back to his definitions in the third section. However the scientific theory of evolution, called evolution by natural selection, is something different, and it is only limited to biology. In this section, I will briefly explain this scientific theory.

Evolution is defined as a change in the heritable characteristics of biological populations over successive generations.^[3] This is equivalent to a change in the gene pool of a population over time, since genes are the hereditary units that are passed on to the next generation.^[4] The gene pool is the set of all genes in a species or population. The English moth, *Biston betularia*, is a good example for illustrating evolution (change in the gene pool). There are two colour variations, light and dark. H. B. D. Kettlewell found that dark moths constituted less than 2 % of the population prior to 1848. The frequency of dark moths increased in the years following. By 1898, 95 % of the moths in Manchester and other highly industrialized areas were of the dark type. The moth’s colour was primarily determined by a single gene, so the change in frequency of dark coloured moths represented a change in the gene pool. This change was, by definition, evolution. The increase in relative abundance of the dark type was due to natural selection, not simply a reduction in overall moth numbers that spared the dark ones. Soot from the factories during the industrial revolution darkened the birch trees the moths landed on. Against a sooty background, birds could see lighter coloured moths better and ate them. This resulted in a higher relative number of dark moths surviving until reproductive age and leaving offspring that inherited the gene of dark colour. This is an excellent example of evolution by natural selection due to a change in environmental pressure, in this case a difference in visibility for predators.^[5] Natural selection sorts out the individuals with the best suited genes, and the result of this is adaptation.

This example also shows that populations evolve, not individuals. Individual organisms retain the same genes throughout their life, but a population evolves by changing the ratio of different genetic types. In this case, the change was an increased frequency of black moths, happening as the generations went by. That is to say that the individual moths did not turn from light to dark during their lifetime.

Evolution can be summed up in three sentences: Genes change. Individuals are selected. Populations evolve. Natural selection, genetic drift, mutation and gene migration are the four most essential evolutionary processes. Mutation and gene migration create variation, while natural selection and genetic drift sort variation.^[6] Evolution can be divided into microevolution and macroevolution, where the former refers to changes of gene frequencies within a species or population, and the latter to changes on a scale at or above the level of species.^[7] Some biologist argue that the mechanisms of macroevolution are different from those of microevolutionary change, while other think the distinction is arbitrary, that macroevolution is cumulative microevolution.^[8]

Contrary to the impression of many people, there exists solid evidence for macroevolution, which is neatly summed up in a Talkorigins-article named "29+ Evidences for Macroevolution - The Scientific Case for Common Descent".^[9] One of the most obvious lines of evidence for macroevolution comes from observations of speciation, the lineage-splitting process where biological populations evolve to become different species. Cases of species in various stages of separation have been observed all around the world. One example is the two new species of the wildflower genus *Tragopogon* that separated from former species during the last century. A change in the number of chromosome sets meant that the new flowers could only breed with other flowers having the same mutation and not with any of its predecessors, hence making it a new species. This example illustrates that speciation sometimes happens very fast as only one single mutation can be enough, but the more common case is a gradual change over time.^[10]

When it comes to the role of mutations, this passage from Talkorigins sums up pretty well: «While it is true that most mutations are either harmful, as suggested by the creationists, or neutral, the creationists gloss over a crucial fact: beneficial mutations do occur, though they are very rare. Can a beneficial mutation that occurs once in million individuals ever really contribute to evolution? Yes it can, since a rare beneficial mutation can confer a survival or reproductive advantage to the individuals that carry it, thereby leading -- over several generations -- to the spread of this mutation throughout a population. Beneficial mutations occurring in several different individuals in several different genes can simultaneously spread through a population, and can be followed by successive rounds of additional mutation and selection.»^[11] It is essential to keep in mind that the impact of a beneficial mutation increases its chance of being passed on to the next generation through

natural selection, thus compensating for the low frequency of occurrence. The impact of a mutation depends on which genes are effected. If control genes are effected, the impact would be much greater, like impacting a conductor of an orchestra instead of a musician.^[12] Another important remark is that the terms beneficial and deleterious alleles only makes sense when talking about a specific environment of a population. Traits that can be beneficial in some environments can be neutral or deleterious in others. Once again, the moths in England is a great example of this as the soot made dark colour a beneficial trait, and white became a deleterious trait.

Evolution, naturalism and theism – the great confusion

Hovind and many other creationists use a different definition of evolution than the standard one. What is the difference, and why do we have this great confusion? Firstly, we need to distinguish between the broader worldview some associate with evolution and the scientific theory of evolution. In conversations these meanings are often conflated, which is confusing. Some people consider evolution inherently atheistic or naturalistic, thinking it replaces God or otherwise rules out God's involvement in the development of life. This is a philosophical position, a part of a naturalistic worldview, and not a strictly scientific position. The reason for this is that science only deals with explanations within the natural realm, any supernatural causes is by definition not a part of science, but that does not mean that these causes or entities do not exist. One cannot use science to rule out the existence of God or any supernatural being because this is beyond the very scope of science.

An essential issue here is the difference between the two different versions of naturalism, methodological naturalism and philosophical/metaphysical naturalism (or materialism). The former is a working method of science. Since science only deals with explaining the natural realm, only natural causes are invoked as explanations. Other causes or entities beyond the physical reality may exist, but are irrelevant for doing science since they are not a part of the reality which science is meant to explain. Additionally, their existence and interference with nature cannot be detected by scientific enquiry. This version of naturalism is a method of science, hence the name methodological naturalism, and it deals with scientific epistemology, which is knowledge of what science can tell us.

Philosophical naturalism, on the other hand, is a worldview where the physical world with mass and energy is believed to be the ultimate reality. Natural causes and entities are the

only ones believed to exist. This worldview holds the non-existence of any God or supernatural entity, and hence it makes ontological truth claims. Ontology is the part of philosophy that deals with what does exist. This is generally not bound by the physical reality, but in a naturalistic worldview it is. To sum up, the former is a working method of acquiring knowledge of the physical reality, but the latter is a worldview claiming that nothing exists outside physical reality (i.e. God). Applying methodological naturalism as a scientific method does not logically contradict a supernatural view of reality.

How does this relate to evolution? While Hovind and other creationists refer to evolution as a part of a naturalistic worldview, this is not part of the scientific theory of evolution itself. Evolution does not entail philosophical naturalism. There is no logical contradiction between evolution as an explanation of the development of life on earth, and God as a creator of life. The former explains how and the latter who were behind it. Some argue that there is a theological problem here, due to of the conflict between the creation narrative in Genesis and the evolutionary account of life's history on earth, but that is a different question.

Hovind uses evolution to cover all of the origin of the universe and life, while the scientific theory of evolution by natural selection only deals with biology. One has to keep this in mind in discussions about evolution because the definitions may vary a lot. Hovind's definition gives the erroneous impression that all these different theories are covered by one monolithic theory of evolution. This is misleading, and one can accept any of the six meanings of evolution from the next section without accepting the others. An objection here can take the form that "is that if the Big Bang theory is wrong, then the universe is not 13.8 billion years old, and evolution does not have enough time to happen", but this does not follow. The universe might still be old, but not due to the arguments presented in a erroneous scientific theory. This line of reasoning, using a flawed explanation for a phenomenon as evidence that the phenomenon did/does not occur at all, is a formal fallacy known as substituting explanation for premise.^[13]

Creationists as well as many new atheists sees evolution as incompatible with theism, but this is just one of several positions. By saying that evolution entails philosophical naturalism one deliberately rules out a very common view, namely that theism and evolution are compatible. Hovind should not imply such a connection between evolution and philosophical naturalism without mentioning it explicitly, and pointing out that many Christians do accept evolution, and some secular scientists, like David Berlinski,^[14] do not accept evolution.

