

The Theory of Naturalism in Pre-Historic Science

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Keywords: Naturalism, Assumptions, Scientific Freedom

26 May 2022

1. Summary

The scientific investigation into the origin of the natural world, Origins Science, and pre-historic events in the natural world, Pre-Historic Science, is a vast and fascinating one. The volume of research into the fundamental question: ‘how did we/the universe come to exist?’ indicates that this is the most vexing question facing the human race.

The fundamental methodology of Pre-Historic/Origins Science is reviewed to see if there is any room for improvement that will enable progress towards describing reality as accurately as possible.

This review covers several areas and draws several conclusions. The first is that Pre-historic Science is different to Normal Science because most of the proposed unique past events have not and cannot be observed and conventional experiments cannot be conducted to replicate the proposed events. Second, this difference causes the assumption of naturalism to be unjustified in, and only in, Pre-Historic/Origins Science. Third, it is found that perfect scientific freedom requires the comparison of natural and supernatural pre-historic/origins theories so that we can discover the theory that explains the most and/or discover if any violations of the regularities of nature are contained in any of the theories. Fourthly, it is found that Pre-Historic/Origins Science will be improved by moving towards an interdisciplinary endeavour with Philosophy. And finally, it is found that pre-historic/origins theories will need to be published in journals specifically for Pre-Historic/Origins Science/Philosophy so that we have clarity to achieve the continuous improvement review cycle. With all of these elements in place I propose that we will progress towards the goal of Science and Philosophy, to describe reality as accurately as possible.

2. How does science work when experiments and observations cannot be conducted?

Sten Odenwald recently published a summary of the state of play regarding the origins of the universe and he concluded: “Of course, this entire story is highly speculative, even fanciful. It is based on theories or pieces of theories that remain largely unproven - or perhaps, one shudders to think, even unprovable. But our quest for the origin of the universe is a result of who we are as sentient beings.”¹

In classical science one would not expect the words “fanciful” or “unprovable” and in modern science used by Engineers and Medical Doctors, we definitely would not allow fanciful or unprovable theories to be used as it would endanger the lives of many people. And yet this type of wording is published by Odenwald as acceptable science. We humans are very clever at contextualising and as such we automatically note the context of this paper, the origin of the universe, and we all know it goes without saying that an origins theory can be fanciful without endangering us. And so, like we do in all areas of human life, if there are no severe consequences, then we allow behaviour to carry on. However, is this the best way forward or is there

¹ Odenwald, Sten., “Imagining Our Infant Universe”, *Astronomy*, April 2022.

an improvement available to us that can be applied to Pre-Historic Science to raise its standard well above ‘fanciful’ and ‘unprovable’?

The definition of science is associated with what is called the demarcation problem and normally observations and experiments are included as part of the process that achieves the goal of science, to progress towards describing reality as accurately as possible. Experiments and tests build the accuracy of the measurements that can be made during empirical observations. So if observation and experiment cannot be conducted it means we need to build the accuracy of descriptions some other way. This does not stop science, as the other fundamental characteristics of science remain in play. Generally these characteristics are considered to be: 1. Measurement of observations that are then written in a logically falsifiable manner. 2. Descriptions of regularities of nature are used to make predictions. And finally, 3, all science must be published for review by the scientific community who can verify or falsify the descriptions or at least note anomalies or inaccuracies such that there is a cycle of continuous improvement. This process is what enables descriptions to progress towards describing reality as accurately as possible, the goal of science.

The subset of science that encapsulates pre-historic events may be called Pre-Historic Science (of which origins events are a further subset) includes many proposed unique events that have never been observed and cannot be replicated in an experiment. (It is acknowledged that many philosophers and scientists refer to what they call Historical Science (Currie (2018), Mayr (2009), Turner (2009), Calvert (2018), Cleland (2011) . I prefer to use the term Pre-Historic Science because the proposed events are purported to have taken place before human observation, whereas History normally is a record of events made by a human observer. It is acknowledge that some already use the term ‘prehistoric sciences’, e.g. UISPP, L’Anthropologie and the Society for Archaeological Sciences, in an anthropology context.) There are other subsets of science where observations and experiments are limited, but I will only focus on the subset I prefer to label Pre-Historic Science.

So, without the option to observe a proposed past unique event or conduct an experiment to replicate the proposed event the scientist must base the proposal on how systems are observed to change over short time spans in the present and then theoretically reverse time. This is what Darwin did with *On the Origin of Species* and what Hawking did in *The Large Scale Structure of Space-Time*. This method, however, is extremely inductive and the problem of induction cannot be reduced by conducting observations and experiments. As a result scientists and philosophers make a variety of claims about what is and is not science or what difficulties arise in Pre-Historic Science.

James Gunn pointed out one of the differences, that we cannot repeat the proposed events, when he said: “Cosmology may look like a science, but it isn't a science... A basic tenet of science is that you can do repeatable experiments, and you can't do that in cosmology.”² However I do disagree with his conclusion, that Cosmology is not a science, because observations and simulations provide reliable knowledge, a basic tenet of science.

Michael Turner highlighted how the proposed events are in the past and unique when he said: “Cosmology is a reconstructive science, we are trying to put together the history.”³ I disagree that it is History in the traditional sense of the field, because the proposed events do not have written records by observers. This is why I prefer the term Pre-Historic Science. Otherwise I like the description he uses, “reconstructive science” because it conveys how we are just using the known regularities of nature to write a story about the past. In other words we are not trying to discover a new regularity of nature via experiments, nor are we using the regularities of nature to predict the future or conduct engineering or medicine. We are simply trying to describe the past, which is different to normal science. That is why it is reasonable to call it Pre-Historic Science.

² Gunn, James in Cho, A., “A Singular Conundrum: How Odd Is Our Universe?” *Science* 28 Sep 2007:Vol. 317, Issue 5846, pp. 1848-1850 DOI: 10.1126/science.317.5846.1848.

³ Turner, Michael S., video of Panel 1 at the Origins Symposium, Arizona State University, 3 April 2009. (<http://thesciencenetwork.org/programs/origins-symposium>).

Christopher Smeenk and George Ellis raised two key difficulties, that past events can have the characteristic of uniqueness and that the scale of the events is so large that it makes them impossible to repeat experimentally, they said: “Cosmology provokes questions about the limits of scientific explanation because it lacks many of the features that are present in other areas of physics... [Cosmology] lacks independent experimental probes of physics at the relevant scales. ...What can we mean by ‘laws’ for a unique object (the universe as a whole) or a unique event (its origin)?”⁴ The answer to their question is no we cannot have laws (i.e. that describe a regularity of nature that repeats) if we claim that a proposed event is unique. Similarly, unique events are proposed in Pre-Historic Biology, for example the formation of the first living cell. We say it is a unique event because we do not observe living cells spontaneously generating today. This aspect of Pre-Historic Science, describing unique events in the past, is a key characteristic of the field and one that clearly sets it apart from normal science.

Ijjas, Steinhardt and Loeb claim there is a severe affect when experiments cannot be conducted saying: “Inflationary cosmology, as we currently understand it, cannot be evaluated using the scientific method.”⁵ However I disagree with their claim because evaluation can take place by comparing theories and assessing how closely their simulated predictions match what we observe today. Such evaluation still produces reliable information.

Tim Maudlin raises an interesting point: “There are particular physical problems, problems of explanation, which arise in thinking about the entire universe, which don't arise when you consider only its smaller systems.”⁶ Maudlin notes that with the specific topic of the origin and early events of the *entire* universe, the problem is more than the events being of large scale. The problem is that we, the observers, are included in the universe. A normal scientific experiment would require us to be outside the universe so we can be objective observers, which is obviously impossible. However this does not pose an actual problem, because the proposed events are in the past and unique, then we cannot conduct an experiment anyway.

Stephen Hawking discovered a significant conundrum relating to origins, and described it this way: “One can regard a singularity as a point where the Einstein equations, and presumably the other presently known laws of physics, break down.”⁷ and “i.e. the theory no longer provides a correct description.”⁸ This conclusion deserves an extreme amount of attention and analysis. If one part of a theory points to a contradiction with another part of the theory then we need to work out a way to obtain reliable information from the situation.

Moving from Cosmology to Biology, Karl Popper outlines the situation this way: “...natural selection, is difficult to test. ...really severe tests of the theory of natural selection are hard to come by, much more so than tests of otherwise comparable theories in physics or chemistry.”⁹ He does not state why the natural selection events are difficult to test, but since extinction events do not repeat in the present because the particular species is no longer around, then it can be said of those events that they are difficult to test because they are unique past events than cannot be replicated in an experiment. So there are aspects of Biology that can be placed in the field of Pre-Historic Science and as such need a methodology other than experiments to obtain reliable information. As Ernst Mayr said: “Evolutionary biology, in contrast with physics and chemistry, is a historical science—the evolutionist attempts to explain events and processes that have already taken place. Laws and experiments are inappropriate techniques for the explication of such events

⁴ Smeenk, Christopher and George Ellis, "Philosophy of Cosmology", *The Stanford Encyclopedia of Philosophy* (26 Sep 2017), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2017/entries/cosmology/>

⁵ Ijjas, A., Steinhardt, P., Loeb A., “Pop goes the universe”, *Scientific American*, January 2017.

⁶ Andersen, R., quotations of Tim Maudlin in “What happened before the Big Bang? The new Philosophy of Cosmology”, *The Atlantic*, 19 January 2012.

⁷ Hawking, Stephen., Ellis, G., *The Large Scale Structure of Space-Time*, Cambridge University Press, Cambridge, 1973, p. 287.

⁸ Ibid p. 363.

