Chapter 1:

Cosmologies

If somebody told you today that a team of horses drags the sun across the sky every day, then takes the sun back to its resting place at night, how would you respond? It is likely that you would reject this explanation even though that explanation with variations was accepted for thousands of years in a variety of cultures.

What is interesting philosophically, is not the changes in the contents of cosmology, but rather the transformation in other aspects of culture and religion that force changes in cosmology. Cosmology may then be something like a thermometer, a gauge of changes, a test of a variety of other enterprises within a culture. Cosmologies tell us what a culture thinks about the structure of reality.

The word cosmology comes from the Greek words cosmos [κοσμος] and logos [λογος]. *Cosmos* is translated to mean order, world, universe, or specifically the earth. *Logos* is translated as Word or in any place where you see "…ology," as a suffix, it is the word about or study of whatever it is the suffix for. So in this case the word cosmology has taken on a meaning in the contemporary world not too different from its original use, that is, the word or study about order in the universe. Cosmologies are theories about how the universe functions.

The reason to begin lessons of philosophy discussing cosmologies is that as a public face of a culture cosmologies reveal something about beliefs irrespective of religion, science, or philosophy. You may be interested to know that, at least in the Global West, the culture has not coherently adopted any particular cosmology since the

fifteenth century. With the rise of scientific observation and empirical evaluation of the real world, many views have risen and fallen, marking political, religious, and scientific divisions within cultures. One view, a scientific theory, has come to dominate not only the West, but also the rest of the world. It is called the Expanding Universe or the Big Bang theory. Though the term Big Bang was at first used derisively, it has been adopted as the title for this theory almost universally.

We will be exploring some of the cosmologies that have held significant sway over cultures to try to understand what those cultures understood. We will conclude the discussion of cosmologies with the Big Bang theory and why it surpasses all the previous ones in detail and scope.

Ancient views of the cosmos

Let's begin by putting the early cosmologies in context. When we speak of early cosmologies, we are talking about ideas that emerge in written form that come from oral histories. Oral histories have a life quite different from the texts that arise from them. What tribes consider important cultural artifacts that must be passed down to the next generations varies widely, but often the stories that are told contain something of the origins of their culture, and the rules whereby the culture is held together. For the Mesopotamians the stories are contained in a variety of clay tablets. The most famous is the *Enuma Elish.* For the Greeks, origin stories were written in books by Hesiod, the *Theogony* and *Works and Days*. After that, explanations of Greek cosmology are referred to and elaborated in the works of Aristotle, Plato, and a variety of others. The *Popol Vuh* is a creation story from Central America. The Indian sub-continent also developed a variety of origin stories. We'll look at one from the Hindu *Vedas*. The most

famous cosmology in the West is the Genesis account of creation found in the Bible. However, it is by no means singular in its general outlines. Many of its features are also found in the Mesopotamian and Greek myths, and since the earliest founders of the Jewish tribes came from Mesopotamia, it shouldn't be a surprise that their creation stories have similar features. The great flood of Noah has at least two analogous stories from Mesopotamia.[18]

Most cultures ordered their conception of the universe around elemental gods and goddesses from which the universe came, or which the universe birthed. Stories of the origin of the earth, gods, and the origin of earthly life are persistent themes.

The Enuma Elish[19]: The Babylonian Creation story from Mesopotamia

The heavens and earth existed at the beginning but were as yet undefined. The primeval god Apsu (sweet water) made the heavens and earth. The primeval goddess Tiamat (bitter water) was their mother, who, along with chaos birthed all that is. Together they made all of creation, including the greater and lesser gods. Apsu is destroyed by his children the greater gods, and Tiamat plans revenge. Marduk one of the lesser gods is born and leads the other gods in a plan to destroy Tiamat. Tiamat is killed and half of her becomes the sky while the other half becomes the earth. Marduk makes man to serve the needs and wishes of the gods.

[18] Richter, Sandra L., *The Epic of Eden* (Downers Grove, IL: IVP Academic, 2008), 140-141.
[19] *Enuma Elish*, tr. L. W. King in the *Seven Tablets of Creation*, (London, 1902), < http://www.sacred-texts.com/ane/enuma.htm >.

The Song of Creation: from the Hindu *Rig Veda* of India

In the beginning there was neither nothingness nor existence, no earth or heavens. From formlessness and the void, desire emerged from this chaos, and with it both material and spiritual reality. The gods are created subsequent to the emergence of the universe and the earth, and nobody knows when that happened. Maybe the rule, order, and model of creation comes from the great God, or maybe it does not, "Whose eye controls this world in highest heaven, he verily knows it, or perhaps he knows not." [20]

The Popol Vuh[21]: The Sagas of the Kichés of Central America

From the primeval night Hurakan (the great wind) created the earth. In council with Gucumatz, the green-feathered serpent, Xpiyacoc, and Xmucane, the mother and father gods, the animals were created. But man had not yet been created. Then primordial men were created out of wood. But primordial men soon displeased the gods because they did not live in harmony with the rest of the creation. The animals criticized men and then warred against them. Men ran around in confusion, were pursued from tree tops to the ground and finally were subdued. Their children are of no account in creation. But, then a great man arose, Vukub-Cakix, who fought the gods and won. But the gods retaliated and killed him. The sons of Vukub-Cakix continued in animosity to the gods and the story of the world is wrapped around the enmity between the gods and men.

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[20] *Creation*, tr. Ralph T.H. Griffith in the *Rig Veda, Book 10, Hymn 129*, (1896), < http://www.sacred-texts.com/hin/rigveda/rv10129.htm >.
[21] *The Popol Vuh*, tr. Lewis Spence, (Long Acre, London: David Nutt, Sign of the Phoenix, 1908), < http://www.sacred-texts.com/nam/pvuheng.htm >. The Kichés were related to the Mayans, but distinct in language.

Before we recount the most well-known story of origins in the West from the book of Genesis in the Bible, let me remind the reader, that the preceding stories as well as the biblical story of Genesis have the same or similar origins and transmission to the modern world through oral history. Oral history, as a form of recordkeeping is notorious for leaving out what they thought were inessential details in order to focus on the central story. Time and space are telescoped into brief events so the story remains coherent. The details that remain are not instructive for any scientific worldview, or an organized theology except in the most primitive fashion. The cosmologies these stories represent are characterized by their mythic and poetic structure, not the sort of text that lends itself to modern scientific or historical exposition in some explicit literal and logical fashion. There are central lessons in all the stories that may be extracted, but to force the stories, anachronistically, to say something about modern cosmology, except in the most cautious senses, which I attempt here, cannot be warranted.

We can say of the Mesopotamian *Enuma Elish* that people were created as a slave race to the gods. Is this true? Well, whether it is true or not is a matter of further examination. The story will be tested scientifically. If it is true, then as moderns we should adopt it. If not, then we should reject it, understanding its ancient historical context. The assertion of slavery as the order of the universe must be a difficult one to defend, especially when the text that declares it is incomplete, offering only a very limited account. Though the Hindu *Song of Creation* notes much that is unknowable, it does tell us that there is order in the universe whether or not God is the origin, whether God understands it or not. Like the *Enuma Elish*, the Mayan/Kiché *Popol Vuh* tells the

story of enmity between gods and people. The creation is in conflict. The Bible as well tells the story of conflict with the Almighty God after Adam and Eve disobey His command not to eat of the tree of the knowledge of good and evil. The larger lesson of the Hebrew Genesis account of origins is that there was a beginning of the universe and God its creator is the Almighty one who presides over all of creation. The universe, our planetary system, our Earth, life, and human interactions with God are all subject to the Almighty God.

None of the other stories produce this stark contrast between creator and creation, a **first-order theological object** that is the persistent background layer to the entire Hebrew and Christian scriptures. Arguing for a creation that only took six days is a variety of interpretation of the scriptures that held sway for thousands of years, but never universally, and not always a majority view. Many within Judaism and Christianity, even in ancient times, argued for a much deeper history of the earth than could be sustained in a literal interpretation of the first eleven books of Genesis. It serves no purpose other than conflict to insist that one's interpretation of the creation event in ancient literature is an exact scientific rendering of the truth of that event. Or to suggest that one's interpretation of the Genesis account is the primary indicator of their status as a believer must be mistaken since believers down through the ages have held widely divergent beliefs about how the creation actually took place.