Evolution in a theistic worldview is called theistic evolution or evolutionary creationism.^[15]

Francis Collins, leader of the Human Genome Project and founder of the Christian organization BioLogos, is a prominent spokesperson for this view, which he presents in his book *The Language of God: A scientist presents evidence for belief*. The Catholic Church also officially hold this view, declaring that evolution and Christian faith are compatible.^[16]

Finally, I want to emphasize that evolution by natural selection is simply a scientific theory, and that any philosophy or interpretation beyond the scope of science that is added to it, theistic or non-theistic, is what constitutes a worldview, not the scientific theory of evolution itself.

The six meanings of evolution

In this section I will introduce Hovind's definition of evolution, and the six theories it covers, as presented in the start of his speech. His goal is to show that evolution is stupid, and he starts his speech by defining these terms, stupid and evolution. Defining stupid can be seen as both funny and necessary since we need to understand what is meant by saying evolution is stupid. According to Webster's College Dictionary stupid has three variations; lacking normal intelligence, foolish/silly, and dull and boring.

According to Hovind, the word evolution has at least six meanings concerning the origin of the universe and life: cosmic evolution, chemical evolution, stellar and planetary evolution, organic evolution, macroevolution and microevolution. He uses evolution as an umbrella term covering all these theories. Cosmic evolution is the origin of time, space and matter, covered by the Big Bang theory. Chemical evolution is the process by which higher elements form through nuclear reactions, usually called nucleosynthesis. Stellar and planetary evolution is the process by which stars and planets form. Organic evolution covers the origin of life from non-organic material, a theory also known as abiogenesis. Macro- and microevolution together make up the theory of evolution by natural selection.

Macroevolution is by Hovind defined as the change from one kind of animal into another, while microevolution is variations within kinds.

An important remark here is the way Hovind has grouped many different scientific theories from different fields under the umbrella term evolution, which is okay as long as he is consistent. He cannot switch from using evolution as a short term for all these theories concerning the origin of the universe and life to mean a single scientific theory. By doing this

he would violate his own definitions and mislead the audience.^[17] However, his definitions are a bit problematic as his aim is to debunk evolution, so it would be more convenient to use a standard definition rather than an umbrella term. The Big bang theory and nucleosynthesis are the standard terms for cosmic evolution and chemical evolution, so it seems inconvenient to use these new names. The term chemical evolution is confusing as well because it is used for abiogenesis, which is the origin of complex organic molecules, as well as for stellar nucleosynthesis.^[18]

After 5.10 minutes^[19] Hovind claims that microevolution is the only one of the six meanings of evolution that has been observed, and all the other meanings are stupid, certainly not a part of science and something you have to believe in. Let us first look at the meaning of the word “scientific”. The assertion “The moon is made of cheese” is scientific, while the assertion “God exists” is not scientific. This does not mean that the latter cannot be true, but the truth of the assertion cannot be evaluated by the scientific method, while it can be applied to the former. There is no doubt that microevolution is the one of the six meanings of evolution that we can test most easily, but that does not mean we do not have empirical evidence supporting the other theories as well, even though they deal with things far away in time and/or space.

Many of these processes happened in the past, as the big bang, or take a long time, like star formations, but they are all a part of the physical reality and the scientific method does apply. We make hypotheses, assess their soundness and logical validity, check how well they conform to empirical observations and check their predicative power by making predictions and doing experiments to test whether the predictions fit to the observations. Hence, all of the six meanings of evolution are falsifiable and a part of science. The big bang theory, abiogenesis and macroevolution cannot be directly observed in the present. The two former are theories about the past, while macroevolution takes a lot of time, so it is hard to observe during our lifetime, but some examples were mentioned in section one.

Stupid was defined as lacking normal intelligence, foolish/silly, or dull and boring, and the five scientific theories dealing with the history of the universe and the history of life are, in my opinion, none of these. All of them are falsifiable, have explanatory power and makes inductive or abductive inferences based on the available observations. Even if some of them in the end were falsified in the future, they would not be stupid theories since they conform to all of today’s observations. Hovind says that these theories are “not scientific, and

something you have to believe in". To believe in a scientific theory does not mean belief in the absence of evidence, and this rhetoric does not contribute to support the claim that these theories are stupid or unscientific.

“No one has ever seen a star form”

After introducing the six forms of evolution Hovind goes on to examine each of them more carefully. Regarding stellar and planetary evolution, Hovind repeatedly claims that “No one has ever seen a star form” (3.51 minutes^[20]). The problem here is the implication that since we have not observed the formation of a star, this is not happening. Absence of evidence is not necessarily evidence of absence. Even though we have not observed an event A, this does not mean that A cannot possibly happen. This is an induction fallacy. In this case where A is star formation, we have had simulations of this showing that it is possible in theory and very likely happening even though we lacked empirical observations for a long time. This was largely because the protostellar stage of stellar life is hidden away deep inside dense clouds of gas and dust left over from the giant molecular cloud, which makes it difficult for any electromagnetic waves to get out, and hence hard to observe. On top of that, the electromagnetic waves from star formations are not available in optical wavelengths, so we need infrared and x-ray telescopes to study this.^[21]

A lot has happened on this field since Hovind's speech in 2001, but already at that time we had several of observations of star formations, but Hovind does not mention or try to debunk them in his video, even though that is essential for his claim that we have never seen a star form. MWC 349 was first discovered in 1978, and is estimated to be only 1000 years old, and VLA 1623 found in 1993 is possibly younger than 10 000 years.^[22] Wide-field Infrared Survey Explorer (WISE) is a NASA telescope operating in infrared wavelengths, and it has since it was launched in 2009 provided observations of star clusters where protostars have been observed, like FSR 1184, FSR 1190, Camargo 14, Camargo 74, Majaess 64 and Majaess 98. X-ray observations have also been useful for studying young stars since not all of them have infrared excesses. The direct observation of the formation of individual stars is limited to the Milky Way, but star formations in distant galaxies have been detected through their unique spectral signatures.^[23]

Hovind goes on to quote a scientist who says that the death of 20 stars can produce one new star. No sources are cited, and there is nothing in this statement implying that the only

way a star can be born is through the death of 20 other stars. Hovind does not give any source or explanation to back up the implicit claim that this is the only way stars can form, and he then makes the following conclusion about star formations happening the way the scientist suggest: "I think it is scientifically impossible." (4.30 minutes^[24]) Does it violate the laws of physics? Certainly not. Why does theoretical simulations support the idea that star formations take place and conform to empirical observations from telescopes? To sum up, the claim that we have never seen a star form was controversial in 2001, and with more advanced telescopes Hovind's case has not become any better. He needs to demonstrate why these empirical observations are wrong in order to defend his statement, so the burden of proof is, without doubt, on his side.