⁹ Popper, Karl. “Natural Selection and the Emergence of Mind.” *Dialectica* Vol 32, Wiley, 1978, pp 32: 339-355. <http://www.jstor.org/stable/42970324>.

and processes.”¹⁰ Likewise Phil Skell pointed out that: “Darwinian evolution, whatever its other virtues, does not provide a fruitful heuristic in experimental biology.”¹¹

It is apparent then that there are aspects of Cosmology, Biology, Geology and Palaeontology that fall into the category of what can be summarised as descriptions of unique past events. Added to this is the fact that: “Historical targets tend to be at large spatial and temporal scales – not easily admitting of experimental treatments.”¹² The particular type of proposed event that is definitely different to normal science is the one that is seen as unique because the physical scale, time scale or complexity of the event prevents us replicating it in an experiment. This is what leads Adrian Currie to say: “It is commonly thought that historical investigation is not amenable to experiment: We cannot manufacture evidence about the deep past.”¹³

However, I technically disagree with such a generalisation because not that all Pre-Historic Science is difficult by virtue of being defined as pre-historic. Some proposed events can be replicated in experiments because the proposed event is of a small physical scale, and covers a short time scale and so we can replicate it in an experiment, like the chemical processes involved in fossilisation. So to be clear, it is only the proposed events that cannot be replicated in an experiment that are different to normal science. However, since most proposed pre-historic events fall in ‘cannot replicate’ category it practically makes sense to just simplify things and run with the generalisation that Pre-Historic Science is the study of proposed past events that are unique and cannot be replicated in an experiment.

Some have started to think about possible methodological adjustments to improve Pre-Historic Science. For example, Tim Maudlin, Philosopher of Physics at New York University, proposes that: “maybe there might be special sorts of laws, or special sorts of explanatory principles, that would apply uniquely to the initial state of the universe.”¹⁴ This is as good a starting point for improvement as any, but sadly he does not propose any actual new methodology. Also, if a proposal for a special new ‘law’/regularity of nature is made then the only way to show it is a ‘law’/regularity is to repeatedly show it is regular by experiment or multiple observations. But since the proposed event is unique and in the past then we cannot follow that process.

Brustein and Kupferman have also made a proposal regarding the origin of the universe: “Of course scientists cannot claim to know the definitive truth. But we can approach the question from a scientific viewpoint and see what we find out. How do we do that? First, we look to the data. Thanks to modern technology, we have much more information than did people of previous ages who asked the same question. Then we can use scientific methods and techniques to analyze the data, organize them in a coherent way and try and extract an answer.”¹⁵

This proposal is also a good start, but it is a little vague. If they specifically mean by “modern technology” that we now have powerful computers that can simulate the change over time of the universe then that is in fact what is being done. It is regularly done in Cosmology and Astrophysics and Nelson points out, “Mathematical models are widely used in modern evolutionary biology.”¹⁶

¹⁰ Mayr, E., Darwin's Influence on Modern Thought, *Scientific American*, 24 November 2009, (<https://www.scientificamerican.com/article/darwins-influence-on-modern-thought1/>).

¹¹ Skell, P., “Why Do We Invoke Darwin?”, *The Scientist*, 28 August 2005. (<https://www.the-scientist.com/opinion-old/why-do-we-invoke-darwin-48438>).

¹² Currie, A, *Rock, Bone, and Ruin: An Optimist's Guide to the Historical Sciences*. United Kingdom: MIT Press Limited, 2018, p. 229.

¹³ Currie, A, *Rock, Bone, and Ruin: An Optimist's Guide to the Historical Sciences*. United Kingdom: MIT Press Limited, 2018, p. 7.

¹⁴ Andersen, R., quotations of Tim Maudlin in “What happened before the Big Bang? The new Philosophy of Cosmology”, *The Atlantic*, 19 January 2012.

¹⁵ Brustein, R., Kupferman, J., “The Creation of the World-According to Science”, *History And Philosophy Of The Life Sciences*, 2012 (<https://arxiv.org/abs/1202.0623>).

¹⁶ Nelson, R., “The sciences are different and the differences matter”, *Research Policy* 45 (2016) 1692–1701. (<https://www.sciencedirect.com/science/article/pii/S0048733316300981>)

Modern computer models are very useful because they come close to satisfying the requirement of science, namely, observations and predictions. The first element, measurable observations, is partially satisfied because the computer model can be compared to observations in the present. (It is only partial because the proposed initial conditions and all subsequent modelled events/processes up to the present, are not observed.) They also come close to satisfying the second requirement, that theories of changing systems make predictions. A good pre-historic/origins theory will model the systems in the past and how the system changes over time. The model then will make a measurable prediction about what we should observe in the present. If the predictions of the model do not align with present day observations then the models initial conditions or processes are tweaked until it does align. It seems then that these types of models are similar to replication experiments, it's just that the 'experiment' is virtual, a mathematical model. As Adrian Currie says: "I do not think we should take experiments and simulations to be the same kind of activity, I argue that under certain circumstances simulations play explicitly experiment-like roles – and do so successfully."¹⁷

Apart from Maudlin, Brustein and Kupferman there is very little written about this intriguing situation in Pre-Historic Science. Why is this the case? Is there something deterring further deep critical analysis? Well, yes, in fact there is. In reviewing books and papers on Pre-Historic Science one finds an abundance of unsolved puzzles (see Appendix A for a list), one, for example, is the conclusion made by Dormand and Woolfson regarding solar nebula theories:

"Finally we may note that one difficulty common to all solar nebula theories concerns the rotation axis of the sun, which is at 7° to that of the system as a whole. It is not feasible that the rotation axis of the central body could be so inclined to that of the disk, or alternatively, that planets produced within the disk could systematically depart so much from its plane."¹⁸

Quite rightly they point out that the origins model does not predict the axial difference observed, thus the observation is actually falsifying the theory or at best telling us the theory needs improvement. There are many similar problems, see Appendix A, where our observations in the present do not match the predictions of the theory. With so many instances where proposed origins theories makes inaccurate predictions about what we should observe around us it is understandable that most are deterred from digging deeper into the situation. However, I am afraid of nothing, and so I embark on this review of the situation in the hope that improvement can be found. As Ijjas, Steinhardt and Loeb said regarding the origin of the universe: "Today we are fortunate to have sharp, fundamental questions imposed on us by observations. The fact that our leading ideas have not worked out is a historic opportunity for a theoretical breakthrough."¹⁹

3. Philosophical Motivation

The founders of modern Philosophy have paved the way for science to flourish by asking that we doubt everything and then investigate with perfect scientific freedom and great courage. René Descartes suggests that we should begin investigations by first doubting everything, he said:

"That whoever is searching after truth must, once in his life, doubt all things; insofar as this is possible."²⁰

¹⁷ Currie, A, *Rock, Bone, and Ruin: An Optimist's Guide to the Historical Sciences*. United Kingdom: MIT Press Limited, 2018, p. 25.

¹⁸ Dormand, John R., and Woolfson, M. M., *The Origin of the Solar System: The Capture Theory*, United Kingdom, E. Horwood, 1989, p. 48.

¹⁹ Ijjas, A., Steinhardt, P., Loeb A., "Pop goes the universe", *Scientific American*, January 2017.

²⁰ Descartes, René, *Principles of Philosophy*, Translated by Miller, V. and Miller, R., Huron College, University of Western Ontario, London, Ontario, Kluwer Academic Publishers, Holland, 1982. First published in Latin, in 1644, p. 3.

The Latin inscription on the Arms of the Royal Society of London effectively says this too, it says “Nullius in verba” and about it the Royal Society says:

“It is taken to mean ‘take nobody’s word for it.’ It is an expression of the determination of Fellows to withstand the domination of authority and to verify all statements by an appeal to facts determined by experiment.”²¹

In the context of Pre-Historic and Origins Science then, since we are going to embark on a critical review and carry out a new investigation, then we should doubt all origins theories, doubt all preconceived ideas and doubt all assumptions. Then from the position of doubt we shall follow the evidence where it leads. W. K. Clifford asks us to only place reliance on a scientific theory that has sufficient evidence and to not suppress doubts, he said:

“It has been judged wrong to believe on insufficient evidence, or to nourish belief by suppressing doubts and avoiding investigation.”²²

Therefore this investigation into the foundation of Pre-Historic and Origins Science must review all the assumptions, even those dearly held, as Bertrand Russell said:

“None of our beliefs are quite true; all have at least a penumbra of vagueness and error. The methods of increasing the degree of truth in our beliefs are well known; they consist in hearing all sides, trying to ascertain all the relevant facts, controlling our own bias by discussion with people who have the opposite bias, and cultivating a readiness to discard any hypothesis which has proved inadequate. These methods are practised in science, and have built up the body of scientific knowledge.”²³

Therefore we must “hear all sides” with perfect freedom, as Immanuel Kant said:

“For this enlightenment, however, nothing is required but freedom, and the freedom in question is the most innocuous form of all – freedom to make public use of one’s reason in all matters.”²⁴

However, perfect scientific freedom will be met with opposition, as John Stuart Mill points out:

“Unmeasured vituperation, employed on the side of the prevailing opinion really does deter people from professing contrary opinions and from listening to those who profess them.”²⁵

Epicurus encourages us to carry on with the investigation even if it is difficult, he said:

“The greater the difficulty, the more glory in surmounting it.”²⁶

And Kant encourages us with:

“The motto of enlightenment is therefore: Sapere aude! [Dare to be wise!] Have courage to use your own understanding!”²⁷

²¹ The Royal Society of London, (<https://royalsociety.org/about-us/history/>).

²² Clifford, William K., *The Ethics of Belief*, Read at the Grosvenor Hotel, London, 11 April 1876, p. 4.

²³ Russell, Bertrand, *Free Thought and Official Propaganda*, B. W. Huebsch, Inc., New York, 1922, p. 14. Delivered at the South Place Institute, London, 24 March 1922.

²⁴ Kant, Immanuel, *An Answer to the Question: What Is Enlightenment?*, Penguin Books Limited, 2013, Translated by H. B. Nisbet, Originally published in the *Berlin Monthly*, Dec 1784.

²⁵ Mill, John Stuart, *On Liberty*, Hackett Publishing Company, Inc., Indianapolis, 1978, p. 51. Originally published in 1859 in London.