To treat the Genesis account as a modern, scientifically viable account is what I have called elsewhere an anachronism.[22] The primary distress some modern Christian

[22] Something that is misplaced in time. Treating ancient civilizations as if they have modern scientific apprehensions of the world is an anachronism.

people is that they believe the truth of the Bible is being called into question if we do not interpret the text literally. Some have, in fact, declared that if a person doesn't believe that the earth is a few thousand years old, they are not Christians. I think that is a mistake, but one that can be remedied with careful and sound reasoning about the evidence with a carful application of logic.

First of all, some claim that the Bible can be tested scientifically. Though that is a different problem from whether the Bible is a scientifically accurate document, it is possible to put the claims of the Bible to a scientific test. In fact, that is a proposition which all young-earth creationists agree on. They wish to prove that the Bible is scientifically accurate. Well, how would one go about testing the Bible's accuracy scientifically? We'll look at that in a moment.

Second, there is a problem of interpretation. How can we be sure we have interpreted the Bible correctly? There are a few tried and true rules that all scholars and careful readers of ancient texts agree on. Though those rules will not solve all the present riddles about the age or character of creation, they will help us to reject some interpretations because they break the rules. One of the rules states that the whole text of the Bible must be consistent. Here's how we come to that rule. First if the Bible is the word of God, then the statements in it should not contradict each other. That is simple, something common sense would tell us. I agree. In this case common sense gives us a strong rule that helps interpret the Bible, or, at the very least helps us decide that some interpretations must be incorrect.

Another rule is that translation is not as simple as a direct correspondence between words of one language and another. Any of you who speak at least two

languages understand this problem. Language is full of nuance, and cultural idiosyncrasies. Languages define culture and culture defines language. So anyone who wishes to understand another language must also understand the culture that defines and is defined by it. That means a translation from one language to another loses something. Words do not mean precisely the same thing in translation and so compromises in translation are necessary. And language changes over time. There are no absolute fixed definitions to words, but users of the original Hebrew language would have understood the text of Genesis well enough. It is not so simple for us to translate the Hebrew text being separated by some 3,500 years of time and changes in language and civilization.

Similar to the rule about translation, is the one that tries to understand the intention of the writer. We know for a certainty that Moses had no intention of dictating the terms of scientific consensus for the twenty-first century. His interests were attached to guiding the understanding of the ancient people he led through the desert. Moses had no understanding of the history that would transpire until today, history that would inform our interaction with the real world. So it is a mistake to attribute to him anything like a scientific frame of mind. The same goes for the differences between ancient and modern views about history. Modern historiography[23] would have been impossible for Moses, and we should not attribute to him any intention modeled on modern historiography. He did not see our past or future and one cannot impute our views to him.

[23] The study of how we research and write history.

Another rule, related to the first rule of interpretation above is that scripture interprets scripture. That is, often, a plain language statement in one place helps us interpret some other statements that are not so plain. It is likely that common usage in Moses' day would help us understand other statements of scripture.

Now, if you have taken all these issues into your understanding, you will have learned to be a bit cautious when declaring that you have arrived at the precise interpretation. That does not mean you aren't close, but certainty is the privilege of God alone. All our interpretations must be held with a sense of humility.

So let's take a moment and apply the first rule above, the rule about consistency. Remember we want to retain the truth of the scriptures without contradiction. By this rule, I challenge one of the common suppositions of interpreting the scriptures, that is, that the scripture is, word for word, literally true. That one is an easy one to test. Quickly it leaves us in trouble if we want the Bible to remain consistent. In Genesis chapter 1 we have an ordered creation account. If that is literally, word for word true, then Genesis 2: 5-7 presents a problem. That is, Adam is created before the first plant life, contradicting the sequence of events in chapter 1 where Adam and Eve are created on the sixth day after everything else is created. So, if the text is to be understood in a literal, word for word manner, then the Bible is inconsistent. Let that sink in for a minute. I'm not saying the Bible is inconsistent, but that the literal method of interpretation must be incorrect because it leaves us with inconsistencies. That method used exclusively must be wrong. There must be other means of interpreting the scriptures that do not shackle us with inconsistency.

What this means for the believer is that the common-sense method of interpretation that we all use for many things in ordinary life may be inappropriate when applied to some passages in the Bible because it declares that the Bible is inconsistent. There is a method used in logic called indirect proof.[24] It goes like this. If when we suppose a statement X is true, if it allows us to conclude that the statement Y is both true and false at the same time, then X must be false. In the case above with the order of creation, the statement "the order of creation is literally true in Genesis 1," then it is true both that "Adam was created after the plants were created (Gen. 1:11,26)" and also "Adam was created before the plants (Gen. 2:5-7)." You see then, that it must not be true that the order of creation in Genesis 1 is meant to be understood by Moses literally.

Since we do not want to impute error to the scriptures, we must look for another method of interpretation to understand them. After telling a short version of the creation story below, I will present a theory that explains all our observations of the text without contradiction, and then explore one scientific test of the young-earth theory.

Genesis: The Story of Origins from the Jewish Bible

The heavens and earth created by God precede the formation of the earth out of chaos that was its natural state. The world is formed and filled with order and life in the six days of Genesis 1-2:4. Genesis 2:4 to the end of chapter 2 recounts a second, but not parallel version of the creation story. Its central feature is the origin of people in Adam and Eve, the primary characters in the next few chapters and it has the character of an oral history, a morality tale constructed to explain some features of relations

[24] Carter, K. Codell, *A First Course in Logic*, Gold ed. (New York, NY: Pearson Longman, 2005), 292.

between God, Adam, Eve, and their family. The enormous variety of interpretations placed on the record of the first eleven books of Genesis begs us to look past a simple literal reading. As well, conflict in logic and order spring up almost immediately if a literal rendering is insisted on. The obvious simplicity of the Genesis record is misleading when we attempt to make the story cohere with the rest of the Bible. Scholars have struggled over the ages with its content and interpretation. But a few things are known. One, the first chapter tells us that the Almighty God is dominant over all creation, and that He declared the creation to be good, even very good. This stands in contrast to other early cosmologies where the earth and its people are often in conflict, and at odds with the gods. But for the Bible, the conflict comes in chapter 3, where Adam and Eve, the first human parents, transgress the divine command and decide to put themselves in conflict with God. But God knew they would do this, and so prepared a sacrifice to atone for their error. It is not known precisely what the error was, though the description is couched in the concrete terms of eating a desirable fruit, but it is understood that the natural people Adam and Eve were now burdened with knowledge that complicated their interaction with God, the world, and each other.

One distinction between all the other ancient stories of creation is that the Hebrew story tells of a beginning. At one time, well, before time existed, there was no universe, though God himself exists. Genesis 1:1 says distinctly that God spoke the universe into being. It is not fitting to speak of what existed before the universe came into existence because time itself, the means by which we distinguish between past and future, came into existence with the universe. Space as we know it also didn't exist until God spoke the universe into being. The other cultures noted above all theorize a

cyclical universe, one that continues into the infinite past moving through the present into the infinite future. Also, until the advent of modern science in the late 1920s to early 1930s with the slow adoption of the **Expanding Universe** theory, most scientists continued to believe that the universe was static, that is, it remained pretty much the same into the infinite past. Like most of the ancient cosmologies, the scientists thought a cyclical universe seemed to be the best explanation for what we saw. Let us look at a theory about Genesis 1 that is consistent with the text and doesn't contradict Genesis 2.

The Framework theory of Genesis 1, introduced to the Church by Augustine of Hippo[25] provides an interpretative method that allows one to think in terms of the literature of the ancients instead of modernist literal interpretations. In other words, the interpretation as literature is superior to an interpretation as a literal account. I mentioned in the short synopsis of the Genesis account above, that the earth was formed and filled with order and life in the six days of creation. This passage is constructed in a well-known format known as **parallelism**, common in the Hebrew poetry found in the Bible. *Figure 2* below shows this parallelism. Individual days become less important than the structure of creation, and if, as it appears here, we are to take chapter 1 of Genesis as a **literary** construction, there would no contradiction with Chapter 2, or indeed any other statement of the Bible. The truth of the passages would not be in question based on their consistency or lack of it. If the Chapter 1 and 2

[25] Saint Augustine, Stanford Online Encyclopedia of Philosophy <https://plato.stanford.edu/entries/augustine/>, accessed Feb. 16, 2017.

narratives are literary constructions with different purposes, there would be no reason to challenge their consistency.

Day 1 God **forms** by dividing light from darkness	Day 2 God **forms** by dividing upper waters from lower waters	Day 3 God **forms** by dividing dry land from seas (plus creation of vegetation as food for those who would **fill** it, (v. 11-12))
Day 4 God **fills** by making sun, moon, and stars	Day 5 God **fills** by making fish and birds	Day 6 God **fills** by making animals and humankind (v. 24)

figure 2

After this, God sets Adam and Eve over the earth as stewards, and commands them to be fruitful and multiply, declares his creation to be very good, then in chapter two, declares a day of rest, the Sabbath. In Genesis 2:4 Moses reiterates God's preeminence over all creation.