Abiogenesis and biological evolution

Moving on to organic evolution, or the origin of life, Hovind makes the following claim: "Life had to come from non-living material." (4.43 minutes^[25]) This is by no means linked to evolution by natural selection, which as it only deals with what is happening after life originated. Whether the first life forms were created by direct divine creation or abiogenesis would not affect evolution at all, as Logicked points out after 9.45 minutes^[26] in his first video on Hovind. One does not need to know causes to observe effects. This means that we can observe how life evolved without knowing the cause of the origin of life. Yet abiogenesis is a part of Hovind's definition of evolution, which shows how important it is to be aware of the difference between his definition of evolution and the standard one.

As of 2017, there is still no accepted scientific theory that can account for the origin of life, but there is a lot of scientific work in progress. One of the most interesting contributions on this field comes from the Nobel Prize winner Jack Szostak and his laboratory at Harvard. He has proposed a model for the origin of life containing how RNA molecules came about, started copying and turned into DNA. The model covers all the steps from chemistry to biology, including genes and cells.^{[27][28]} There are lots of problems left to solve, but if scientists manage to crack the code of the origin of life it does not mean that God did not play any part in this. The creator of the universe could perfectly well put the potential into this world for life to form in an indirect way, as well as doing it by direct creation.

“Nobody has ever seen a dog produce a non-dog”

Hovind goes on to talk about macroevolution, and argues that this has not happened because “Nobody has ever seen a dog produce a non-dog”. (4.57 minutes^[29]) This statement is obviously true, but it is not a good argument against evolution by natural selection because changes take more time than that. One has to look at to zoom out to see the big picture. It is like looking at a graph of the function $\ln(x)$ for a high value of x and argue that the value of $\ln(x)$ does not change much with increasing x , but it in fact will increase to infinity.

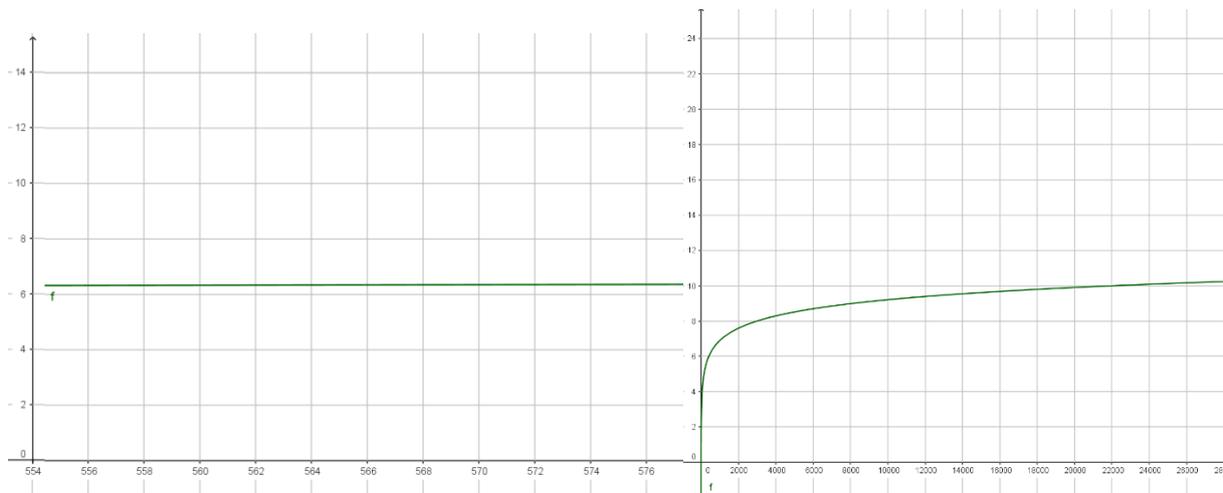


Figure 1: The same function, $\ln(x)$, shown in two different scales. Small changes over long periods can really make a difference.

Logicked makes a good point about this after 10.10 minutes^[30] of his first video: Hovind says microevolution has produced a variety within kinds, for instance that dogs evolved from wolves. By the same standards as he uses for macroevolution he would be faced with the assertion “No one has ever seen a wolf produce a non-wolf”. Since changes takes place in the latter case, this argument does not work against macroevolution either.

This topic comes up several times during his presentation, and he keeps repeating that animals can only produce offspring of their own kind, even if he does not define the word “kind”. Evolution does not predict animals to produce offspring other than their “kind”, as Hovind suggests, but it predict animals to change through the generations through descent with modification.

Another important issue here is the definition of species and kinds. Kind is a biblical term, not a scientific one, and Hovind suggests in a debate with William Moore that it would be

closer to “family” than “specie”.^[31] There are several definitions of species, but a typical one is “a group of individuals that actually or potentially interbreed in nature. In this sense, a species is the biggest gene pool possible under natural conditions.”^[32] This might seem like a perfectly clear definition, but there are many examples in nature where it is highly ambiguous, if not useless. It works well for sexually reproducing animals, while it cannot be applied to asexually reproducing species like bacteria. If two populations cannot interbreed, but each of them can breed with a third population, how do we define the limits of these species?

It is important to recall that we use the word “species” to classify animals and it does not pose any limit to the varieties and development of animals. Species change their gene material generation by generation. 10 000 years into the future the dogs will not be equal to the dogs we have today. Should we still call them dogs? This shows how a static language does not keep up with the dynamics of animal changes. Another example of this is two birds that are classified as the same species today, but many generations into the future their descendants have become so different that they can no longer interbreed, and they ought to be classified as different species.

We must recall that species names like “dog” or “bird” are human classifications and that animal varieties are continuous. There are several examples in nature of animals that appear to be distinct species, but have an intermediate zone where they can interbreed. Hooded crows and carrion crows are an example of this.^[33] Should they be considered the same species or separate species? Several problems arise when using a terminology that indicates discrete species while reality is a continuous spectre with blurry lines.

This is a complicated topic and Hovind oversimplifies it in his argument, making it totally irrelevant. He misrepresents what evolution would predict. Changes happen, but it takes time.

The Big Bang “What exploded?”

Hovind says that the Big Bang theory predicts that the universe is 20 billion years old, which is a significant deviation from the 13.8 billion years we operate with today. During the 70s the estimated age of the universe was as high as 20 billion years,^[34] but when Hovind held his speech in 2001 the estimations suggested the universe to be between 12.4 and 14.8

billion years old.^[35] In a debate with Dr Robert Trivers he refers to the book *General science* from Prentice Hall (1992), page 61, which says 18-20 billion years old.^[36] This number was a bit outdated in 2001, but it is not an important issue.

The language he uses when talking about the big bang theory is a bit more problematic, such as asking “What exploded?”. To describe the Big Bang as an explosion is misleading, as it is not an explosion in any usual meaning, but the creation of time and space itself. Hovind uses the book *General Science* that also uses the word “explosion”, but the book should not have used that word to avoid confusion. “Where did it come from?” is a good question, and we do not have the answer to this. However, it does not pose a problem for the observed effects of the Big Bang, and we cannot deny the observed effects because the cause is unknown. Logicked has a good analogy about this after 13.45 minutes^[37] of his video: “What you [Hovind] are doing is looking at a car in the ditch and saying it ran off the road one minute ago even though you have been standing there looking at it for two minutes, the engine is totally cold, nobody is inside and it is covered in six feet of snow and then you are justifying that position by saying: Hey, you do not know why it ran off the road.”