²⁶ Epicurus, *The Sayings of Epicurus*, Messer, William, Bibliomundi E-book, 2021. Epicurus (341 – 270 BC).

²⁷ Kant, Immanuel, *An Answer to the Question: What Is Enlightenment?*, Penguin Books Limited, 2013, Translated by H. B. Nisbet, Originally published in the *Berlin Monthly*, Dec 1784.

Therefore the prerequisite for a critical review is to courageously doubt everything. This includes the foundational assumptions of the current methodology. Interestingly the fundamental question that comes to the forefront most often in a philosophical discussion about origins/pre-historic science is the metaphysical question regarding a supernatural being, i.e. does God exist? Philosophers have filled abundant pages for millennia discussing this question. Since this is the question most often asked then the associated assumptions regarding this question will be the first to be analysed and the key assumption to investigate is naturalism. Is naturalism assumed in Pre-Historic/Origins Science and if so, is it a justified assumption?

4. Is Naturalism Assumed in Pre-Historic/Origins Science?

The Royal Society states on their website that “Natural Knowledge” is the only knowledge they seek:

“We who have hereunto subscribed, do hereby promise, that we will endeavour to promote the good of the Royal Society of London for improving natural knowledge.”²⁸

With such a directive it is therefore logical that the origins research conducted by the Royal Society and published in the society journals is limited to natural origins theories.

A brief literature review of papers and books on Pre-Historic Science reveals the current position. The following statements were all made in the context of Pre-Historic or Origins Science. This context is of utmost importance!

“Scientific explanations do not appeal to supernatural entities such as gods or angels (fallen or not), or to non-natural forces (like miracles, karma, or Qi).”²⁹

“A methodological naturalist would insist on explaining all phenomena, however strange, in natural terms.”³⁰

“And this takes us to the heart of the matter. Most Darwinists see science as inherently committed to methodological naturalism; they argue that this approach is therefore not up for democratic debate. One does not have to accept methodological naturalism, but if one rejects it, then one is no longer viewing the world as a scientist... Within science proper they need to proceed as if only natural causes are operative.”³¹

“Science holds to naturalism... not allowing itself to appeal to miracles or other supernatural interventions.”³²

“Within science proper they need to proceed as if only natural causes are operative.”³³

“Could a hypothesis that makes reference to God be part of science? Science does not allow for this possibility.”³⁴

²⁸ Royal Society of London, (<https://royalsociety.org/fellows/elections/>).

²⁹ De Cruz, Helen, "Religion and Science", The Stanford Encyclopedia of Philosophy (Winter 2021 Edition), Edward N. Zalta (ed.), URL = <<https://plato.stanford.edu/archives/win2021/entries/religion-science/>>.

³⁰ Ruse, Michael, "Creationism", The Stanford Encyclopedia of Philosophy (Summer 2021 Edition), Edward N. Zalta (ed.), URL = <<https://plato.stanford.edu/archives/sum2021/entries/creationism/>>.

³¹ Menuge, A., Dembski, W., Ruse, M., *Debating Design: From Darwin to DNA*, Cambridge University Press, 2004, p. 44.

³² Pennock, R., Dembski, W., Ruse, M., *Debating Design: From Darwin to DNA*, Cambridge University Press, 2004, p. 134.

³³ Menuge, A., Dembski, W., Ruse, M., *Debating Design: From Darwin to DNA*, Cambridge University Press, 2004, p. 32.

³⁴ Ruse, M., Pennock, R., *Intelligent Design Creationism and Its Critics*, MIT Press, 2001, p. 371.

“Science is obliged to leave out any appeal to the supernatural.”³⁵

“Scientific theories are therefore explanations about aspects of nature without reference to God. This means they are natural, and we call this context methodological naturalism.”³⁶

“Invoking the hand of God to explain natural phenomena breaks the rules of science.”³⁷

“Supernatural explanations are not part of science.”³⁸

“We cannot allow a divine foot in the door.”³⁹

“In science, explanations must be based on naturally occurring phenomena.”⁴⁰

The context of these statements is extremely important because they are all made in the context of Pre-Historic/Origins Science. Interestingly none of the statements include the words Pre-Historic or Origins, but the context (the titles of the references give most of the context) is indeed Pre-Historic/Origins Science. Along with this lack of clarity, the other shortcoming of these references is that they do not analyse if there are critical assumptions in their statements or if there are any unjustified assumptions present in the current practice of Pre-Historic Science. They also do not analyse if Pre-Historic Science is different to or the same as Normal Science. So, firstly, it is clear that naturalism is assumed in Pre-Historic/Origins Science, based on the above statements. Secondly, regarding justification, none of the statements have an associated justification for the assumption, the whole topic is studiously ignored.

Of possibly greater importance regarding these statements is that the scientists use the terms miracle, supernatural, God and divine foot without providing a definition of the term or how the term should relate to science or Pre-Historic/Origins Science/Philosophy. Understandably it is an extremely difficult and complex task to define such terms, but these scientists should have defined the terms they use, especially since they are not generally accepted or commonly used terms in science. I acknowledge that I am not qualified to provide definitions as an expert either and so I hope the reader refers to expert Philosophers on this topic. However it seems that the approach I take in this paper most aligns with Hume:

“David Hume (Hume 1748/2000; cf. Voltaire 1764/1901: 272) famously defined a miracle as “a violation of the laws of nature,” and this definition has been the focus of lively discussion ever since.”⁴¹

As stated earlier, a key characteristic of science is that it describes the regularities observed in nature. Therefore by definition when an observation is made that is contrary to a regularity of nature, like a metal axe head floating in water, then the event is called a miracle or supernatural. Of course such events are not repeatable, so they fall outside the definition of normal science. On the other hand when events are experimentally repeated regularly or accurately predicted to occur using a theory the events become a regularity in nature and are no longer supernatural by definition.

³⁵ Haught, J., Dembski, W., Ruse, M., *Debating Design: From Darwin to DNA*, Cambridge University Press, 2004, p. 231.

³⁶ Staver, John R., *Evolution & Intelligent Design*, *The Science Teacher*, Vol. 70, No. 8, November 2003, p. 34.

³⁷ Fields, H. “Dinosaur Shocker”, *Smithsonian Magazine*, May 2006. (<https://www.smithsonianmag.com/science-nature/dinosaur-shocker-115306469/>)

³⁸ Jones, John E., Tammy KITZMILLER, et al., Plaintiffs, v. DOVER AREA SCHOOL DISTRICT, et al., Defendants. No. 04cv2688. United States District Court, M.D. Pennsylvania. December 20, 2005. MEMORANDUM OPINION, JONES, District Judge.

³⁹ Lewontin, Richard C., Billions and Billions of Demons (review of *The Demon-Haunted World: Science as a Candle in the Dark* by Carl Sagan, 1997), *The New York Review of Books*, p. 31, 9 January 1997.

⁴⁰ National Academy of Science, *Science, Evolution, and Creationism*, The National Academies Press, 2008, p.10.

⁴¹ McGrew, Timothy, “Miracles”, *The Stanford Encyclopedia of Philosophy* (Spring 2019 Edition), Edward N. Zalta (ed.), (<https://plato.stanford.edu/archives/spr2019/entries/miracles>).

However, in the field of Pre-Historic/Origins Science many unique events are proposed. For example, the first atom forming, the first star forming, the first living organism forming. Interestingly by defining the event as unique then the event cannot be defined as a regularity of nature, not in the way we currently define and observe the current regularities in nature. It follows then that the cause of a unique past event can be brought into question, was the cause a regularity of nature or was the cause supernatural? Both options should be included in the analysis of proposed unique past events. The fact is that when we cannot conduct observations of proposed unique past events then we do not know for sure if the event was regular or irregular, i.e. if its cause was natural or supernatural. With no experiment/observation available to show the event to be one or the other we simply just need to allow both supernatural (irregular) and natural (regular) origins theories to be compared in Pre-Historic/Origins Science to see which one explains the most.

One way of managing this is with clear definitions, like David Hume has done for us. To expand, and dig a little deeper then, one could say that if a proposed origins event can theoretically (or in a computer model) be shown to be the result of known regularities (laws) of nature then that origins event/process is natural by definition. However, if a proposed origins event theoretically has an initial state or proposed processes that violate a regularity in nature, then we need to acknowledge that such an event may have a supernatural cause and as such we would be wise to leave that option open until it can be shown otherwise. This is not to say that this is the only way to define and manage the supernatural in, and only in, Pre-Historic Science, this is just a proposed concept that can now be debated by the scientific community.

To be clear, I am not proposing any changes to Normal Science. Richard Lewontin says of naturalism that it is "...an a priori adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations..."⁴²

Note how Lewontin uses the Latin based term "a priori" which literally translates as "from the previous". What he is referring to is the fact that centuries of 'previous/ a priori' observations of events occurring at the time and centuries of repeatable experiments have shown that naturalism is a justified assumption when describing the regularities of nature we observe today. The theories that describe the regularities in nature are reliable and when tested there is no interference by a supernatural being. We take it for granted that chairs, light switches and gravity always work. On the contrary, it makes sense that, for example, nuclear scientists do not say that a supernatural being is going to make their reactor operate safely. That would endanger the lives of many people because any such (hypothetical) supernatural theory of nuclear physics has not been shown to be repeatedly reliable or regular via a method of testing predictions. Whereas it is the repeatability of the regularities of nature that enables us to build things like nuclear reactors with confidence in how they will operate. As Eugenie Scott says regarding the supernatural:

"In experimental research an omnipotent deity cannot be 'controlled'."⁴³

Therefore, in Normal Science the assumption of naturalism is completely justified. It has been so well established that it does not even get listed as an assumption in science papers along with the other assumptions. It is so justified that it is not even mentioned and this practice is accepted and even expected by the scientific community.

Note however that Scott refers to experimental science, but Pre-Historic Science is different, most of it proposes unique past events that cannot be repeated in an experiment. Therefore it can be concluded naturalism is actually an outcome of experiment and observation, not a fundamental characteristic or overarching principle of science, if science is defined as including pre-historic/origins events that are unique past events that cannot be repeated in an experiment.