For those of you who yet believe that the universe is young, thousands of years instead of billions, please do not trouble yourself over this issue. It is not a central issue to one's relation to God and salvation, nor does the Bible make one's belief about this essential to their relationship with God. But you should keep in mind the few rules about

interpretation noted above, because they will help you sort out the meaning of scriptures you encounter.

From views of creation to the structure of the universe

Contained in these stories are accounts of the shape of the universe. Many have attempted to draw these shapes and Figure 3 will help to illuminate one of these attempts. People were convinced, and wrote of these shapes and assumed the simple readings of their texts gave them substantial information and a coherent structure for their cosmos, their world. But remember that these shapes are already contained in the oral histories from which the written stories are constructed. It is not likely they ever had even the beginnings of our concept of the universe in mind. Let's not make the error of judging the accuracy of their representation. All they had to go on were their observations of the real world and the stories of their predecessors. In the case of *figure 3*, The Bible has informed the construction of this diagram from stories having their origins in prehistory, thousands of years prior to the life of Moses who, it is stated, recorded the original Genesis record.[26] The Genesis account puts all the elements of the early cosmos in the position this illustration does. Their world encompassed no more than a few thousand miles, and every reference to the whole world is couched in these phenomenal, mostly local interpretations of their reality.

[26] The Genesis record, and indeed the first five books of the Bible, the Pentateuch, are not entirely the work of Moses. This must be the case since the last chapters of it were written by someone recording the last moments of Moses on earth, not Moses himself. But we must expand the possible injection of notations and passages by others as well. The Bible itself has its origins as a collection of books from the fifth to the seventh century BCE, edited and compiled by the priests in Babylon. And there are many internal evidences of multiple authorship. But remember that the Jews of that age took the text to be authentic. So should we. In addition to that, we have ample evidence that there are a variety of streams of the Old Testament text, and variants within each stream.

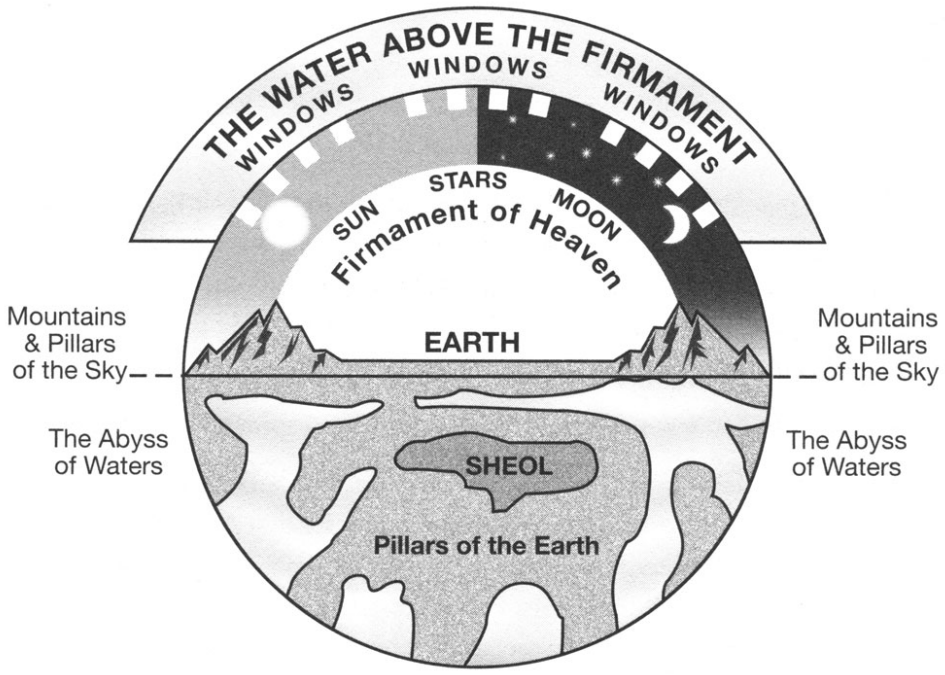

figure 3[27]

Until the arrival of a distinctly modern cosmology in the sixteenth and seventeenth centuries, the model in Figure 3 represents, with some elaborations, the model of the world. Let us look now to the scientific challenge, testing the Genesis account of creation. Can the literal Genesis account typified by the cosmos of *figure 3* find support from modern science? Unequivocally, no, it cannot. But the modern young-earth creationists, do not insist that this diagram is compelling. In fact they use very little of the literal description from the Bible that supports it. Their main contention is that each "day" of Genesis 1 is a literal 24-hour day, that the earth must be very young, and that people have been on earth for a few thousand years (often expanded to 10,000 years) instead of the ~4.57 billion years in the standard scientific timescale.

[27] Richter, Sandra L., *The Epic of Eden* (Downers Grove, IL: IVP Academic, 2008), Fig 6.4, 101.

The purpose of this part of the conversation is not the internal consistency of the text, but testing whether any of the statements of the text do not correspond with the real world. Because the YEC take it that the scripture is literally true, we may pick out a passage and test it. I use an illustration that permits us to see the fundamental honesty of the YEC community, that is, concerning Genesis 1:6-8 about the vault between the waters above the earth and the waters on the earth. So in this description, there are waters above the heavens. Dr. Marcus Ross of Liberty University himself a young-earth theorist admits that all the legitimate young-earth scientists had rejected the waters above the firmament theory because it was not physically possible in any scientific view.[28] Some who still hold the waters above the firmament theory, on his account, are not reputable scientists.

So it is not only possible to test young-earth creationist propositions, but the scientists among them will reject scriptures interpreted literally, that have no correspondence with reality on scientific grounds. Is this an indication that science has gone mad? Or, is it an indication that science has a particular edge when it comes to testing assertions about reality. I would choose the second explanation because it keeps intact the proposition that though the Bible is not to be taken literally, it still has truths that are important for us today. Even though young-earth scientists are in a very small minority of scientists, as long as they allow the available evidence to drive their conclusions about reality, they should continue to do their best to take the scriptures as proposals to be tested. It happens that this mode of behavior moves us away from literal

[28] Dr. Marcus Ross, Ph.D. University of Rhode Island, during a conversation with Dr. Hugh Ross (not related) in the 2016 Faith and Science Conference at Evangel University, Springfield, Missouri, U.S.A. Dr. Marcus Ross is one of the leading young-earth catastrophe theorists in the United States, teaching at Liberty University.

readings of the scriptures where inconsistencies are found, but doesn't challenge the truth of scriptures.

Some scientists like Dr. Hugh Ross accepts the ancient age of the earth with the modern timeline while taking the scriptures seriously.[29] His view is exceptionally consistent. Hugh Ross has been careful to note the advances of human history in the last 400 years, and has taken to heart the propositions that steer him closer to the real world and God the creator. The value of his perspective is that not only are the scriptures consistent, but science is consistent as it persists in drawing evidence from observation of nature. He opposes the claims of **materialism**, and the secular theorists who have removed God from the equation. But he acknowledges the practical results of the scientific project. He has drawn a coherent narrative from his biblically focused scientific enterprise, and has not failed to allow the evidence to reveal the truth of our universe. The discussion about the age of the earth is not the only field where testing the claims of the Bible have drawn attention.

In addition, we could look at anthropological and archaeological findings to discover whether the Bible can be tested scientifically. With respect to archaeology, the evidence of the Bible has turned out to be the most reliable ancient record of its era. This has been found in numerous cases, archaeological digs, and researches. Bible scholars and many scientists are in agreement about this, though there is some contention over details and interpretations of the data. But in the case of cosmology, the Western world has already gone through a cycle of testing the biblical claims since the

[29] Hugh Ross says that he reads the scriptures literally, but I'm sure he doesn't mean that the same way as Marcus Ross means it.

seventeenth century, discovering that the record of Genesis 1-11 is problematic in terms of dating the creation, fixing the dates of human civilization, and records of the earliest events. The young-earth scientists are taking us through a second cycle of discovery. I'm not sure they will come to a vastly different conclusion in the end. But the exercise is noteworthy. The honest scholars among them will add to the discussion, instead of alienating generations of believers by adhering to a dishonest and problematic interpretation of the scriptures. This concludes the discussion about whether the Bible can be tested scientifically.