We do not know where the big bang came from, and cosmology does lead us to counterintuitive results, as does many other fields of science. General relativity and quantum physics are some examples of fields in which results are counterintuitive, but still experimentally accurate. If you go for a space travel moving at 90 % of the speed of light compared to earth, you will measure a time of 3 years in your frame of reference when 7 years would have elapsed on earth. Hovind describes counterintuitive theories as stupid, which leads us nowhere. The Big Bang is another example of an event that is in conflict with our intuition, as it seems to be the very origin of space and time itself. Our brains are adapted to understand events happening within space and time, so the big bang is where our understanding of the universe breaks down. We do not know what caused the big bang. We do not even know if causality applies to the big bang.

After 5.48 minutes^[38] Hovind says: “According to the Big Bang Theory it all started with a little dot and exploded and spread out over all the universe much faster than the speed of light.” An important remark here is that the expansion did not take place in an already existing medium, it is the expansion of the universe, the space-time itself, which explains why it can go faster than the speed of light. According to General Relativity no information can travel faster than the speed of light, which means something with mass/energy

experiences this constraint, while spacetime itself does not.

I will end this section with this quote from the introductory lecture on quantum mechanics reproduced in QED: The Strange Theory of Light and Matter (Feynman 1985). It brilliantly sums up the absurd results of science and the conflicts with common sense. “there are many reasons why you might not understand [an explanation of a scientific theory] (...) Finally, there is this possibility: after I tell you something, you just can't believe it. You can't accept it. You don't like it. A little screen comes down and you don't listen anymore. I'm going to describe to you how Nature is - and if you don't like it, that's going to get in the way of your understanding it. It's a problem that [scientists] have learned to deal with: They've learned to realize that whether they like a theory or they don't like a theory is not the essential question. Rather, it is whether or not the theory gives predictions that agree with experiment. It is not a question of whether a theory is philosophically delightful, or easy to understand, or perfectly reasonable from the point of view of common sense. [A scientific theory] describes Nature as absurd from the point of view of common sense. And it agrees fully with experiment. So I hope you can accept Nature as She is - absurd. I'm going to have fun telling you about this absurdity, because I find it delightful. Please don't turn yourself off because you can't believe Nature is so strange. Just hear me all out, and I hope you'll be as delighted as I am when we're through.”^[39]

“Why do two planets spin backwards?”

After 8.47 minutes^[40] of Hovind's video he is again referring to a passage from *General Science*. The only problem is that the passage is about how our sun formed from a spinning nebula, not about the Big Bang. Hovind says that all the matter in the universe was located on one point which span faster and faster, and then exploded. He compares this explosion to a merry-go-round throwing of pieces, which is misleading as the Big Bang was not an explosion within space and time, but the event in which spacetime apparently came into being.

He further argues that the conservation of angular momentum poses a problem for the Big Bang theory since all the planets should rotate in the same direction, but Venus, Uranus and possibly Pluto rotate backwards. “If the whole universe began as a swirling dot, why do two planets spin backwards?” Our solar system was not formed directly from the Big Bang, but much later from a nebula, a big cloud of gas and dust, and the spin of the planets was determined by the collisions when they formed by gravity from gas and dust. Since this

process happened much later than the Big Bang, it is evident that the Big Bang theory has no direct influence on the direction of the spin of planets in our solar system. Even if we were to suppose that our solar system was the direct result of the Big Bang, angular momentum could still be conserved even though some planets were spinning in the other direction as long as the total angular momentum remains the same as the original spinning singularity. To sum up, this is a bad argument against the Big Bang theory and Hovind should not have used it.

“If the big bang theory were true the matter would be evenly distributed”

After 17.35 minutes^[41] Hovind shows a slide that says: “If the big bang theory were true the matter would be evenly distributed. Instead it is “lumpy”. There are clusters of stars and then great voids.” It is hard to see why Hovind insists that the Big Bang theory would imply that the matter is evenly distributed. The universe would be evenly distributed only if there were no quantum effects or forces in nature. If we suppose an evenly distributed universe in equilibrium, this would also turn into a lumpy universe because the slightest quantum deviation would make it collapse. Due to the presence of the fundamental forces this is inevitable. These are called strong nuclear force, weak nuclear force, electromagnetic force and gravity, where the latter is the most important in this case. Gravity tells us that matter in a homogenous distribution will contract and form a massive object, like a planet or a star. This explains how solar systems and galaxies form, and hence there is no reason to expect the matter to be evenly distributed.

Hovind further suggest that anti-matter and black holes are ad-hoc hypotheses invented to rescue the Big Bang theory. Anti-matter has nothing to do with this topic, so dark matter is probably what he meant to say. Anti-matter is antiparticles, like positrons, while dark matter is still not identified, but scientist are using this term to describe a kind of matter that seems to exist because it accounts for the missing mass from observed gravitational effects.^[42] Both dark matter and black holes are explanations for gravitational phenomenon we observe today, so suggesting that these theories were invented to defend the Big Bang that happened long ago seems a bit weird. Additionally, they are not relevant at all to the claim that the Big Bang Theory should predict the matter in the universe to be evenly distributed.

“How did the other natural elements form?”

After 3.33 minutes^[43] of his speech, Hovind has a slide that asks: “If the Big Bang produced hydrogen and some helium, how did the other natural elements form? (...) How did the chemicals evolve? They don’t talk much about that, but that would have to happen.” In other presentations he poses the question somehow differently by focusing on the fact that nuclear fusion should not be able to surpass iron, which has the lowest mass per nuclei.

The formation of the 92 natural elements from the few that came into being at the Big Bang is not a big mystery. The process where heavier elements form by nuclear fusion of lighter ones, is named stellar nucleosynthesis. A newborn star is ignited by the conversion of potential energy to heat due to gravitational collapse of a molecular gas cloud. During the lifetime of the star hydrogen is fused into helium, which results in the emission of energy according Einstein’s famous formula $E = mc^2$. After the star has consumed the hydrogen in its core, it contracts and heats, igniting the fusion of heavier elements, starting with helium, and followed by carbon, neon, oxygen etc.^[44] A star loses most of its mass when it is ejected at the end of its lifetime, thereby increasing the abundance of elements heavier than helium in the interstellar medium. The next generation of stars incorporate these elements during their formation, and the material in our galaxy underwent several such cycles before our solar system formed. This explains the transition from the state of the early universe to today’s solar system, where heavier elements are abundant.

Today it is well established that all elements from carbon to uranium were made by stellar nucleosynthesis. Elements heavier than iron does not release energy when they are formed by fusion. Instead they require energy. The formation of such elements mainly occurs during the extreme conditions of the final stages of supernova explosions. These elements are produced mainly by neutron capture: the s(“slow”) and r(“rapid”) processes, followed by a beta decay, which increases the number of protons in the nucleus. The high-temperature, high-neutron-density explosive process called the r-process is recognized to be responsible for the production of many of the heavier elements.^[45] Other processes also contribute, as shown in the figure below.