⁴² Lewontin, Richard C. Billions and Billions of Demons (review of *The Demon-Haunted World: Science as a Candle in the Dark* by Carl Sagan, 1997), *The New York Review of Books*, p. 31, 9 January 1997.

⁴³ Scott, E., Gross, P., Levitt N., Lewis M., *The Flight from Science and Reason*, New York Academy of Sciences, 1996, p. 518.

Therefore in Pre-Historic Science naturalism needs to be analysed on a case by case basis. Each theory should be assessed regarding the observations we have in the present and on what types of past processes are proposed in the theory. Such analysis may well show that natural processes are clearly all that was involved, but it also might show areas of uncertainty. Thus theories with some uncertainty should be clear on all points where naturalism is assumed.

Further, if a theory proposes events that we cannot replicate in an experiment, then we do not have naturalism as an outcome of the experiment like we do in normal science. Therefore, we are not justified in blankly ruling out the possibility of a supernatural intervention in the past. These types of theories of course will continue to receive critical analysis. This new type of investigation is not based on experiments but rather it is based on comparing theories to see which one explains more of what we observe around us and analyse if any proposed past processes contain a violation of a regularity of nature. This will be difficult, but for now we just need to acknowledge that the assumption of naturalism in Pre-Historic/Origins science is not justified and adjust our scientific methodology accordingly. One foundation of science that will help build this new methodology is scientific freedom.

5. Scientific Freedom and Pre-Historic/Origins Science

Betini, Avgar and Fryxell remind us of a barrier to science that Platt, Chamberlin and Bacon wrote about in their time:

“Chamberlin was concerned with the tendency of some scientists to put more weight on evidence that supports favoured ideas more than other evidence that is available, which is today known as confirmation bias.”⁴⁴

Naturalism is an extremely important achievement of the scientific revolution and as such must remain the overarching principle in Normal Science. However, since it has been shown that Pre-Historic/Origins Science is different then maybe it is because of confirmation bias that Naturalism is still applied. Either way we need to take a step back, doubt everything and review the assumptions in Pre-Historic/Origins Science. Eugenie Scott (while expressing her opinion of creationists) expresses what scientific freedom should look like when all confirmation bias is removed. It is a picture of simply allowing competing and opposing theories and data to be carefully and exhaustively compared. She says: “They seek out only the data that is compatible with their view, which is why, even though what they do looks like science it isn’t actually a legitimate form of science.”⁴⁵ In other words when any field of science excludes data based on an unjustified assumption then that field needs improving to bring it back in line with the required characteristics of science.

Scott’s advice is that we should investigate all the data. Therefore at the heart of the origins question ‘how did we/the universe come to exist?’ is the issue of perfect scientific freedom. The American Association for the Advancement of Science (AAAS) released a statement about freedom of inquiry in science in 2017 and part of it states:

“Scientific freedom is the freedom to engage in scientific inquiry, pursue and apply knowledge, and communicate openly.”⁴⁶

The AAAS statement from 1937 has more detail and directly addresses the problem of dogma, it says:

⁴⁴ Betini, G.S., Avgar T., Fryxell J.M., “Why are we not evaluating multiple competing hypotheses in ecology and evolution?”, *Royal Society Open Science*, 5 December 2016.

⁴⁵ Scott, E. “Reason and Creationism” presentation at the Global Atheist Convention, 13 April 2012.

⁴⁶ AAAS Statement on Scientific Freedom and Responsibility. *Science*, 27 Oct 2017:Vol. 358, Issue 6362, pp. 462 DOI: 10.1126/science.358.6362.462-b (<https://science.sciencemag.org/content/358/6362/462.2>).

“The American Society of Naturalists observes with regret an increasing tendency in certain parts of the world to require of investigators the conformity of their research to officially prescribed doctrines. This society wishes to emphasize that intellectual progress is compatible only with perfect freedom in the conduct of investigation and in the announcement both of results and of conclusions based upon those results. Attention is called also to the fact that the scientific world can place no reliance upon reports of research carried on under conditions which limit its freedom by an enforced agreement with any preconceived views or dogmas.”⁴⁷

Taking the 1937 statement at face value we must conclude that perfect scientific freedom is our goal and the way to achieve that is to weed out all forms of dogma.

Is Methodological Naturalism dogma? It has been shown earlier that in Normal Science naturalism is a justified assumption and that in Pre-Historic/Origins Science it is not justified. Therefore it can be argued that Methodological Naturalism applied in Pre-Historic/Origins Science is done so as dogma. Very few scientists have analysed this situation, refer to the Bibliography.

John Calvert analysed if naturalism is a justified assumption in Origins Science and concluded:

“modern Origins Science is dogmatic, not objective.”⁴⁸

He placed the cause on the ‘orthodoxy’ of Methodological Naturalism, he says:

“There are at least three reasons modern origins science is not in fact objective: (1) its investigation and explanations are determined by the orthodoxy of Methodological Naturalism and not by an objective weighing of the relevant evidence, (2) due to the orthodoxy, it violates the logic necessary for the conduct of the historical science it is, and (3) because the use and the effect of the use of the orthodoxy is generally concealed.”⁴⁹

By calling it an orthodoxy, Calvert is effectively saying exactly what the AAAS warns against, “enforced agreement with any preconceived views or dogmas”. Timothy Williamson addressed the question and concluded that: “Naturalism as dogma is one more enemy of the scientific spirit.”⁵⁰

The scientific spirit is, of course, perfect scientific freedom. How might this be framed in Pre-Historic/Origins Science? To start with the pursuit of freedom means that all origins theories are worthy of investigation. Otherwise, if all supernatural origins theories are excluded with no scientific investigation then naturalism is just dogma and if all natural origins theories are excluded with no scientific investigation then supernaturalism is just dogma. It is the aim of science to avoid dogma, and so all origins theories need to be compared and scientifically analysed to see which one explains more of what we observe or to see if any violate a regularity of nature.

Since we want confidence in our answer to the question ‘how did we/the universe come to exist?’ then we need to ensure dogma is removed. The new best practice and overarching principle in Origins Science should no longer be Methodological Naturalism but rather, as Robert Delfino says, it should be:

⁴⁷ Scientific Freedom. *Nature* 139, 185 (1937). <https://doi.org/10.1038/139185b0>
(<https://www.nature.com/articles/139185b0>).

⁴⁸ Calvert, John H. “The Absence of Religious Neutrality in K-12 Public Science Education” *Liberty University Law Review* Vol 12:571, 2018, p. 645. (https://digitalcommons.liberty.edu/lu_law_review/vol12/iss3/4/).

⁴⁹ *Ibid*, p. 592.

⁵⁰ Williamson, T. “What Is Naturalism?” *New York Times*, 4 September 2011.
(<https://opinionator.blogs.nytimes.com/2011/09/04/what-is-naturalism/>).

“Methodological Neutralism...[where] scientists should simply search for causes without setting any a priori conditions on what ontological status those causes must have.”⁵¹

To be clear, such a principle of methodological neutralism, is to only be applied in Pre-Historic Science. This new freedom in Pre-Historic/Origins Science will ensure careful, honest, thorough inquiry into all natural and supernatural origins theories and will enable the goal of science to be achieved, to describe reality as accurately as possible.

Massimo Pigliucci touched on an example of one small aspect of the debate when he said: “physicalism is the idea that everything that exists is made of matter, and clearly numbers, moral values and thoughts don’t fall into that category.”⁵² However he is not actually talking about the validity of supernatural origins theories here, but since there are so few published statements about Pre-Historic/Origins Science being different to Normal Science, then this peripheral reference is noted. It is also a good example of some of the other issues facing philosophical debates about physicalism. This is why we will be better off with more interdisciplinary papers combining Pre-Historic Science and Philosophy, because these issues are extremely complex.

There are a myriad of examples of the debate that could be referenced in the ‘unscientific’ literature, but sadly the debate is ignored in scientific literature. Sean Carroll admits:

“debates continue between naturalism and spiritual or religious or dualistic worldviews, and those debates are worth having.”⁵³

Sean Carroll is correct, the debate between natural and supernatural origins theories is “worth having”. What must be recognized though is that the only way the debate can produce reliable knowledge is if the debate is conducted in accordance with AAAS perfect scientific freedom and officially reported in scientific journals, otherwise the debate is worthless because it is not peer reviewed by the scientific community. This review process is a required characteristic of science.

Currently the debate is not being conducted in the scientific literature, but with acknowledgement that Pre-Historic/Origins Science is different we will be able to move towards a scenario where both natural and supernatural origins theories can be debated and compared in science journals. Papers regarding such comparisons will enable the debate to take place with peer review by the scientific and philosophical community. Then Pre-Historic/Origins Science can progress towards describing reality as accurately as possible.

Debate and comparison of competing theories is a common scientific practice and is encouraged. Betini, Avgar and Fryxell say:

“The use of multiple working hypotheses to gain strong inference is widely promoted as a means to enhance the effectiveness of scientific investigation... first developed by Chamberlin in 1890, who believed that scientists usually ‘fall in love’ with their favourite hypothesis, leading to the unfortunate practice of trying to fit all evidence into a single explanation instead of finding genuine explanations for the phenomenon they study. The solution, according to Chamberlin, is to cultivate the habit of developing and comparing alternative hypotheses to explain any phenomenon observed... One useful antidote to perceptual bias is to work directly with other scientists with different perspectives. The results of such collaboration could yield a more even-handed, informative, and constructive contribution

⁵¹ Delfino, Robert A. “Scientific Naturalism and the Need for a Neutral Metaphysical Framework” in *Science and Faith within Reason: Reality, Creation, Life and Design*, ed. by Jaume Navarro (Surrey, England: Ashgate, 2011), p. 47.