Consistent with this project, one should realize the fundamental difference between the Biblical project and a scientific one. Though both are part of the human knowledge project, the Bible is concerned with who, why, and for what purpose, while the scientific project is concerned with the how, what, and when. If the reader runs into a conflict, they should remember to make this distinction. The views then become complementary instead of conflicting. Any honest assessment of the real world will accept the best evidence from wherever it proceeds without prejudice. And just as the Bible contains no formulas for the trajectory of rockets, science contains no rationale for the discovery of our purpose in creation. In fact, happily, the scientific among us declare that there is no purpose in the universe at all. It just is and cares nothing for human intentions and endeavors, nor indeed for humans.

Whether we resolve here the question about which view of the universe corresponds with reality, it is incumbent on us to carry out a discussion about how

cosmology has changed over the centuries and to discover why the modern story is compelling and how we should react to it. But that will require a thorough acquaintance with the topic. Because this is a text on philosophy the details of physics will be lightly glossed over to capture the more important issues related to the questions posed in the Introduction. That is, “What is reality? What is the context in which we live? Who are we as people? Why can we ask these questions about where we are, who we are, what we are? How did we get here? Is there a cause for all of this, or did it just appear accidentally?”

A note to young and vigorous minds: It may not be useful to challenge the beliefs of your elders, especially where that challenge may be taken as an affront to their authority. In social relations, and relations with those who have preceded us, it may be better to allow your knowledge to ferment in your thoughts, until the time when it is mature. Do not be hasty to correct the apparent ignorance of others, no matter how strong the temptation might be to do so.

As we continue this discussion, I present Figure 4 as one of the final models of the very ancient cosmology passed down from the scriptures and other cultures through the centuries. This is the view of the universe from the era of Dante’s *Divine Comedy*, the early fourteenth century.

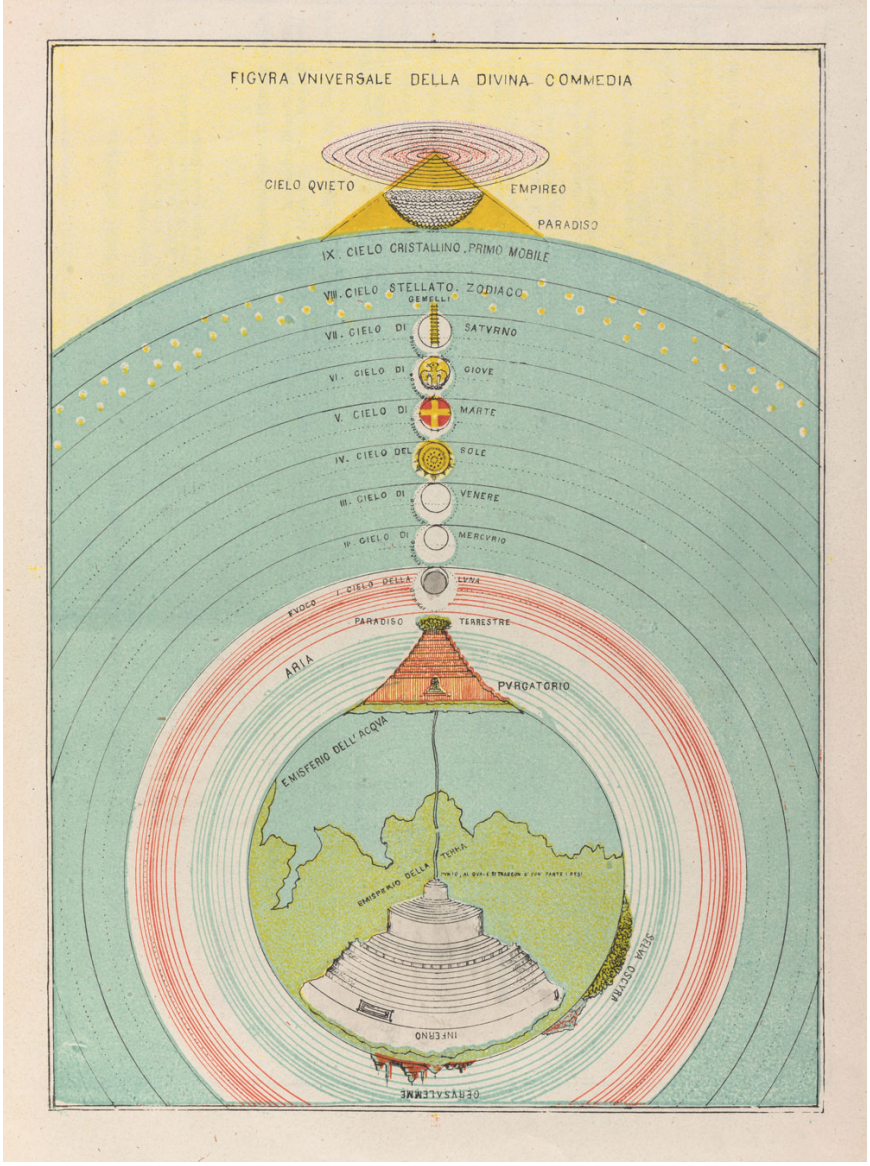

figure 4[30]

This depiction of cosmology and those like it clearly do not reflect the modern one, but they did, for their age reflect the dominant beliefs of the educated population. Figure 4 shows that the world is a sphere, recognized by all advanced societies shortly

[30] Michelangelo Caetani [Public domain], via Wikimedia Commons, accessed 1/11/2017, <https://commons.wikimedia.org/wiki/File%3AMichelangelo_Caetani%2C_Overview_of_the_Divine_Comedy%2C_1855_Cornell_CUL_PJM_1071_01.jpg>

after the time of classical Greek civilization. The flat earth proposition had been abandoned for well over a thousand years before the thirteenth century in the West, and the Biblical earth of *figure 3* abandoned with it, though some features remain in a refined form in *figure 4*. It might be of interest for some to know that a few people still assert a flat-earth cosmology. But like the second generation of young earth creationists who have gently expanded the timeframe for the creation event in the modern era, if we allow the flat earthers to do the science, eventually they will abandon their beliefs.

Why should these things be of interest philosophically? The chief reason is that knowing these things will help the people recognize that the human knowledge project is not fixed in some archive of *true* knowledge, whose origin may be discovered once for all. Knowledge grows through the ages, even though growth is terribly slow at times and often takes two steps back for every three steps forward. Two sciences have added to our knowledge about these cosmologies, Astronomy and Archeology. Astronomy has shown us, from the time of Galileo in the early seventeenth century, that our heavens contain more than the approximately 5000 stars visible to the naked eye, and archaeology from the seventeenth century has begun to show a fair timeline for the events of our predecessors in civilization and prehistory. Observation of the comets helped us to abandon the idea that the planets were fixed within impenetrable spheres,[31] and the mathematicians: Galileo, Kepler, Newton, Leibniz, and others helped us understand that the heavenly bodies are, like the earth, suspended as if by strings in space, travelling around the sun in roughly elliptical orbits. We know the force that

[31] An ancient idea held by most cosmologies until the Age of Reason.

sustains the planetary orbits as gravity, but for most of human history, the concept of gravity was as yet unknown and not understood.

Knowledge like that of Galileo or Newton, emerging from the new sciences, was sometimes met with furious and sustained opposition. Accusations of heresy with resultant death penalties waited for some of those who would flout the prevailing beliefs of the church and state in the West. Yet the scientific view continued to gain ground while the views of their predecessors moved slowly into obscurity.

Now with modern astrophysics, our cosmology has been fleshed out to a much greater degree. We know that the universe is some 39 billion light years across, contains hundreds of billions of galaxies each containing hundreds of billions of stars. Yet, philosophically, it continues to elude us what the order of the universe really is, why it is here in the first place and what we are obligated to do within it. Even though we have very sophisticated theories of how certain elements act as they do we do not understand why they do so. The difference is instructive. We can predict with extreme accuracy what will happen when you drop a pencil to the ground because we know what gravity does to a very fine degree. Yet we have very few clues as to why gravity acts as it does. We have mathematical models that describe phenomena in our world yet those mathematical models do not understand why phenomena work as they do. Our knowledge, though finely tuned to the real activity of the universe doesn't reach to the reasons why the universe is here, or why phenomena act as they do. These questions remain unanswered at the present time.

We know that all the elements in our world, including those that make up our bodies are composed of materials that are the products of stellar evolution, stellar

explosions, and that our star, the Sun, is probably a second or third generation star, built from gasses of prior stellar explosions. We know that this had to take a very long time, billions of years. We also know that there is a beginning to the universe as we know it some 13.7 billion years ago.[32] The earth coalesced from elements left behind from stellar explosions, just like the gasses that compose our sun. Humans are also composed of those elements.