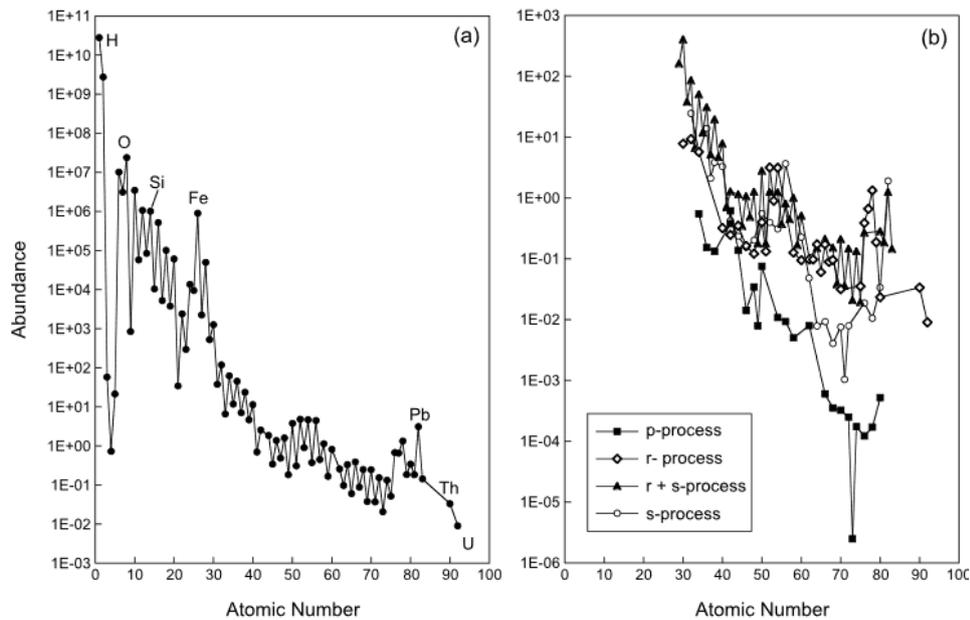


Figure 2: (a) Abundances of the elements in the solar system (b) Abundances of the nuclides of a given element produced by the p-, r-, and s-process, respectively.^[46]

This means that we have a good scientific explanation of the formation of natural elements, and Hovind needs to point out why he thinks this account is unsatisfactory in order to make a good argument.

Woodpeckers and termites

Hovind tells about a debate he did where he sent in questions that he wanted to cover in the debate, but were dropped. After 10.44 minutes^[47] he presents the two of them, the first being: “A woodpecker’s tongue goes all the way around the back of its head and comes out on the top of its left eyebrow, left nostril here (points). Would you please show me any fossils that have been found, intermediate species between a normal bird and a woodpecker.(...) What evidence do you have of how this evolved?”.

Hovind here asks for transitional fossils that shows the transition from other birds to the woodpecker. First, you would not expect to find fossils of every single transition. Every new intermediate fossil that is found creates two new holes in the record. As Logicked says after 7.05 minutes^[48], the pattern is shown very clearly from the fossils we already have. To argue that most birds have common descent while the woodpecker has not due to a different tongue, seems quite arbitrary. It is actually very hard to see why Hovind would argue that the woodpecker is not related to other birds, as this is microevolution, which he

acknowledged as true and accurate. It seems like Hovind thinks there is a unique woodpecker kind because its tongue goes all around its head, as if this feature could not possibly be produced by evolution.

Logicked further points out that when the woodpecker is born its tongue is similar to other birds, but as it gets older the muscle extends over its head, and the main selection factor for this trait is that it gives the woodpecker a longer tongue to extend into the holes that it bores in the trees to catch its prey. Evolution presents a viable explanation of how this evolved, so Hovind's argument does not make much sense.

The second question is: "Termites chew on wood and they swallow it, but termites can't digest it. It goes into their stomach and there is little, tiny critters in their intestines that actually digest the cellulose. Now those little critters can't live without the termites and those termites can't live without those critters. Which one evolved first?" This is just one of several examples of co-dependent species in nature. Hovind poses this argument as a problem for evolution, while it is, in fact, only a problem if you ignore the entire concept of evolution. From an evolutionary point of view, this is not a problem because species change with time. Logicked says after 9.14 minutes^[49]: "If two different species find each other useful, but they don't critically depend upon each other for survival, they can start to evolve to be more suited to each other because they are constantly interaction. They find each other useful, their survival rate is higher together and so they keep living together and working together and as time passes they become more and more dependent on each other until eventually they can't live without each other." Hovind might have asked "Which one evolved first?" rhetorically, but Logicked nonetheless presents a viable answer: "The wood digesting capability of the termite gut flora likely came long after co-dependency between organisms and their gut flora, and long before termites."

Even though all the answers from how the co-dependency in this particular example evolved is not exactly clear at this moment, we have a reasonable explanation of how it happened and we can know that it is possible by comparing it to similar examples in nature. The argument poses no real challenge to evolution. A 7-day creation view, on the other hand, run into difficulties because these species must have been created on same day in order to survive, at least if they were created in their present form. If Hovind accepts that the species were different in the past, he has no reason not to buy the evolutionary explanation of this. After all, it is just microevolution, which he accepts.

“Evolution is a religion”

Hovind keeps repeating “evolution is a religion” during his speech, and after 13.15 minutes^[50] he says that both evolution and creation are religious because you have to believe in them. The main problem here is his definitions. “Evolution is a religion” does not mean what one would think because he has redefined both “evolution” and “religion”. His definition of evolution is covered thoroughly in other sections, so I choose not to repeat it here. “Religion” is defined by Hovind as something you believe in, but this definition is too unspecific as it contains many things that are not religious by any standard definition of the word. I believe that I exist. I believe that I am writing this sentence. These things would fall under Hovind’s definition. Once again, I would like to stress the difference between belief and belief in the absence of evidence, or blind faith. People often believe in something *because* of the evidence for it, which is usually the case with scientific theories like evolution by natural selection. Taken this into consideration, the word “believe” is very misleading as Hovind try to use it to imply blind faith or lack of evidence. Even if no evidence supported evolution, it would not be a religion by any standard definition, but rather a hypothesis that lacks empirical validation. By using Hovind’s definitions, on the other hand, he is right in saying evolution is a religion, like many other things that nobody would normally define as religious. He needs to define more carefully what is meant by “religion” in order to make sense of this claim.

Logicked presents a very broad definition of religion after 16.31 minutes^[51], a definition that captures non-theistic religions like Buddhism as well. Hovind’s definition of evolution fails to qualify as a religion in even the broadest possible sense because it does not fulfil any of the criteria.