⁵² Pigliucci, Massimo, “Stephen Law on humanism and naturalism”, *Scientia Salon*, 19 September 2014. (<https://scientiasalon.wordpress.com/2014/09/19/stephen-law-on-humanism-and-naturalism/>).

⁵³ Carroll, Sean, (<https://www.preposterousuniverse.com/naturalism2012/>).

to the literature than either side is likely or able to contribute on their own. Debate among researchers with different points of view is crucial for the development of any scientific field.”⁵⁴

Therefore the only way to enable scientists with different perspectives to collaborate in Pre-Historic/Origins Science is to enable all perspectives an opportunity to publish. Comparing competing theories was also a key element of Karl Popper’s falsifiability method. “Popper stresses that we ascertain whether one theory is better than another by deductively testing both theories.”⁵⁵

6. A New Methodology for Pre-Historic/Origins Science

As shown earlier the current methodology for Pre-Historic/Origins Science is already slightly different to Normal Science. Because proposed events have not been observed and cannot be replicated in an experiment simulations and computer models are used. The present/modern era observations of changing systems are then used to create theoretical models with time reversed. Those models are then used to propose events in the pre-historic past. The models are also used with time running forwards to simulate changing systems from their origin, through the pre-historic past and then to the present day. The predictions of these models regarding what we should observe in the present, are compared with what we actually observe now. As such, the models can be considered virtual experiments. This process satisfies the goal to move towards precision of the observation-theory match.

Interestingly there are instances where proposed origins theories make inaccurate predictions about what we should observe around us, for example:

“The presence of such fully evolved galaxies so early in the life of the cosmos is hard to explain and has been a major puzzle to astronomers studying how galaxies form and evolve.”⁵⁶

However, the new methodology where the assumption of naturalism is removed (because it is unjustified in Pre-Historic Science), allows a new set of alternative theories to be compared and could lead to a completely new set of theories that match observation far better than the current set of theories.

The other benefit of removing the assumption of naturalism is that it enables us to avoid the problem of dogma. We will have perfect scientific freedom when we compare both natural and supernatural theories with each other to determine which ones explain more of present day observations and reveal the theories that violate a regularity of nature. This satisfies the requirement for collaboration of scientists with different perspectives and enables an element of falsifiability. As Karl Popper said: “In so far as a scientific statement speaks about reality, it must be falsifiable.”⁵⁷ And in the context of Astrophysics, Avi Loeb of the Center for Astrophysics at Harvard University said: “Falsifiability should be a hallmark of any scientific theory.”⁵⁸

Within the current methodology naturalism is adhered to dogmatically which renders it unfalsifiable. As shown earlier, in Pre-Historic Science the assumption of naturalism is unjustified and as per normal scientific practice a shadow of doubt is cast on any theory that has an unjustified assumption at its foundation. To remove this doubt and move towards a reliable description of reality the new methodology must allow comparison of both natural and supernatural origins theories. I suggest this can be known as The Theory of Naturalism in Pre-Historic Science.

⁵⁴ Betini, G.S., Avgar T., Fryxell J.M., “Why are we not evaluating multiple competing hypotheses in ecology and evolution?”, *Royal Society Open Science*, 5 December 2016.

⁵⁵ Stanford Encyclopedia of Philosophy, Karl Popper, 7 August 2018.

⁵⁶ “Old Galaxies Stick Together in the Young Universe”, *Science Daily*, 4 April 2008.

⁵⁷ Popper, Karl. *The Logic of Scientific Discovery*, (London: Routledge, 2002) p. 316. (First published 1959).

⁵⁸ Loeb, Avi. As quoted in “What Happened Before the Big Bang?” *Center for Astrophysics* Release No.: 2019-10. (<https://www.cfa.harvard.edu/news/2019-10>).

The advantage of this is that the predictive success of any proposed origins theory that includes supernatural interventions can be compared to the predictive success of the competing natural models. The model with the best observation-theory match is the one that is progressing towards describing reality as accurately as possible, the goal of science and philosophy.

This review of Pre-Historic/Origins Science reveals a problem for all current natural and supernatural origins theories. The supernatural origins theories have not been reviewed in science journals, so we can have no confidence in them and the natural origins theories conform to the dogma of naturalism and so we can have no confidence in them either. To rebuild our confidence we will need to remove dogma and openly compare natural and supernatural origins theories so that we can find the theory that best matches observations in the present. Fourthly, with comparison of natural and supernatural origins theories, we need to progress towards the field being more of an interdisciplinary endeavour between Science and Philosophy.

This brings us to the final requirement of science, publishing. One could argue that the required change in publishing is small. It is already a standard expectation that science papers state the assumptions and the justification for those assumptions. This seems simple enough, but the ramifications are significant because now the theories will include philosophical analysis of metaphysical existence in combination with analysis of proposed violations of the regularities in nature.

Is it reasonable to expect science journals to accommodate these changes? One recent example is when the journal *PLOS ONE* published an article with the statements “design by the Creator” and “the Creator’s invention” the response from the scientific community was enough that *PLOS ONE* “decided to retract the article.”⁵⁹

A literature review reveals that it is extremely rare for a paper to analyse supernatural origins theories. In Pre-Historic Science we are not actually searching for regularities in nature that can be applied in daily life, engineering and medicine. The goal is significantly different, it is not predictive, rather it is just explaining how past events formed what we observe today. In that context we can compare natural and supernatural origins theories and see if any proposals violate a regularity of nature. This is opposite of normal science which looks for and verifies the existence of regularities in nature. Therefore, it is unreasonable to expect the current journals to publish these new types of papers. As such we will require new journals to be published that are specifically for Pre-Historic/Origins Science/Philosophy. This will enable the scientific debate, perfect scientific freedom and continuous improvement.

7. Discussion

7.1 Precedent

There is a precedent in Pre-Historic/Origins Science where competing natural and supernatural origins theories were compared with each other, in *On the Origin of Species by Means of Natural Selection* by Charles Darwin. Darwin includes analysis and comparison of competing natural and supernatural origins theories. Darwin correctly allowed each theory to be falsifiable and does not dogmatically insist on naturalism. He just compared how much of what we observe around us is explained by each theory and allowed the one with the best observation-theory match to be the one that more accurately describes reality.

The following quotes are examples of Darwin comparing the competing natural and supernatural origins theories of his time. These are quoted from the 5th edition published in 1869.

⁵⁹ Cressey, D. “Paper that says human hand was ‘designed by Creator’ sparks concern” *Nature*, 3 March 2016. (<https://www.nature.com/news/paper-that-says-human-hand-was-designed-by-creator-sparks-concern-1.19499>).

“The great majority of naturalists have believed that species were immutable productions and have been separately created.” (Preface, p. v)

“Let us now see whether the several facts and rules relating to the geological succession of organic beings, better accord with the common view of the immutability of species, or with that of their slow and gradual modification, through descent and natural selection.” (p. 273)

“In the following remarks I shall not confine myself to the mere question of dispersal; but shall consider some other facts, which bear on the truth of the two theories of independent creation and of descent with modification.” (p. 339)

“How inexplicable on the theory of creation is the occasional appearance of stripes on the shoulder and legs of the several species of the horse-genus and in their hybrids!” (p. 411)

“Why, it may be asked, have nearly all the most eminent living naturalists and geologists rejected this view of the [im]mutability of species? It cannot be asserted that organic beings in a state of nature are subject to no variation; it cannot be proved that the amount of variation in the course of long ages is a limited quantity.” (p. 417)

As it can be seen then, Darwin compared the competing natural and supernatural origins theories of his time and showed which one explains more of what we observe around us. Darwin thus provides us with a precedent for the new methodology in Pre-Historic/Origins Science.

7.2 Potential Concerns

7.2.1 Testable predictions are key to science because it is a process that can show if a theory is reliable or not. In Pre-Historic/Origins Science predictions are made regarding what we should observe in the present. For example, Darwin predicted we should find a “finely graduated organic chain” (p. 246) in the geological record.

Some claim that supernatural origins theories do not make predictions of what we should observe in the present. For example, the AAAS states in their Resolution on Intelligent Design Theory that “the ID movement has not proposed a scientific means of testing its claims.”⁶⁰

Similarly the *Nature Methods* article titled An Intelligently Designed Response claims that “[ID] does not generate testable hypotheses.” However in the same article they say “[ID] postulates that some features in nature are too complex to have evolved.”⁶¹

This statement reveals that the authors are actually contradicting themselves because such a postulation is a testable hypothesis. Darwin said so himself: “If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down.”⁶²

⁶⁰ AAAS Board Resolution on Intelligent Design Theory, 1 July 2013. (<https://www.aaas.org/news/aaas-board-resolution-intelligent-design-theory>).

⁶¹ “An Intelligently Designed Response”, *Nature Methods*, Dec 2007, DOI <https://doi.org/10.1038/nmeth1207-983>, (<https://www.nature.com/articles/nmeth1207-983>).

⁶² Darwin, C. *On the Origin of Species by Means of Natural Selection 5th Edition*, 1869 p. 169.

Another contradiction is also presented in the Understanding Science website hosted by Berkeley University where they say: “Intelligent Design is untestable.” Then in the next sentence they say “ID proponents have made testable claims.”⁶³

So it appears there is some confusion regarding the predictions of supernatural origins theories. This is not surprising because until now such theories have not been published in science journals, thus they have missed the key element of science, review by the scientific community. The proposed new journals specifically for Pre-Historic/Origins Science will improve this situation.

However, there are some examples of testable predictions made by supernatural origins theories. One is in the paper by Alex Williams in the *Journal of Creation* titled “What Life Isn’t” and he concludes that “Water sets a threshold for cellular origin that excludes all scenarios other than Genesis-style fiat creation!”⁶⁴ In other words his prediction is that we will not observe in the present living organisms spontaneously generating from non-living matter. This prediction is actually being tested every day in labs conducting abiogenesis experiments with multi-million dollar budgets. So Alex Williams has indeed made a testable and falsifiable prediction based on a supernatural origins theory.