But we don't know why the earth is so friendly to life, or why life should emerge here, or why intelligence emerges from biology. We know the earth supports an abundance of life and life forms, and that some of them are intelligent. We have not answered the question of how this comes to be or why it should be this way instead of some other way. The early cosmologies give answers to these questions, but are disconnected from any modern science that may support their views. However, parts of the stories told in the ancient cosmologies have roots in philosophical questions that the modern world is still exploring today. In this sense the development of cosmologies tells a story about the nature of people and their curiosity to explore the truths of the universe and the truths of the people in it.

[32] Panek, Richard, *The 4% Universe: Dark Matter, Dark Energy, and the Race to Discover the Rest of Reality* (New York, NY: Houghton Mifflin Harcourt Publishing, 2011). The 13.7 billion years is a figure arrived at after much measurement and correction for error. But alongside these measurements we have discovered two major problems with this answer. That is, most of the mass of the universe is made up of matter that we have only the faintest idea what it is so we have called it dark matter, and most of the energy in the universe is wrapped up in what we have come to call dark energy. They are called dark because we don't know what they are. They will not remain dark forever, but our physics has yet to do more than scratch the surface of what they really are. The age of the universe is not, however that of the ancients or of those ancient speculations about it. To force the modern universe into the ancient cosmologies would do damage to everything we know about natural law and force our science to be reinterpreted in very narrow terms that would only comprehend a very few things, and obscure the rest of what we already take to be secure scientific knowledge.

On another note, many say that God has done all this by his own will and whim. But this view, whether it is correct or not, (we cannot know this, though many of us believe it), moves us no closer to the knowledge of the universe we seek. Just saying that God performed all of this is uninformative, and has in many cases just prevented further inquiry. Suggesting that God is not a very good explanation for the universe doesn't in any way reject the possibility, and even great probability that the universe was formed by a great intelligent architect. That idea must be explored on its own terms, without also rejecting the more than reasonably secure science humans have achieved at this point. What we aim for is not an exclusive and absolute answer that forbids further questions, but a milieu in which we can hold truth without abandoning our curiosity.

The modern Expanding Universe cosmology: The Big Bang

Development of the modern cosmology, specifically, the Big Bang cosmology with all its material and theoretical structures was the long and arduous result of centuries of observation, mathematics, theories, structures, presuppositions, and the occasional lucky discovery. The basic elements of this cosmology are in place. At one time, calculated to be approximately 13.7 billion years ago, our universe sprang into existence. Though many claim to know how this happened, no human being observed the event. Some believe that the universe brought itself into being, that it is self-caused, while others believe God brought it into being. Others believe that our universe is only one of uncounted universes, and that a *multiverse* spawns universes like ours all the time. But the multiverse explanation only serves to put the question about a cause further back. One then asks what caused the multiverse. Was it self-caused, or did God

create it. But that question is even less answerable than the question about the cause for our universe since no one has observed other universes or indeed, the multiverse, in contrast to the fact that we can observe a small part of ours.

Before the Big Bang cosmology, many thought that the universe was eternal, and perhaps cyclical. That is, there was no discernable beginning. Albert Einstein and many of his contemporaries believed this, and they only reluctantly admitted, when the preponderance of evidence and theory required it, that the Big Bang cosmology had better basis in observable facts, physics, and mathematics. If the universe is unchanging and eternal, then no explanation of cause is required. All we have to do as physicists is discover how the universe works without having to say why it works that way. The discovery of an origin, a beginning, begs for a cause, looks for an explanation of why.

Models

I have used the word model, now let me explain the concept. It is an extremely useful concept and one that is instrumental in science. It also makes religion possible. Models in science are called theories and models in religion are often called theologies, though there are religions like Buddhism that are more like philosophies than theologies because Buddhism does not require a deity, in fact, assumes that there isn't one. So then Buddhism has a philosophical model. The Big Bang cosmology is a scientific model. Models are devices we use to explain the real world. Dolls, toy cars, and doll houses are models of a kind that we use to instruct young children about the real world through play. Toys of a variety of kinds are used for the same purposes.

Models in science imitate features of the real world. They instruct us about the shape and actions of things. During the time the West moved toward a theory of a heliocentric planetary system from the sixteenth through the seventeenth century, people devised models of the solar system called *orreries*. Figure 4 shows one version of this device.

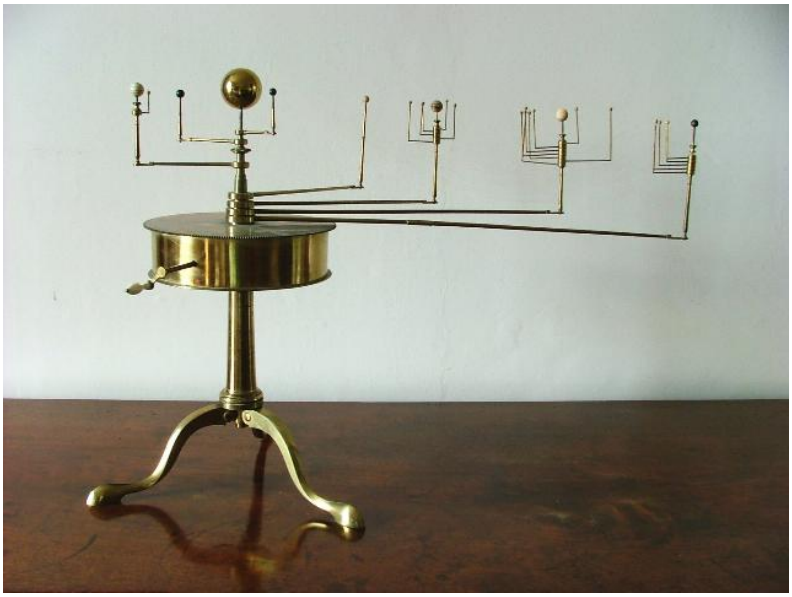

Figure 4. Orerry by Gilkerson and Co.[33]

Though the model is not built to scale, (the planets are bigger than they should be, the Sun smaller, the distances are not in proportion), when the machine is operated, the planets circle the sun, the moons their planets, and their relation to each other is a near approximation of their actual relation in the heavens over time. The physical model, shown above, is built from a mathematical model of the solar system based on

[33] Accessed April 22, 2016 <http://star.arm.ac.uk/history/instruments/Glikerson-orrery.html>.

observations by many astronomers and contains many measurements and calculations. So the model is not only a physical thing, it is a mathematical thing. The mathematics give us the ability to create a physical device that mimics some characteristic of nature.

So, the model begins with observations and data, proceeds to mathematical calculations, then finally to reproducing some features of the real world we attempt to understand. Today, we often reproduce mathematical models in computer simulations. If you've seen a weather report, you have witnessed the results of modelling the weather in order to predict its behavior in the near future. As you know, those predictions are not always successful, but they often are. As those weather models are refined, that is, adjusting the mathematics and thus the accuracy of the model, the predictions coming from those models become more accurate and thus more useful. However the greatest limitation in predicting the weather is not the model itself but the massive project of collecting all the data and feeding it to the model.

So, the concept of a model, a functioning replica of some feature of reality, should be understood by now. We use models to guess what reality is like, and we do that by comparing our model with the real world. So, you see, modern cosmologies are models of the real universe, often demonstrated in computer models meant to simulate the real universe. The reason we try to simulate reality is to find out first how it works, second to predict its actions, and third, to create technologies that use the physics of the real world in practical ways.

The Big Bang model of the universe gives us both a narrative of the ancient past and ability to predict the future. Our astronomical observations are giving us the ability

to understand the evolution of systems of planets like our own by observing those in distant space that are in the process of formation. This narrative does not settle the question about the cause of the universe, or why we are here, but it does solve the question about our history with some success. That doesn't mean all the riddles are solved, but rather we are at the beginning of writing a much richer narrative within that basic structure or outline. Part of the question of how we arrived at this point in time is answered, and further evidence we are now collecting seems to support this basic structure.

The accomplishments of physics, astronomy, archaeology, chemistry, and anthropology are fleshing out this richer narrative, and modelling a real world that until a few centuries ago remained hidden from us, things that the discipline of **metaphysics** only guessed at. Now that physics has a better grasp on reality, much that *metaphysicians* accomplished in history has been sidelined. But it would be a mistake to suggest that the physical models of the universe and human beings are anything like complete descriptions that answer the big questions about meaning or consciousness. They do not do this satisfactorily, and part of the job of philosophy, indeed the need of philosophy, is to sort out what remains to be done, what we know, what we do not know. What our scientific models also tell us is that if metaphysics is to accomplish its task, it may not overwrite modern discoveries by insisting on its ancient axioms which have turned out to be false. One cannot replace the modern cosmology with an ancient one or even elements of an ancient one and consider that they have accomplished anything. That's just a scientific, philosophical, and metaphysical mistake.