1	BELIEF IN SOMETHING SACRED (FOR EXAMPLE, GODS OR OTHER SUPERNATURAL BEINGS).	✘
2	A DISTINCTION BETWEEN SACRED AND PROFANE OBJECTS.	✘
3	RITUAL ACTS FOCUSED ON SACRED OBJECTS.	✘
4	A MORAL CODE BELIEVED TO HAVE A SACRED OR SUPERNATURAL BASIS.	✘
5	CHARACTERISTICALLY RELIGIOUS FEELINGS (AWE, SENSE OF MYSTERY, SENSE OF GUILT, ADORATION), WHICH TEND TO BE AROUSED IN THE PRESENCE OF SACRED OBJECTS AND DURING THE PRACTICE OF RITUAL.	✘
6	PRAYER AND OTHER FORMS OF COMMUNICATION WITH THE SUPERNATURAL.	✘
7	A WORLD VIEW, OR A GENERAL PICTURE OF THE WORLD AS A WHOLE AND THE PLACE OF THE INDIVIDUAL THEREIN. THIS PICTURE CONTAINS SOME SPECIFICATION OF AN OVER-ALL PURPOSE OR POINT OF THE WORLD AND AN INDICATION OF HOW THE INDIVIDUAL FITS INTO IT.	✘
8	A MORE OR LESS TOTAL ORGANIZATION OF ONE'S LIFE BASED ON THE WORLD VIEW.	✘
9	A SOCIAL GROUP BOUND TOGETHER BY THE ABOVE.	✘

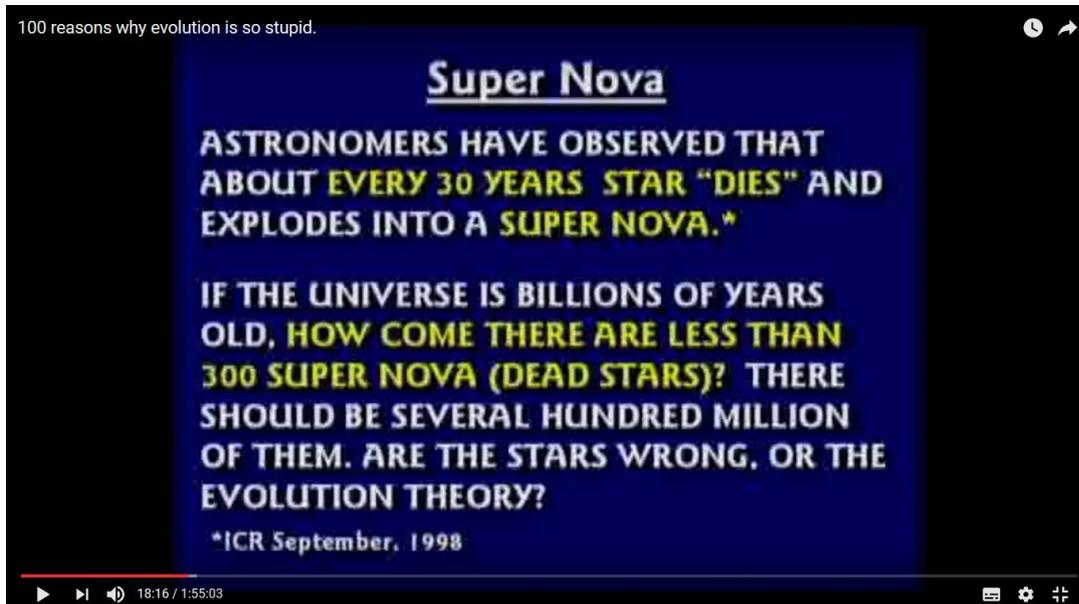
Figure 3: A broad definition of religion provided by Logicked.^[52]

While it is certainly true that evolution by natural selection is not a religion, what about a naturalistic worldview of which evolution is part, called naturalistic evolution? Naturalism (philosophical naturalism) is a worldview and holds that everything that exists is (1) solely physical and (2) can be explained by natural processes. While (1) is clearly denying the existence of a transcendent God, a common misconception is that (2), natural explanations, also does. There is, however, no logical contradiction between explaining everything within the universe using natural explanations and the existence of a God creating this universe.

When Hovind talks about evolution, he thinks evolution entails philosophical naturalism, thus making it a worldview, which he would call religion. Once again, I want to repeat that evolution by natural selection is simply a scientific theory, and any interpretation beyond the scope of science that is added to it, theistic or non-theistic, is what constitutes a worldview, not the scientific theory of evolution itself. For the sake of curiosity, philosophical naturalism would not qualify as a religion either because it does not match the above criteria. Through this explanation of the meaning of the terms “evolution” and “religion” it is obvious that he tries to stretch their meaning too far. If we were to translate Hovind’s sentence into standard definitions, we would find that “Evolution is a religion” actually means “naturalism is a world view”, which I would agree on.

“How come there are only 300 dead stars out there?”

Hovind asks this question after 18.17 minutes^[53] of his video. He shows the following slide:



The argument can be formulated like this: If the evolution theory (which in creationist terminology includes the Big Bang theory) is true we would expect to observe a lot more dead stars in the universe than we do. First let us get the numbers right. As Logicked points out, the 30-year average is only for the Milky Way Galaxy. NASA confirms this by operating with a similar period, 50 years, between two super nova explosions in our galaxy.^[54] For the entire universe, the number is significantly larger. According to Dr. Richard Mushotzky of NASA Goddard Space Flight Center an average of 1 billion supernovas a year are occurring in the universe, which is fairly close to Hovind’s “several hundred millions”. This number is obtained by using a 100 year interval between supernovas per galaxy and a total number on the order of 100 billion galaxies.^[55] Speaking of supernova observations, we have a total of 5476 (as of 2014),^{[56][57]} which is a lot more than Hovind’s 300. Still there is a big difference between 5476 and 1 billion. Why have we not seen more supernovas?

First, recall the similarities between this and the star formation argument. In both cases we expect to observe something, and the observations are not equal to the theoretical estimations. The observed rate of supernovas in our galaxy is much lower than the estimated rate of one every 50 years,^[58] and for a long time we did not observe the expected number of star births. It is important to recall that “absence of evidence is not evidence of absence”, and that future technology can make it easier to detect distant and faint signals so

the observed rate will increase. Supernovas far away are almost impossible to detect, and our vision is most likely obscured by interstellar dust. However, more supernovas are likely to get detected in the future with instruments that can observe a wider range of the electromagnetic spectrum, along with neutrino detectors.^[59]

Today we cannot detect most supernovas in the universe with our current technology, but we are always improving. Hovind's argument requires that we should observe all supernovas in the universe, and all supernovas that happened in the past, which is just impossible as remnants are very hard to detect. Old supernovas remnants are very hard to detect since they have stopped emitting visible light, are increasing in size and hence getting thinner and more spread out.^[60]

Before moving on, I will sum up all the flaws and misconceptions in Hovind's argument. As already pointed out, the 30-year number is just for our galaxy, and a number of 300 supernovas is way too low, in 2001 as well as today. By using his numbers we nonetheless get an age of the universe of 9000 years, which is 3000 years older than the universe, according to Hovind. He further makes the inference "since there is only x observed supernovas, there are x supernovas out there", which is very sketchy since we are not able to detect them all. He also describes the theory covering this as "the evolution theory", which is confusing and misleading, since his umbrella term is not a unified scientific theory, and this has certainly nothing to do with evolution by natural selection. Finally, Hovind seems to imply that all dead stars turn into supernovas, which is not right. This picture shows the events happening during the lifetime of different star types:

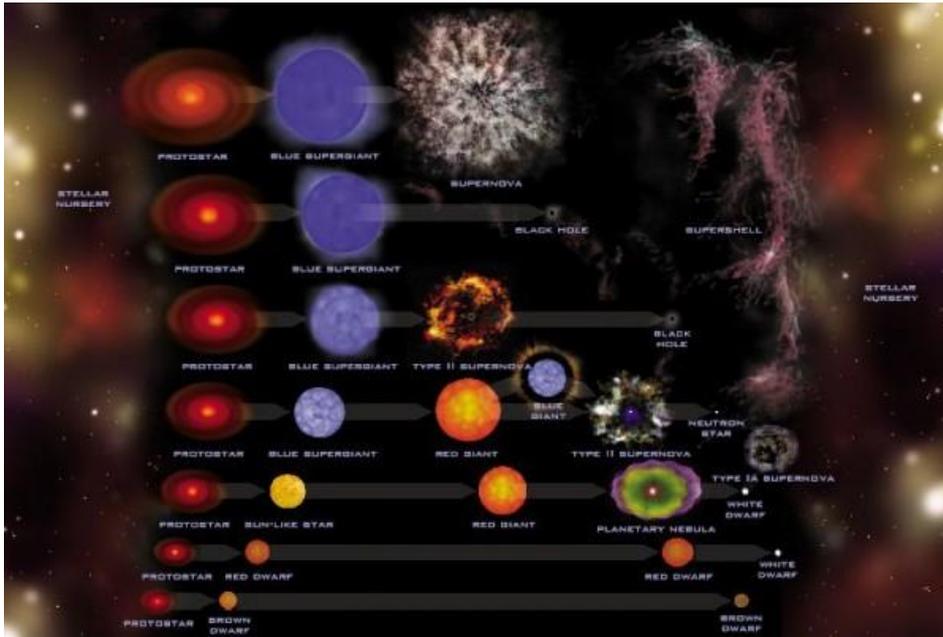


Figure 4: The different types of stars.^[61]

The mass of a star determines its fate, and just a minority of stars form a supernova. The two main ways in which this can happen are called type 1a and type 2. The former happens when a white dwarf feeds on a companion star so it reaches the 1.4 solar masses, called the Chandrasekhar limit, when the star explodes into a supernova. The latter happens when a massive single star, larger than 8 solar masses, collapses due to its own gravity at the end of its life time.^[62] If the core mass exceeds the Chandrasekhar limit, it explodes into a supernova in the same way as type 1a. The core remnants can form either a neutron star or a black hole. As most stars lack a twin star they cannot form a type 1a supernova, and since they are not massive enough (<8 solar masses) they cannot form a type II supernova.^[63] The majority of stars end their lives as white or brown dwarfs. This means the number of star deaths outnumbers the number of supernovas by a lot, and Hovind use these terms in his slide as if they meant the very same thing. If he is trying to say that there are only 300 observed dead stars out there, including brown dwarfs, white dwarfs, supernova remnants and black holes, he is surely off by several orders of magnitude.

Other arguments about the number of supernovas and supernova remnants (SNRs) supporting a young universe has been proposed by several creationists, tracing back to a 1994 article by Keith Davis called “Distribution of Supernova Remnants in the Galaxy”, but these arguments have been debunked by Talkorigins. For further reading, see <http://www.talkorigins.org/faqs/supernova/#BM10>.

Conclusion

Has Hovind presented any convincing arguments against evolution during the first 20 minutes of his speech? The following arguments/topics have been covered in this essay: the supposed lack of observation of star births, abiogenesis, animals can only produce offspring of their own kind, why do two planets spin backwards?, the matter in the universe should have been evenly distributed, how did the heavier elements form?, woodpeckers and termites, “evolution is a religion” and the lack of dead stars/supernovas. To sum up: Hovind is wrong in saying that we have never observed a star form. He shows his inability to understand evolution when he demands animals to only produce offspring of a different kind than their own because changes accumulate over long periods of time. The fact that two planets spin backwards is totally irrelevant to the Big Bang theory and the fact that Hovind believes the Big Bang happened like a merry-go-round throwing matter out into space shows an unbelievably flawed understanding of the theory. He also conflates the universe with a spinning nebula. His flawed understanding of the Big Bang theory is also the foundation for the next argument, that the matter in the universe should be evenly distributed. The forces in nature predict otherwise, and it seems peculiar that no scientists think the Big Bang theory entails a uniform distribution of matter. When it comes to nucleosynthesis, which is a universally accepted theory, Hovind does not accept it for some reason he fails to explain. The argument about woodpeckers and termites once again shows that Hovind does not understand evolution by natural selection as he cannot comprehend the concept of gradual changes over long periods of time and the adaptation of species into forming co-dependency, which is well documented. The assertion “Evolution is a religion” only makes sense in Hovind’s terminology, where he has redefined both evolution and religion. Finally, the argument about lack of dead stars/supernova shows that Hovind does not have a clue about astrophysics. He uses out-of-context information from the Institute for Creation Research that conflict with the scientific consensus on the number of supernovas, makes an argument that implies an age of the universe 3000 years older than he believes himself, and completely denies the facts that only a minority of stars form supernovas and that supernova remnants fade from visibility. The conclusion is inevitable: Hovind’s arguments do not stand up to scientific scrutiny. Personally, I cannot possibly see why someone would regard Hovind as a trustworthy authority on this topic. He has no scientific degree,^[64] and argues against the views of the entire scientific community.

This is only a minority of the topics Hovind covers in his speech, and to give a full evaluation of the entire speech I would have to cover them all in detail. As you understand, this is just the beginning, but I cannot see there is any point in going on from here as the rest of the arguments are at the same level. The extent of this essay in comparison to the relatively short corresponding passage of Hovind's speech shows that he jumps from one topic to the next without going into depth or providing reliable scientific explanations or sources for his arguments. Throughout the scientific analysis I have kept my focus on the arguments, and trying to be as nice and neutral as possible, but I need to make it very clear what my opinion is. What Hovind is presenting is two hours of brief arguments based on cherry-picked data in order to support a conclusion that is given beforehand. This is not science. Although he raises a lot of interesting questions and a few valid points, Hovind is very biased and shows a staggering lack of understanding of simple scientific terms, theories and fields, like the Big Bang, evolution by natural selection and astronomy. He systematically misrepresents the theories, making the majority of his arguments highly irrelevant. For a non-specialist like me being able to tear this arguments apart simply by checking with qualified science reveals the true quality of the speech.

I would argue the reason for Hovind's bad arguments is that he tries too hard find arguments that fit his conclusion without considering their soundness. Anything that does not conform to his beliefs is dismissed, while any argument, sound or unsound, that could possibly support his conclusion is used for all it is worth. Logicked puts it rather harshly, but in my opinion brilliantly: "If we just make up an answer based on no research and then attach ourselves to it emotionally, we have no chance at all of ever discovering true answers, and unfortunately that is exactly the situation you've trapped yourself in to such an extreme degree that can't even accept any part of observed reality that contradicts the fable you've latched on to." (Logicked's 2nd video, 12.26 minutes^[65])

Maybe you think that Hovind cannot possibly be that wrong, that I have been biased in my analysis or that there are important parts of the arguments that I have missed. Maybe you regard me as brainwashed by "evolutionist" propaganda. If that is the case, I would suggest you to apply the same standards to yourself when it comes to creationist material. I encourage you to think through what you just read. Feel free to give a response discussing the scientific content of this essay.