Another example of a testable prediction is in the paper by John Woodmorappe in the *Journal of Creation* titled “The Cambrian Explosion in Colorful, Zoological Context” and he concludes that “Special creation remains the most parsimonious explanation for the Cambrian explosion.”⁶⁵ In other words his prediction is that we will not find a finely graduated organic chain in the Pre-Cambrian strata. This prediction has been and will continue to be tested every time a Pre-Cambrian dig takes place. So John Woodmorappe has indeed made a testable and falsifiable prediction based on a supernatural origins theory.

There are many other claimed testable predictions made by supernaturalists and they should be analysed and published in a Pre-Historic/Origins Science journal. Only then will we find the theory that explains more observations than the others and progress towards describing reality as accurately as possible.

7.2.2 Will introducing careful analysis of supernatural origins explanations cause further scientific inquiry to be cut off? Alvin Plantinga suggests, “Ascribing something to the direct action of God tends to cut off further inquiry.”⁶⁶

In normal science Plantinga’s opinion is absolutely correct. Observations and experiments, conducted over centuries now, have found regularities in nature. These do not contain ad-hoc or irregular elements or supernatural interventions. However in Pre-Historic/Origins Science it is different, yes Plantinga’s wisdom should be taken into account so that we proceed with caution, but as shown earlier, the assumption of naturalism is unjustified. Rather the competing natural and supernatural origins theories are compared with each other so further inquiry is not “cut off” but rather the inquiry is extended. If managed well we can ensure further inquiry always continues so that we avoid the danger Plantinga warns us of.

The real danger to science is exclusion of theories without great care. Inclusion of competing theories enables science to take place, whereas exclusion of a theory based on an unjustified assumption is what causes science to be ‘cut off’. Briefly looking at key historical scientists who proposed competing theories to the supernatural explanations of their day, like Copernicus, Galileo and Darwin it can be seen that they refused to accept the lack of competing theories. Rather, these scientists pursued their goal to propose a competing theory so that science would progress. They were inhibited, but it was not because the competing theory was

⁶³ Understanding Science: Intelligent Design, Is it Scientific?
(https://undsci.berkeley.edu/article/0_0_0/id_checklist).

⁶⁴ Williams, A., “What Life Isn’t”, *Journal of Creation* 29(1) 2015.

⁶⁵ Woodmorappe, J., “The Cambrian Explosion In Colorful, Zoological Context”, *Journal of Creation* 27(3):37–40, December 2013. (<https://creation.com/cambrian-explosion-and-animal-biodiversity>).

⁶⁶ Plantinga, A. “Methodological Naturalism?”, *Perspectives on Science and Christian Faith* 49 (September 1997): 143-154.

supernatural, rather it was because people (the church leaders mostly) attempted to exclude their theory by application of an unjustified assumption. If we are to learn from history then we need to realise that if we, today, exclude a theory from careful analysis and honest, thorough inquiry, then that act of exclusion is what inhibits scientific progress. Thus to allow Pre-Historic/Origins Science to flourish we need to carefully include all theories in our analysis so that the theory that explains the observations around us can be discovered and reports of the results can be published and reviewed by the scientific community.

- 7.2.3 Another common assertion is “You can’t put God in a test tube.”⁶⁷ However in Origins Science it is necessary to find a way to achieve this to some approximation because it is equally as difficult to put nothing in a test tube so as to test the natural coming from nothing. However just because both theories are difficult to analyse does not mean we give up, rather it should spur us on to even more vigilant analysis, because in science we must find the cause, as Albert Einstein said: “All natural science is based upon the hypothesis of the complete causal connection of all events.”⁶⁸

So too in Origins Science we should search for the cause(s) that make things originate. It does not matter if the cause is ‘nothing’ (which can be said to be immaterial, unphysical or unnatural) or supernatural, both sets of causes are unnatural. In Pre-Historic/Origins Science all proposed theories can be examined to see which theory explains more observations and to see which theory contains violations of the regularities of nature. As such we will be able to ‘put God in a test tube’ and actually put supernatural origins theories to the test and falsify them.

Therefore origins scientists can theorize differently and look for irregularities. Of course any irregularities will be completely useless in engineering, medicine and applied science, but they will be extremely useful in answering the question ‘how did we/the universe come to exist?’

- 7.2.4 In science there is a general process that moves towards a precise observation-theory match. In his famous descriptions of “normal science” Thomas Kuhn makes this clear, he says: “Determination of significant fact, matching of facts with theory, and articulation of theory—exhaust, I think, the literature of normal science.” And: “Normal science leads to a detail of information and to a precision of the observation-theory match that could be achieved in no other way.”⁶⁹ In other words in science the main and general feature is puzzle solving and progress towards being able to make predictions that precisely match observations.

It is possible that this is not the current state of affairs in Pre-Historic/Origins Science. Further analysis is required, but there are multiple predictions made by origins theories and computer models that do not match our observations, see Appendix A. Is it reasonable to view these as anomalies? Maybe we can take note of Kuhn’s statement that: “Failure of existing rules is the prelude to a search for new ones.”⁷⁰ And note his ideas regarding paradigm shifts, like when he says: “It demands large-scale paradigm destruction and major shifts in the problems and techniques of normal science.”⁷¹

It is also possible that origins/pre-historic science is still in the pre-paradigm phase, which means that new alternatives are allowed to be proposed, as Kuhn says: “...invention of alternates is just what scientists seldom undertake except during the pre-paradigm stage of their science’s development...”⁷²

⁶⁷ Scott, E., *Evolution Vs. Creationism: An Introduction*, University of California Press, Berkeley, 2004, p. 50.

⁶⁸ Einstein, Albert, “On Boltzmann’s Principle and Some Immediate Consequences Thereof”, Zürich Physical Society Lecture, 2 November 1910, translated by Duplantier B. and Parks E, reprinted in *Einstein, 1905-2005*, Birkhäuser Verlag, Basel – Boston – Berlin, 2006.

⁶⁹ Kuhn, Thomas. *The Structure of Scientific Revolutions 3rd Edition*, Chicago: University of Chicago Press, 1996. p. 34 and p. 65. (First published 1962)

⁷⁰ *Ibid*, p. 68.

⁷¹ *Ibid*, p. 68.

⁷² *Ibid*, p. 76.

It is problematic to claim that when sufficient anomalies have accumulated, scientists should hunt for a new paradigm, so this concept needs more analysis, but it is mentioned here because Kuhn's ideas are helpful as we review current methodologies and debate potential improvements to science.

8. Conclusion

How did we/the universe come to exist? Answering this question with confidence is currently very difficult as can be seen in some of the problems presented in the literature, see Appendix A. These justify the above review of the current methodology in Pre-Historic Science. Interestingly it is found that there is in fact opportunity for improvement and this can be achieved by doing the following: 1. We need to acknowledge that Pre-historic Science is different to Normal Science because most of the proposed unique past events have not and cannot be observed and conventional experiments cannot be conducted to replicate the proposed events. 2. We need to acknowledge that this difference causes the assumption of naturalism to be unjustified in, and only in, Pre-Historic/Origins Science. 3. We need to acknowledge that perfect scientific freedom requires the comparison of natural and supernatural pre-historic/origins theories so that we can discover the theory that explains the most and/or discover if any violations of the regularities of nature are contained in any of the theories. 4. This new methodology will be best managed as an interdisciplinary endeavour between Science and Philosophy. And 5. The scientific and philosophical work will need to be published in journals specifically for Pre-Historic/Origins Science/Philosophy so that we have clarity to achieve the continuous improvement review cycle. With all of these elements in place we will progress towards the goal of Science and Philosophy, to describe reality as accurately as possible.

Acknowledgments

I thank Dr Geoff Edwards, Vice-President of the Royal Society of Queensland, and Robert Delfino, Professor of Philosophy at St John's University New York, for their encouragement, review and criticism of the many drafts of this paper.

Ethical Statement

No research on humans or animals was conducted.

Funding Statement

No funding has been received by the author for this paper.

Data Accessibility

There is no data referenced by this paper.

Competing Interests

The author is also the owner of the url pre-historic.com

9. Appendix A: Literature Review

A brief literature review of Origins and Pre-Historic Science reveals that there are observations that do not match theoretical predictions and also that there are areas of largely unexplained phenomena. An investigation into why this is the case is perfectly reasonable and warranted. The following quotes are a small sample.

9.1 Cosmology

“Finally we may note that one difficulty common to all solar nebula theories concerns the rotation axis of the sun, which is at 7° to that of the system as a whole. It is not feasible that the rotation axis of the central

body could be so inclined to that of the disk, or alternatively, that planets produced within the disk could systematically depart so much from its plane.”⁷³

“The presence of such fully evolved galaxies so early in the life of the cosmos is hard to explain and has been a major puzzle to astronomers studying how galaxies form and evolve.”⁷⁴

“We just simply don’t know the answer to the question ‘how did the universe begin?’. There are things that all cosmologists don’t know the answer to, many questions, that’s one of the main ones, how did the universe begin?”⁷⁵

“Why a superflare has not occurred on the Sun in recorded history is unclear. ‘I think a consensus is emerging that our Sun is extraordinarily stable.’ suggests Galen Gisler”⁷⁶

“Is there a self-consistent single-impact and disk evolution scenario that is consistent with the masses, angular momentum, lunar iron fraction, and isotope/volatile compositions of the Earth and Moon? Is the initial thermal state of the Moon consistent with its formation from an impact-generated disk?”⁷⁷

“We are really amazed – these are the earliest, oldest galaxies found to date. Their existence was not predicted by theory... we’re detecting galaxies we never expected to find, having a wide range of properties we never expected to see.”⁷⁸

“The discovery of such a complex and mature structure so early in the history of the universe is highly surprising. Indeed, until recently it would have been deemed impossible.”⁷⁹

“We expected to find basically zero massive galaxies beyond about 9 billion years ago, because theoretical models predict that massive galaxies form last. Instead we found highly developed galaxies that just shouldn’t have been there, but are.”⁸⁰

“Cosmologists have another saying they like to cite: ‘You get to invoke the tooth fairy only once,’ meaning dark matter, ‘but now we have to invoke the tooth fairy twice,’ meaning dark energy.”⁸¹

“Most of us are persuaded that stars form out of more diffuse material which must, therefore, condense, contract, accrete etc. nevertheless, nearly all observations of pre-main-sequence and proto-stars are dominated by outflowing stuff.”⁸²

“We don’t understand how a single star forms, yet we want to understand how 10 billion stars form.”⁸³

⁷³ Dormand, John R., and Woolfson, M. M., *The Origin of the Solar System: The Capture Theory*, United Kingdom, E. Horwood, 1989, p. 48.