In addition, philosophy can help science avoid the mistake of making claims that are more expansive than the data permits. Suggesting, as many have in our era that because science explains so much about how we got here we no longer need God as an explanation, is a mistake. It is not that we can prove scientifically whether there is a God or not, but making claims about the non-existence of God with the little evidence we have is premature. The difficulties of creating a model of reality must not be underestimated. A variety of difficulties present themselves to us that we must overcome if we wish to proceed.

I present you with one of the earliest meditations on the difficulties of constructing a new model of knowledge. Francis Bacon (1561-1626), a citizen of England who served the royal houses of England, wrote a variety of books attempting to outline the requirements of a scientific worldview. One of the most famous passages concerns "The *idols* and false notions which have already preoccupied the human understanding."[34] Bacon enumerates four idols. They encompass the entire region of human understanding. They are called idols because they usurp the place of true understanding. The project he set out to accomplish is that of rewriting not only the basic suppositions of our rationality, but replacing them with a balanced view that took in the real world and our rationalizations about it. His method relies heavily on observation and then evaluation. He is called the father of modern science because his view requires not only the real world, but fair evaluation of the relation between

[34] Francis Bacon, *Novum Organum or True Suggestions for the Interpretation of Nature*, ed, Joseph Devey (New York, NY: P. F. Collier & Son, 1902), <http://www.gutenberg.org/ebooks/45988>, accessed 3 May, 2016.

elements in that world, as well as sound reasoning about it. He resisted quite strenuously any suggestion of metaphysics that might dominate the research. The problem on his account is that the very basic elements of metaphysics undermined the scientific process.

For example, Aristotle suggested that heavier things fall faster than lighter ones. Obviously, Aristotle had not tested this theory or he himself would have rejected it. But it took Galileo Galilei, in the sixteenth and seventeenth centuries to challenge Aristotle's supposition with rigorous empirical tests. For almost 2000 years the erroneous supposition of Aristotle held sway. The authority of an untested assertion ruled the behavior of thinkers and practitioners of science in its infancy. This is the sort of problem Francis Bacon wished to prevent. I will let Bacon's words speak for themselves. Originally written in Latin, the translator uses a variety of words unfamiliar to modern speakers. Where unusual words are used, the content is edited for clarity or definitions are provided.

Novum Organum

Sir Francis Bacon, a selection

Edited by Joseph Devey and this author

From Aphorisms — Book I

38. The idols[35] and false notions[36] which have already preoccupied the human understanding, and are deeply rooted in it, not only so beset men's minds that they become difficult of access, but even when access is obtained will again meet and trouble us in the instauration[37] of the sciences, unless mankind when forewarned guard themselves with all possible care against them.

39. Four species of idols beset the human mind, to which (for distinction's sake) we have assigned names, calling the first **Idols of the Tribe**, the second **Idols of the Den** (or Cave), the third **Idols of the Market**, the fourth **Idols of the Theatre**.

40. The *formation of notions and axioms*[38] *on the foundation of true induction* is the only fitting remedy by which we can ward off and expel these idols. It is, however, of great service to point them out; for the doctrine of idols bears the same relation to the interpretation of nature as that of the confutation of sophisms[39] does to common logic.

41. The **idols of the tribe** are inherent in human nature and the very tribe or race of man; for man's sense is falsely asserted to be the standard of things; on the contrary, all the perceptions both of the senses and the mind bear reference to man and not to the universe, and the human mind resembles those uneven mirrors which impart their own properties to different objects, from which rays are emitted and distort and disfigure them.

[35] Bacon's use of the word idol here is meant to convey the idea that even as idols come between a person and their God, so these false notions come between a person and truth about reality.
[36] Bad ideas.
[37] The action of restoring or renewing something.
[38] Rules that are thought to be basic and without need of proof.
[39] "confutation of sophisms" may be read "argument against bad reasoning."

42. The **idols of the den** are those of each individual; for everybody (in addition to the errors common to the race of man) has his own individual den or cave, which intercepts and corrupts the *light of nature*, either from his own peculiar and singular disposition, or from his education and conversation with others, or from his reading, and the authority acquired by those whom he reverences and admires, or from the different impressions produced on the mind, as it happens to be preoccupied and predisposed, or equable and tranquil, and the like; so that the spirit of man (according to its several dispositions), is variable, confused, and as it were actuated by chance; and Heraclitus[40] said well that men search for knowledge in lesser worlds, and not in the greater or common world.

43. There are also idols formed by the reciprocal conversations and society of man with man, which we call **idols of the market**, from the commerce and association of men with each other; for men converse by means of language, but words are formed at the will of the generality,[41] and there arises from a bad and inept formation of words a wonderful obstruction to the mind. Nor can the definitions and explanations with which learned men are inclined to guard and protect themselves in some instances afford a complete remedy—words still manifestly force the understanding, throw everything into confusion, and lead mankind into vain and innumerable controversies and fallacies.

44. Lastly, there are idols which have crept into men's minds from the various dogmas of peculiar systems of philosophy, and also from the perverted rules of

[40] Heraclitus of Ephesus (535 - 475 BCE), < https://en.wikipedia.org/wiki/Heraclitus>.
[41] "will of the generality" means that we define words by the way we use them. Words do not have absolute definitions, and though we often define words in dictionaries, those meanings change over time. For example, the Oxford Dictionary of the English Language defines words as they are used today as well as all the past meanings of the words.

demonstration,[42] and these we denominate **idols of the theatre**: for we regard all the systems of philosophy hitherto received or imagined, as so many plays brought out and performed, creating fictitious and theatrical worlds. Nor do we speak only of the present systems, or of the philosophy and sects of the ancients, since numerous other plays of a similar nature can be still composed and made to agree with each other, the causes of the most opposite errors being generally the same. Nor, again, do we allude merely to general systems, but also to many elements and axioms of sciences which have become unchangeable by tradition, implicit credence,[43] and neglect. We must, however, discuss each species of idols more fully and distinctly in order to guard the human understanding against them.

45. The human understanding, from its peculiar nature, easily supposes a greater degree of order and equality in things than it really finds; and although many things in nature be unique and most irregular, will yet invent parallels and conjugates and relatives[44], where no such thing is. …

46. The human understanding, when any proposition has been once laid down (either from general admission and belief, or from the pleasure it affords), forces everything else to add fresh support and confirmation; and although most cogent and abundant instances may exist to the contrary, yet either does not observe or despises them, or gets rid of and rejects them by some distinction, with violent and injurious prejudice, rather than sacrifice the authority of its first conclusions. … In establishing

[42] "perverted rules of demonstration" This has to do with the misuse of logic to prove something.
[43] "implicit credence" refers to a common sense answer. "It seems so obvious to our senses."
[44] connections and relationships

any true axiom the negative instance is the most powerful.[45]

47. The human understanding is most excited by that which strikes and enters the mind at once and suddenly, and by which the imagination is immediately filled and inflated. It then begins almost imperceptibly to conceive and suppose that everything is similar to the few objects which have taken possession of the mind. …

…

49. The human understanding resembles not a dry light, but admits a tincture of the will and passions, which generate their own system accordingly; for *man always believes more readily that which he prefers*. He, therefore, rejects difficulties for want of patience in investigation; sobriety, because it limits his hope; the depths of nature, from superstition; the light of experiment, from arrogance and pride, lest his mind should appear to be occupied with common and varying objects; paradoxes, from a fear of the opinion of the vulgar; in short, his feelings imbue and corrupt his understanding in innumerable and sometimes imperceptible ways.

50. But by far the greatest impediment and aberration of the human understanding proceeds from the dullness, incompetence, and errors of the senses; since whatever strikes the senses holds sway over everything, however superior, which does not immediately strike them. Hence contemplation mostly ceases with sight, and a very scanty, or perhaps no regard is paid to invisible objects. … All the better interpretations of nature are worked out by instances[46], and fit and apt experiments,

[45] Counterexamples must not be excluded from the conversation. Often when a clear example of how the mistaken belief is wrong, it is easier to reject the mistake.
[46] models

where the senses only judge of the experiment, the experiment of nature and the thing itself.