I would not recommend anyone to use Kent Hovind's material to understand the

relationship between faith and science. Rather I would recommend Francis Collins, which I have already mentioned, and Kenneth Miller. Both accept evolution and are considered world class scientists on the topic, as well as being devoted Christians. Collins deals with questions of faith and evolution in his book *The language of God*, while Kenneth Miller's book *Finding Darwins God* has been recommended by the National Center for Science Education. I would also recommend the Irish mathematician John Lennox and his material, primarily *God's undertaker: Has science buried God?* and *The seven days that divide the world*. Lennox, being an Intelligent design-proponent, is a critic of several aspects of evolution, and he presents a much better critique than Hovind does. This is an important point, as one should be aware that there are serious critics of evolution that are worth listening to, but Hovind is not one of them.

Both Collins, Miller and Lennox cover the question of whether and how science/evolution and Christian faith be reconciled, a question that might as well be the topic of my next essay. Other sources that I will recommend is the Faraday papers which ought to provide the general reader with an accessible and readable introduction to the relationship between science and religion, written by a broad range of authors who are experts in the field. The papers can be found at <https://www.faraday.st-edmunds.cam.ac.uk/Papers.php>. Sources dealing specifically with Hovind's material are the Talkorigins article <http://www.talkorigins.org/faqs/hovind/howgood-dr.html>, and Logicked's videos, if you can endure his sarcastic and rude presentation style. In order to get a better understanding of evolution by natural selection I would recommend Talkorigins' introduction article to evolutionary biology: <http://www.talkorigins.org/pdf/faq-intro-to-biology.pdf>.

Epilogue

I think Hovind has a damaging effect on how Christians think about the relationship between science and religion, and in this epilogue, I briefly want to put his views into a larger context by presenting the views of a few contemporary and historical Christians.

First out is Francis Collins, who shares his critical view on young earth creationism in *The Language of God*: "Young Earth Creationist argue that evolution is a lie. (...) Many books and videos can be found in Christian bookstores that claim that no intermediate fossil forms can be found for birds, turtles, elephants, or whales (yet examples of all these have been found in the last few years), that the Second Law of thermodynamics rules out the possibility of

evolution (it clearly does not), and that radioactive dating of rocks and the universe is wrong because decay rates have changed over time (they have not). (...) In general, those who hold these views are sincere, well-meaning, God-fearing people, driven by deep concerns that naturalism is threatening to drive God out of human experience. (...) For anyone familiar with the scientific evidence, it is almost incomprehensible that the YEC view has achieved such wide support, especially in a country like the United States that claims to be so intellectually advanced and technologically sophisticated. (...) Harkening back to St Augustine's interpretation of Genesis 1 and 2, however, and remembering that he had no reason to be accommodating to scientific evidence about evolution or the age of the earth, it is clear that the ultra literal YEC views are in fact not required by a careful, sincere, and worship reading of the original text. In fact, this narrow interpretation is largely a creation of the last hundred years, arising in large consequence as a reaction to Darwinian evolution. (...) Many believers in God have been drawn to Young Earth Creationism because they see scientific advances as threatening to God. But does He really need defending here? Is not God the author of the laws of the universe? Is He not the greatest scientist? The greatest physicist? The greatest biologist? Most important, is He honoured or dishonoured by those who would demand that His people ignore rigorous scientific conclusion about His creation? Can faith in a loving God be built on a foundation of lies about nature? (...) Young people brought up in homes and churches that insist on Creationism sooner or later encounter the overwhelming scientific evidence in favour of an ancient universe and the relatedness of all living things through the process of evolution and natural selection. What a terrible choice they then face! (...) Presented with no other alternative than Creationism, is it any wonder that many of these young people turn away from faith, concluding that they simply cannot believe in a God who would ask them to reject what science has so compellingly taught us about the natural world?"^[66]

Collins points out that we must not fool ourselves to create a false dichotomy between faith and science, as this is destructive for both. Throughout the history great Christian thinkers have had a non-literalist interpretation of Genesis, most notably St Augustine and St Thomas Aquinas. They argued that God had created the universe with a potential and did not interpret the six days of creation to be six 24-hour days.^{[67][68]} Augustine, just like Collins, warned Christians against speaking nonsense about science: "Usually, even a non-Christian knows something about the earth, the heavens, and the other elements of this world, about

the motion and orbit of the stars and even their size and relative positions, about the predictable eclipses of the sun and moon, the cycles of the years and the seasons, about the kinds of animals, shrubs, stones, and so forth, and this knowledge he holds to as being certain from reason and experience. Now, it is a disgraceful and dangerous thing for an infidel to hear a Christian, presumably giving the meaning of Holy Scripture, talking nonsense on these topics; and we should take all means to prevent such an embarrassing situation, in which people show up vast ignorance in a Christian and laugh it to scorn. The shame is not so much that an ignorant individual is derided, but that people outside the household of faith think our sacred writers held such opinions, and, to the great loss of those for whose salvation we toil, the writers of our Scripture are criticized and rejected as unlearned men. If they find a Christian mistaken in a field which they themselves know well and hear him maintaining his foolish opinions about our books, how are they going to believe those books in matters concerning the resurrection of the dead, the hope of eternal life, and the kingdom of heaven, when they think their pages are full of falsehoods and on facts which they themselves have learnt from experience and the light of reason? Reckless and incompetent expounders of Holy Scripture bring untold trouble and sorrow on their wiser brethren when they are caught in one of their mischievous false opinions and are taken to task by those who are not bound by the authority of our sacred books. For then, to defend their utterly foolish and obviously untrue statements, they will try to call upon Holy Scripture for proof and even recite from memory many passages which they think support their position, although they understand neither what they say nor the things about which they make assertion.”^[69]

Thus, a non-literalist view of Genesis is not a modern invention. Other interesting historical facts are that one of Darwin’s biggest contemporary supporters in the US was the conservative Christian botanist Asa Gray (1810-1888),^{[70][71]} and the Big Bang theory was proposed by the catholic priest George Lemaître in 1927.^[72] This conflicts with Hovind’s views, but shows that faith and reason can be in harmony. Galileo Galilei (1564-1642) puts it this way: “I do not feel obliged to believe that the same God who has endowed us with senses, reason and intellect has intended us to forego their use”.^[73] The modern creationist movement, on the other hand, is much younger and was founded by John C. Whitcomb and Henry Morris in the 1960s. Their 1961 book *The Genesis Flood* introduced many of the ideas of today’s creationist movement. Morris, also being the founder of the Institute for Creation

research, had a huge influence on Ken Ham,^[74] the president and founder of Answers in Genesis and arguably the most famous and influential contemporary creationist.

Let me end with these words by theologian Benjamin Warfield: “We must not, then, as Christians, assume an attitude of antagonism toward the truths of reason, or the truths of philosophy, or the truths of science, or the truths of history, or the truths of criticism. As children of the light, we must be careful to keep ourselves open to every ray of light. Let us, then, cultivate an attitude of courage as ever against the investigations of the day. None should be more zealous in them than we. None should be more quick to discern truth in every field, more hospitable to receive it, more loyal to follow it, whither soever it leads.”^[75]

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