⁷⁴ “Old Galaxies Stick Together in the Young Universe”, *Science Daily*, 4 April 2008.

⁷⁵ Frenk, C., Royal Society Summer Science Online, filmed on 17 July 2020. (<https://royalsociety.org/science-events-and-lectures/2020/summer-science-online/programme/friday/>)

⁷⁶ Seife, C., “Thank our lucky star”, *New Scientist* 2168, 9 January 1999.

(<https://www.newscientist.com/article/mg16121682-600-thank-our-lucky-star/>)

⁷⁷ Barr, A. C., “On the Origin of Earth’s Moon”, *J. Geophys. Res.*, 121, 1573-1601, doi:10.1002/2016JE005098.

⁷⁸ “Astronomical Surprise: Massive Old Galaxies Starve to Death in the Infant Universe”, *Science Daily*, 21 March 2005. www.sciencedaily.com

⁷⁹ ESO Press Release, “Surprise Discovery of Highly Developed Structure in the Young Universe.” 2 March 2005. www.eso.org

⁸⁰ Glazebrook, K. “Glimpse at Early Universe Reveals Surprising Mature Galaxies” *Science Daily* July 2004.

⁸¹ “Out There”, *New York Times Magazine*, 11 March 2007.

⁸² Trimble, V., Aschwanden, M. J., “Astrophysics in 2000.” *Publications of the Astronomical Society of the Pacific*, 113:1025-1114, September 2001.

⁸³ Frenk, C. as quoted in “Surveys Scour the Cosmic Deep.” *Science* 303:1750, 19 March 2004.

“The origin of stars represents one of the most fundamental unsolved problems of contemporary astrophysics.”⁸⁴

“If none of us knew in advance that stars exist, frontline research would offer plenty of convincing reasons for why stars could never form.”⁸⁵

“Nearly a century after the true nature of galaxies was established, their origin and evolution remain great unsolved problems of modern astrophysics.”⁸⁶

“The formation of galaxies and large scale structures remains ‘TMIUPIMA’... ‘The most important unsolved problem in modern astrophysics’...”⁸⁷

“A completely satisfactory theory of galaxy formation remains to be formulated.”⁸⁸

“The processes that led to the formation of the planetary bodies in the Solar system are still not fully understood.”⁸⁹

“How the first stage of this process, primary accretion, works is a fundamental unsolved problem of planetary science.”⁹⁰

“Growth of planets may occur through their gravitational accretion into large bodies. Just how that takes place is not understood.”⁹¹

“The formation of planetesimals, the kilometre-sized planetary precursors, is still a puzzling process.”⁹²

“Because of its multiple close connections to important problems in both physics and astronomy, cosmic acceleration may be the most profound mystery in science. Its solution could shed light on or be central to unravelling other important puzzles, including the cause of cosmic inflation, the vacuum energy problem, supersymmetry and superstrings, neutrino mass, new gravitational physics, and even dark matter.”⁹³

“The present generation of young physicists may envy those of us who had the excitement and delight of developing the standard model. This might be a mistake, just as it turned out that my generation would have been mistaken to envy the earlier heroes of quantum electrodynamics. Our newly minted experimentalists and theorists now have a chance to participate in making the next big step beyond the standard model. They may even be able to see their way clear to the very high energy scale where a

⁸⁴ Lada, Charles J., and Shu, Frank H., 4 May 1990. “The Formation of Sunlike Stars.” *Science* 248:564.

⁸⁵ Tyson, Neil Degrasse, *Death by Black Hole and Other Cosmic Quandaries*. New York: W.W. Norton and Co. 2007, p. 187.

⁸⁶ West, M.J., Cote, P., Marzke R.O., and Jordan, A. “Reconstructing Galaxy Histories from Globular Clusters.” *Nature* 427:31-35, 1 January 2004.

⁸⁷ Trimble, V., Aschwanden, M. J., “Astrophysics in 2000.” *Publications of the Astronomical Society of the Pacific*, 113:1025-1114, September 2001.

⁸⁸ Silk, J., *The Big Bang*, New York: Henry Holt, 2000, p. 23.

⁸⁹ Blum, J., “Evidence for the formation of comet 67P/Churyumov-Gerasimenko through gravitational collapse of a bound clump of pebbles”, *Monthly Notices of the Royal Astronomical Society*, Volume 469, Issue Suppl_2, July 2017, Pages S755–S773, <https://doi.org/10.1093/mnras/stx2741>, 25 October 2017.

⁹⁰ Cuzzi, J., “Planets: the first movement” *Nature* 448 (30 Aug 2007) p. 1003.

⁹¹ Harwit, M, *Astrophysical Concepts*, 2nd Ed., p. 553.

⁹² Blum, J., Wurm, G., “The Growth Mechanisms of Macroscopic Bodies in Protoplanetary Disks” *Annual Review of Astronomy and Astrophysics*, Vol. 46: 21-56 (Sept 2008) p. 21.

⁹³ Turner, Michael. S., “Dark Energy and the Accelerating Universe” *The Annual Review of Astronomy and Astrophysics* 3 June 2008. 46:385–432 (astro.annualreviews.org doi: 10.1146/annurev.astro.46.060407.145243)

final theory will be revealed.”⁹⁴

“Many discussions of origins pursue a more ambitious target: they aim to explain the creation of the universe “from nothing”. The target is the true initial state, not just the boundary of applicability of the SM. The origins are supposedly then explained without positing an earlier phase of evolution; supposedly this can be achieved, for example, by treating the origin of the universe as a fluctuation away from a vacuum state. Yet obviously a vacuum state is not nothing: it exists in a spacetime, and has a variety of non-trivial properties. It is a mistake to take this explanation as somehow directly addressing the metaphysical question of why there is something rather than nothing.”⁹⁵

9.2 Biology

“If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down.”⁹⁶

“Macroevolution posed a problem to Darwin because his principle of descent with modification predicts gradual transitions between small-scale adaptive changes in populations and these larger-scale phenomena, yet there is little evidence for such transitions in nature. Instead, the natural world is often characterized by gaps, or discontinuities. One type of gap relates to the existence of 'organs of extreme perfection', such as the eye, or morphological innovations, such as wings, both of which are found fully formed in present-day organisms without leaving evidence of how they evolved.”⁹⁷

“Although naturalists very properly demand a full explanation of every difficulty from those who believe in the [im]mutability of species, on their own side they ignore the whole subject of the first appearance of species in what they consider reverent silence.”⁹⁸

“All the organic beings which have ever lived on this earth have descended from some one primordial form, into which life was first breathed.”⁹⁹

“We have almost no idea how life did originate.”¹⁰⁰

“I would really really like to know how life started, it is something that we absolutely don't know at the moment.”¹⁰¹

⁹⁴ Weinberg, Steven, “Essay: Half a Century of the Standard Model”, *Physical Review Letters* 121, 220001 (2018), 27 November 2018. (<https://doi.org/10.1103/PhysRevLett.121.220001>)

⁹⁵ Smeenk, Christopher and George Ellis, "Philosophy of Cosmology", The Stanford Encyclopedia of Philosophy (26 Sep 2017), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2017/entries/cosmology/>

⁹⁶ Darwin, Charles. *On the Origin of Species by Means of Natural Selection 5th Edition*, 1869 p. 169.

⁹⁷ Reznick, D. N., Ricklefs, E., “Darwin's bridge between microevolution and macroevolution”, *Nature*, 457(7231):837, 12 February 2009.

⁹⁸ Darwin, Charles. *On the Origin of Species by Means of Natural Selection 5th Edition*, 1869 p. 419.

⁹⁹ Darwin, Charles. *On the Origin of Species by Means of Natural Selection 5th Edition*, 1869 p. 420.

¹⁰⁰ Davies, Paul., *Fitness of the Cosmos for Life: Biochemistry and Fine-Tuning*, edited by John D. Barrow, et al., Cambridge University Press, 2007, p. 107.

¹⁰¹ Dawkins, Richard., “Life, The Universe, And Everything”, filmed on 17 April 2015 at the Academia Film Olomouc Science Film Festival, Czech Republic. (<https://www.youtube.com/watch?v=mGHUZ3ncz5A>)

“Nobody knows how a mixture of lifeless chemicals spontaneously organised themselves into the first living cell.”¹⁰²

“Hot acidic waters containing clay do not provide the right conditions for chemicals to assemble themselves into pioneer organisms.”¹⁰³

“Evolution: Still a Theory in Crisis.”¹⁰⁴

“Some biologists marvel that there is any evolution at all, considering the possible pitfalls of change. The idea is that organisms are so complex that it is very hard to change one aspect without wrecking everything else.”¹⁰⁵

“The feature of living matter that most demands explanation is that it is almost unimaginably complicated in directions that convey a powerful illusion of deliberate design.”¹⁰⁶

9.3 Palaeontology

“Geology assuredly does not reveal any such finely graduated organic chain; and this, perhaps, is the most obvious and gravest objection which can be urged against my theory. The explanation lies, as I believe, in the extreme imperfection of the geological record.”¹⁰⁷

“Studies conducted since Darwin’s time have failed to produce a continuous series of fossils as predicted.”¹⁰⁸

“The Cambrian strata of rocks, in which we find most of the major invertebrate groups, and we find many of them already in an advanced state of evolution, the very first time they appear. It is as though they were just planted there, without any evolutionary history.”¹⁰⁹

“When flowering plants show up in the fossil record, they appear with a bang, with no obvious series of intermediates... The ancestor just is not there.”¹¹⁰

“Schweitzer was studying thin slices of bones from a *T. rex*. under a microscope, it appeared that the bone was filled with red disks. Later, Schweitzer recalls, ‘I looked at this and I looked at this and I thought, this can’t be. Red blood cells don’t preserve.’ ...maybe the textbooks were wrong about fossilization.”¹¹¹

“They concluded that the arched back seen in so many fossils was the result of the expiring dinosaur’s final death throes and immersion in water.”¹¹²

¹⁰² Davies, Paul., “Was life on Earth born lucky?” *New Scientist*, 12 July 2003. (<https://www.newscientist.com/article/mg17924034-700-was-life-on-earth-born-lucky/>)

¹⁰³ Morelle, R., “Darwin’s warm pond idea is tested” *BBC News*, 13 February 2006. (news.bbc.co.uk)

¹⁰⁴ Denton, M., *Evolution: Still a Theory in Crisis*, Discovery Institute Press, 2016.