51. The human understanding is, by its own nature, prone to abstraction, and supposes that which is fluctuating to be fixed. But it is better to dissect than abstract nature: such was the method employed by the school of Democritus,[47] which made greater progress in penetrating nature than the rest. … It is best to consider matter, its conformation, and the changes of that conformation, its own action, and the law of this action or motion; for forms[48] are a mere fiction of the human mind, unless you will call the laws of action by that name.

52. Such are the **idols of the tribe**, which arise either from the uniformity of the constitution of man's spirit, or its prejudices, or its limited faculties or restless agitation, or from the interference of the passions, or the incompetence of the senses, or the mode of their impressions.

53. The **idols of the den** derive their origin from the peculiar nature of each individual's mind and body, and also from education, habit, and accident; and although they be various and manifold, yet we will treat of some that require the greatest caution, and exert the greatest power in polluting the understanding.

54. … If men … apply themselves to philosophy and contemplations of a universal nature, they wrest and corrupt them by their preconceived fancies, of which Aristotle affords us a single instance, *who made his natural philosophy completely subservient to his logic*, and thus rendered it little more than useless and disputatious.

[47] Democritus (460 – 370 BCE), <https://en.wikipedia.org/wiki/Democritus>.
[48] Bacon rejects Plato's forms, perfect templates from which all of matter, space, and time comes.

…

End Selection from the *Novum Organum*.

Bacon analyzed a number of difficulties the observer of nature can fall into. Those four idols are capable of twisting our observations into a form that no longer resembles the observed world, at least the world that can be agreed to by the variety of impartial witnesses. Our scientific view of the world is so much closer to the truth of reality than those views preceding them that we can safely abandon the previous views as failed attempts, inaccurate at best. However, when the idols are active in our minds, it becomes very difficult to abandon failed views or adopt views that were correct but still at that time speculative.

Bacon himself was subject to the same flaws and failures that he warned others against, and shown by his cosmology (not demonstrated here), and did not immediately switch to views that, on hindsight turned out to be correct. So many theoretical guesses had been advanced in his age that sorting out the true ones from the false or misleading ones must have been a full-time job. This is true of our day as well. Some sciences are well grounded while others are in continual dispute. Only future hindsight will sort the two kinds out.

One very famous example of a view of this kind is the idea, mentioned above, that the universe is eternal and static. In the early twentieth century many physicists including Albert Einstein believed that the universe existed from eternity and did not have a beginning. They believed that as far into the past as you look, you will discover the same universe. It always existed. It was always the same. The changes that took

place in the universe were not those of the shape and size of the universe, but merely the exchange of matter and energy, movement from one place to another. This was an enticing theory for a number of reasons. One, if there was no beginning, one would not need to explain it or give a date for it, or even calculate its size. From the beginning of the twentieth century Einstein and the astronomer Edwin Hubble favored this view. Einstein even built his equations around that belief.

However, Vesto Slipher in 1917 measured what is called the red shift.[49] He concluded that when celestial objects like stars are moving away from Earth their spectrum moves more to the red side of the visible light spectrum. The more the shift, the faster the speed an object moved away from us. In 1925 Edwin Hubble discovered that the fuzzy cluster of stars, a nebula, we now call Andromeda, was extremely distant from us. Until then we did not know whether all the objects in the sky were part of our own galaxy or whether the universe was much larger than that, containing other galaxies like our own.

Georges Lemaître in 1927, using Einstein's equations, suggested that this red shift proved the universe was expanding, because objects that were farther away were moving away faster than closer objects.[50] In 1929 Edwin Hubble published a paper in which he stated that the universe was constantly expanding, and used his observations to prove it. Not until later was it admitted that the nebulae were in fact galaxies like our own. In 1931 Einstein admitted that the universe was expanding, and on that account must have a beginning. As I have said earlier, scientists have now calculated the

[49] Redshift article <https://en.wikipedia.org/wiki/Redshift>, accessed 25 June, 2016.
[50] Farrell, John, *The Day Without Yesterday: Lemaître, Einstein, and the Birth of Modern Cosmology* (New York, NY: Avalon Publishing Group, 2005).

beginning of the universe at approximately 13.7 billion years ago. So, though the evidence was available for years, Einstein did not immediately change his mind about the static theory of the universe. It was a process that required a good deal of time and the evaluation of a variety of evidences. In Bacon's terms the four idols were too deeply entrenched in Einstein's mind for the great physicist to dislodge without a great deal of effort. And it turns out that the Expanding Universe model because it requires a beginning is in substantial agreement with the Bible.

I've given a scientific example, but there are examples in many fields. Theology has problems of this kind, as do many other disciplines. Only by first leaving behind the idols of the tribe, den/cave, marketplace, and theater can we proceed in our examinations. This is not a trivial task. Calling into question things that seem perfectly natural to our minds is often extremely difficult. And there are many things that our minds take to be natural that are indeed false or misleading. Only with persistence in accepting only the best evidence can we even hope to abandon our cherished but false beliefs. But first we must learn that our commonsense apprehension of reality can be flawed, that it can mislead us, that it does not lead us to certainty. That doesn't mean that our commonsense perception is always wrong, but that common sense is subject to errors it can't correct. We will examine some of these issues in Chapter 3. But first, let's proceed in the next section to sort out some of the things we know, some of the things we don't, and what we can do to further the knowledge project.

Physics and Metaphysics

The discovery that the universe emerged at one point creating time and space in the ancient past has changed the way we imagine reality, the way we define our cosmology. It has removed forever the concept that the universe has always existed, removed from many of the ancient cosmologies the thought that before the acts of creation the heavens and earth already existed. They did not. But the new narrative that has become a standard both for science and the Christian religion is one that physics has driven in the last 500 years. It can't be ignored. It can't be replaced with a more primitive and supposedly truer model. It can be adjusted with new data and knowledge, and may be replaced in the future with something better approximating reality as we will come to know it, but at the moment, there is a great deal of work to do just to comprehend the mysteries we have already exposed. Our model of the universe and our models that simulate smaller portions of that universe are still functioning well enough that we should not scrap them. And we certainly shouldn't scrap them for more ancient, less accurate cosmologies just because a text we believe is authoritative requires us to do so. That is not the path of inquiry, or the search for truth.

The Laws of Nature

First, let me say something about the laws of nature from a **realist perspective**. Usually when we think about laws, we think about the conventions we use to live in society. Most human cities use different colored lights or signs to tell people in cars, bicycles, scooters, and walking whether to stop, go, yield, or turn. The color Red has been used by most cities to tell people to stop. We impose the laws of civilization on each other to make daily transactions more fluid and peaceable, at least some of them.

As you know we are not perfectly good at it, and sometimes we are very bad. But the conventions like colored lights and signs remain fixed in our cultures as a way of consolidating our agreements and helping us get along.

The laws of nature do not work quite the same way. We do not impose laws on nature by a convention like that. In fact we only call a theory of science a law of nature if we understand it well enough to predict the future with it. This was true of the law of gravity as defined by Sir Isaac Newton in his monumental work *Principia Mathematica*. For millennia, observers had been trying to make a model of the planetary system we live in, but were largely unsuccessful because we had some errors at the very beginning of our calculations. These sorts of errors were common, and very difficult to weed out, because they reflected our best intuitions about what we observed, part of our commonsense grasp of the world. But as our observations got better and more numerous in the sixteenth and seventeenth centuries CE, we learned the weaknesses of the geocentric system as expressed by Ptolemy in the second century CE and expanded upon by numerous observers and mathematicians. Realizing the serious problems with the geo-centric system, Nicolaus Copernicus developed a description of our planetary system based on the sun being at the center, not the earth.[51] He suggested this must be true because the mathematical calculations to arrive at successful predictions of planetary motions were much simpler with his system than the cobbled together Ptolemaic system. There were errors in Copernicus' system as well that were not resolved until the early seventeenth century when Johannes Kepler

[51] This was not based on intuition but on ancient Greek astronomer and mathematician Aristarchus of Samos of the third century BCE who made this suggestion first in the West. <https://en.wikipedia.org/wiki/Aristarchus_of_Samos>, accessed 8 June, 2016.

calculated the orbits of the planets as elliptical instead of circular. Along with the more accurate observations from Galileo Galilei's invention of the telescope in 1609, and further refinements of it in the seventeenth century, Isaac Newton devised a mathematical model in which the force of gravity emerged as the primary influence and guide to planetary motion.