¹⁰⁵ Dicks, L., “The creatures time forgot”, *New Scientist* 164(2209):39, 1999.

¹⁰⁶ Dawkins, Richard., *A Devil's Chaplain: Reflections on Hope, Lies, Science, and Love*, London, Weidenfeld and Nicholson, 2003, p. 79.

¹⁰⁷ Darwin, Charles. *On the Origin of Species by Means of Natural Selection* 5th Edition, 1869 p. 246.

¹⁰⁸ Hickman, C., *Animal Diversity*, McGraw Hill, New York, p. 123, 2008.

¹⁰⁹ Dawkins, Richard., *The Blind Watchmaker: Why the Evidence Reveals a Universe Without Design*, New York, Norton, 1987, p. 229.

¹¹⁰ Pennisi, E., “On the origin of flowering plants”, *Science* 324(5923):28,30, 3 April 2009.

¹¹¹ Schweitzer, M. as quoted in “Dinosaur shocker”, *Smithsonian Magazine*, May 2006.

¹¹² Switek, B., “Watery secret of the dinosaur death pose”, *New Scientist*, 23 November 2011. (<https://www.newscientist.com/article/dn21207-watery-secret-of-the-dinosaur-death-pose/>)

10. Appendix B: Bibliography

This bibliography focuses on papers on naturalism in Pre-Historic/Origins Science and are placed in four categories:

1. The following analyse if Naturalism is a justified assumption in Pre-Historic/Origins Science:

Calvert, John H. “The Absence of Religious Neutrality in K-12 Public Science Education” *Liberty University Law Review* Vol 12:571, 2018. (https://digitalcommons.liberty.edu/lu_law_review/vol12/iss3/4/)

Williamson, T. “What Is Naturalism?” *New York Times*, 4 September 2011. (<https://opinionator.blogs.nytimes.com/2011/09/04/what-is-naturalism/>)

Delfino, Robert A. “Scientific Naturalism and the Need for a Neutral Metaphysical Framework” in *Science and Faith within Reason: Reality, Creation, Life and Design*, ed. by Jaume Navarro (Surrey, England: Ashgate, 2011).

2. The following analyse Pre-Historic/Origins Science but do not mention Naturalism:

Pigliucci, M., Finkelman L., “The Extended (Evolutionary) Synthesis Debate: Where Science Meets Philosophy”, *BioScience* 64:511-516, June 2014.

Davies, Paul, *Cosmic Jackpot: Why Our Universe is Just Right for Life*, Houghton Mifflin Company, 2007.

Horgan, John. “Be Careful with Occam’s Razor, You Might Cut Yourself”, *Scientific American*, 8 May 2019. (<https://blogs.scientificamerican.com/cross-check/be-careful-with-occams-razor-you-might-cut-yourself/>)

Dawkins, Richard. *Science in the Soul: Selected Writings of a Passionate Rationalist*, Random House, 2017.

Cressey, Daniel. “Paper that says human hand was ‘designed by Creator’ sparks concern” *Nature*, 3 March 2016. (<https://www.nature.com/news/paper-that-says-human-hand-was-designed-by-creator-sparks-concern-1.19499>)

Lodge, David M. “Faith and Science Can Find Common Ground”, *Nature* 28 July 2015. (<https://www.nature.com/news/faith-and-science-can-find-common-ground-1.18083>)

Godfrey-Smith, Peter, *Theory and Reality: An Introduction to the Philosophy of Science*, University of Chicago Press, 2003.

Branch, Glenn. “Science and Religion: Godless Chronicles”, *Nature* 500, 149, 8 August 2013. (<https://www.nature.com/articles/500149a>)

Editorial: “Science Education Reforms in the UK”, *Nature Cell Biology* 14, 977, 3 October 2012. (<https://www.nature.com/articles/ncb2601>)

Alexander, D., White, B., “Science and Religion are Wise to Talk”, *Nature* 471, 166, 10 March 2011. (<https://www.nature.com/articles/471166b>)

Ball, Philip. “What a Shoddy Piece of Work is Man”, *Nature*, 3 May 2010. (<https://www.nature.com/news/2010/100503/full/news.2010.215.html>)

Bleckmann, Charles A. “Evolution and Creationism in Science: 1880–2000”, *BioScience*, Volume 56, Issue 2, February 2006, Pages 151–158. (<https://academic.oup.com/bioscience/article/56/2/151/274042>)

Minkel, J.R. “Evolving Creationism in the Classroom”, *Scientific American*, 10 Sep 2008. (<https://www.scientificamerican.com/article/evolving-creationism-in-the-classroom/>)

Shermer, Michael. “The Woodstock of Evolution”, *Scientific American*, 27 June 2005. (<https://www.scientificamerican.com/article/the-woodstock-of-evolutio>)

3. The following briefly mention Naturalism in the context of Pre-Historic/Origins Science, but they do not analyse if it is a justified assumption:

De Cruz, Helen, "Religion and Science", *The Stanford Encyclopedia of Philosophy* (Winter 2021 Edition), Edward N. Zalta (ed.), URL = <<https://plato.stanford.edu/archives/win2021/entries/religion-science/>>.

Shermer, Michael. "The Case for Scientific Humanism", *Scientific American*, 1 January 2019. (<https://www.scientificamerican.com/article/the-case-for-scientific-humanism/>)

Scott, Eugenie C. "Back to Basics By Way of Evolution", *Nature* 465, 164, 13 May 2010. (<https://www.nature.com/articles/465164a>)

Scott, Eugenie C., *Evolution Vs. Creationism: An Introduction*, University of California Press, Berkeley, 2004.

Visala, A., Vainio, O. "Philosophy of Religion and the Scientific Turn", *Palgrave Communications* Volume 4, Article number: 135, 2018. (<https://www.nature.com/articles/s41599-018-0190-9>)

Tammy KITZMILLER, et al., Plaintiffs, v. DOVER AREA SCHOOL DISTRICT, et al., Defendants. No. 04cv2688. United States District Court, M.D. Pennsylvania. December 20, 2005. MEMORANDUM OPINION, JONES, District Judge.

"*Science, Evolution, and Creationism*" The National Academies Press, 2008. National Academy of Science, says "In science, explanations must be based on naturally occurring phenomena." (p. 10) and "hypotheses must be restricted to testable natural explanations" (p.43).

"Science, Religion, and Evolution", National Center for Science Education, 12 June 2001. (<https://ncse.ngo/science-religion-and-evolution>)

The Wikipedia article titled "Creation Evolution Controversy" (<https://en.wikipedia.org>) only mentions it to state that "supernatural explanations are outside the realm of science."

4. The following carry out an in depth analysis of Naturalism in Pre-Historic/Origins Science, but they do not analyse if it is a justified assumption:

Dembski, W., Ruse, M., *Debating Design: From Darwin to DNA*, Cambridge University Press, 2004.

Pennock, R., *Intelligent Design Creationism and Its Critics*, MIT Press, 2001.

Pond, F.R., Pond, J.L. Scientific Authority in the Creation–Evolution Debates. *Evo Edu Outreach* 3, 641–660 (2010). <https://doi.org/10.1007/s12052-010-0242-0> (<https://link.springer.com/article/10.1007/s12052-010-0242-0>)

Barr, Stephen M., *Modern Physics and Ancient Faith*, University of Notre Dame Press, 2003. He states that "Materialism is a philosophical opinion... is not science" but does not analyse the falsifiability of materialism in the context of Origins Science.

Forrest, Barbara. "Methodological Naturalism and Philosophical Naturalism: Clarifying the Connection", *Philo*, Vol. 3, No. 2 (Fall-Winter 2000), pp. 7-29. Barbara Forrest carries out an analysis of Methodological Naturalism in the context of Origins Science, however she never asks if it should be falsifiable and thus concludes that "science relies upon methodological naturalism". (https://infidels.org/library/modern/barbara_forrest/naturalism.html)

The *Stanford Encyclopedia of Philosophy* in its section on Naturalism covers Ontological and Methodological Naturalism in so far as how they relate to Philosophy. The paper assumes that naturalism is a justified assumption in Origins Science and does not raise the question of the falsifiability of naturalism and does not carry out a critical investigation of naturalism. (<https://plato.stanford.edu/entries/naturalism/>)

Pigliucci, Massimo, "On Naturalism", *Philosophy Now*, Issue 96, May 2013.

Artigas, Mariano, *The Mind of the Universe: Understanding Science and Religion*, Templeton Foundation Press, 2000.

Haught, John F., *God and the New Atheism: A Critical Response to Dawkins, Harris, and Hitchens*, Westminster John Knox Press, 2008.

Numbers, Ronald L., *Galileo Goes to Jail and other Myths about Science and Religion*, Harvard University Press, 2009

Hayashi, Adam, *Kitzmiller v. Dover: A Public Policy Analysis*, University of Florida, 2010.