What we have in this early version of the law of gravity is a solution to a variety of problems that demystified both planetary orbits and earthly phenomena. But the law of gravity is not a law we imposed on the structure of the universe. Gravity is something we discovered and now try to simulate in our models. We know a great deal more about gravity today than Newton did in the 1680s but we still do not know how it works. We can predict its effects successfully, and create devices that take gravity into account. As a law it functions perfectly well, and though we know its effects, we do not know its cause. We know how it works, and thus call it a law, but do not know why it works. The idea that there are persistent laws in the universe is one of the very foundations of modern science and it is a principle derived from the Bible itself.[52]

So in understanding physics, we must understand that the laws of nature are our best approximation of the function of the universe without knowing precisely how those effects are produced. They are not quite the tidy absolutes we might wish for, but very careful approximations based on our observations of how nature operates. Though people knew for thousands of years that the earth was spherical, they had trouble

[52] Jeremiah 33:25-26. The scriptures declare that the laws of the heavens and earth will never change based on God's promise. "25 Thus says the LORD: If I have not established my covenant with day and night and the fixed order of heaven and earth, 26 then I will reject the offspring of Jacob and David my servant and will not choose one of his offspring to rule over the offspring of Abraham, Isaac, and Jacob."

imagining that there was anything like gravity that would hold people on the planet no matter which side of it they were on. So they worried in Columbus' day in the fifteenth century that if he sailed far enough over the horizon, he would fall off the edge of the earth, like slipping off the side of the Dome of the Rock in Jerusalem. So the laws of nature are our best approximation of the machinery of the universe. These laws have consequences that we trace through observation and mathematics in a narrative called the Great Chain of Being. We do not understand all of the leaps in order, but we can clearly see that one thing must precede the other, even as the existence of dirt must precede the sowing of seeds and growing of plants.

The purely physical part of the great chain of being is a model for the emergence of complexity in the universe.[53] It begins to answer the question of how the universe became like it is, how stars formed, how galaxies formed, how planetary systems and eventually life formed. The formation of life is a question deeper than any answer we have, and the emergence of consciousness in animals, then intelligence are both extremely difficult on their own terms. The scientific answer to the great chain of being has competitors that come from some of the oldest ideas and religions. And though those old cosmologies have weight for other reasons than science, they are to be discounted as adequate explanations because of their non-scientific nature. But their part in this narrative needs to be understood.

The Great Chain of Being

Let me draw a picture of the **great chain of being**, the emergent character of the

[53] The Chronology of the Universe, <https://en.wikipedia.org/wiki/Chronology_of_the_universe>, Accessed April 22, 2016.

universe into all the features we now perceive. The model is not simple or a linear step by step function of reason, but a narrative of our observations with plenty of bumps and bruises, great disasters, loss of life, and violent transformation. It is also a story of slow and steady progress, inevitable formation of order through the laws of physics, chemistry, and biology, and as some of us are discovering, the necessity of including consciousness as an elementary constituent of reality.[54] To tell this story would require the entire library of science, philosophy, and religion, but we will shorten it to provide a few significant moments and enduring structures.

So, in the beginning, from nothing, the universe emerged very rapidly within less than a second to an extremely large size. It grew faster than the speed of light, then slowed to something less than its current speed of expansion. Not only did the universe start time at the moment it emerged, but space as well did not exist until the universe came into being. From Albert Einstein in the early twentieth century we have the annunciation of the idea of space/time. Not two things but one.

So the first element, the first stage in the great chain of being is the **emergence of the universe** itself. The second element is its **self-organization into stars**, galaxies, and the galaxy clusters we have today. There is something about the universe that, though it seems random at first is, in fact, well ordered. Through that order, we begin to perceive laws about its order, and then construct models of how it might have

[54] Nagel, Thomas, *Mind and Cosmos: Why the Materialist Neo-Darwinian Conception of Nature Is Almost Certainly False* (New York, NY: Oxford University Press, 2012).

happened. We must be cautious, however, to take Francis Bacon's advice and avoid attributing order where it does not appear. If there is disorder, and it certainly appears that there is, we must, for truth, allow disorder its place.

The formation of stars from the gravity that draws hydrogen gas together till it ignites is the process of fusion that creates heavier elements within the stars until the stars reach a certain stage of development when they explode. In their deaths, stars create the other, heavier elements known in the periodic table of elements.[55] From all the elements remaining from the death of a star left in great clouds of dust come new stars and planetary systems like our own, organic molecules that make up life as we know it, and all the supporting structures that make life possible.

The third stage, the third element is the **emergence of life**. As I have said, this is the greatest wonder that we know at the moment. Some have said that the mystery of life's origin is deeper than the emergence of complex life forms like ourselves from the theorized original living cells. The bigger question that arrives about life is why the universe seems to favor it in the first place. We look at the conditions of our planet and see that it is extraordinarily well adapted for the emergence and sustenance of life. Why is that? There is a theory called the **fine-tuning** argument. It states that the laws of nature work together so perfectly that life will emerge given enough time. Nature produces all the basic features that make and sustain life. The speculation for why this is true has been given many answers. Some say that the universe has tuned itself, while others, consistent with the biblical view, insist that a great engineer has devised the laws such that life will emerge. We will not solve the riddle here about the cause of

[55] Periodic Table of Elements <https://en.wikipedia.org/wiki/Periodic_table>, accessed 25 June, 2016.

this fine tuning. Many theories and a variety of ideas within them have good rationalities and it's possible they will find common ground eventually. These studies are ongoing and are being rigorously developed today by a broad spectrum of thinkers and scientists.

The startling fact of the universe's fine tuning is cause for much speculation. But being true leads us to this third stage which is the emergence of life. Over the eons of time, life developed on earth into a myriad of forms. Most of these lifeforms have become extinct, yet there are close to 9 million species living today. The very fact of life leads us to the next stage in the great chain of being, the **emergence of consciousness**.

At what point consciousness emerges, or whether there is any beginning of consciousness is a point of argument. We ask whether single celled life is conscious, and our answer depends rather on how we define consciousness, than on whether consciousness exists at any time during the development of life. We know that many forms of life are now conscious. Does consciousness emerge once a life form is complex enough, or does it require a soul?[56] Is there a large gap between consciousness itself and self-consciousness like we find in humans, or is it a matter of degree? Are apes, whales, dolphins, and elephants self-conscious like humans are, or is their behavior just an imitation of self-consciousness, or do we attribute self-consciousness to them because we see behaviors in them that are like our own, behaviors like mourning and burying their dead, friendship, and a variety of other

[56] The question about "having" a soul and "being" a soul has not been resolved. And in many cases this argument is the sticking point to a variety of theological problems. Not only theological problems but medical ones. Is there a separate substance called soul that inhabits a living person, or is it like Aristotle suggests the life force itself.

behaviors?

Self-consciousness is a clue to the next stage in the great chain of being, **intelligence**. But intelligence may have developed alongside consciousness. What we do know is that human self-consciousness allows rational reflection about ourselves. That may be obvious, but try to think of the same thing in a dog, or a cat. The question of whether a dog or cat is self-conscious is more interesting. In general they do not look in the mirror the same way we do. And yet dolphins pass the mirror test. They recognize themselves, pose, and play in front of the mirror as humans do. We do not know whether they are considering their future or past like we do. But we know they are intelligent. They know how to hunt and survive, how to reproduce and rear their offspring. Their lives are as fully complex as many humans. They dream, they have wishes and like us they can see their deaths ahead, though not as far ahead as humans do. They learn habits and skills from their mothers. They feel pain and react to stimulus both positive and negative, and they know the difference. They are obviously intelligent, though not the same as humans. The question about this feature of life is whether intelligence is just a matter of degree, or as many have suggested a matter of kind.[57]

[57] The argument on some accounts regards the authority of ancient texts and the obvious differences between animals and people. The Bible, for instance, suggests that people's intelligence is of another kind than animal intelligence. People were created specially, with a variety of attributes unavailable to animals. This seems correct on the surface, but further examination leaves a few problems. That is, it is problematic to square some absolute distinction between all animals and all people based on observable differences. That doesn't mean there isn't some general difference between people and animals, but that the difference may be more a matter of degree than of kind. That is, any particular aspect that is thought to be exclusive to people, can be shown at least in some degree in some animals. This doesn't argue against the authority of ancient texts. What it requires is that the ancient text be placed in its own context for purposes of interpretation. One cannot interpret it as if it is a modern text with modern origins and implications. The ancient text cannot be expected to comment on scientific observations since scientific observations are of a modern sort. Neither can the ancient texts be forced into any other modern pattern without also destroying the possible intent of the author, and misrepresenting the text itself. Though it may not be entirely possible to understand the intent of the ancient author, to require that author to be commenting on or critiquing a modern worldview or set of problems is beyond any rational or faithful interpretative mode.

But a more interesting issue is whether there is a threshold between levels of complexity that when reached a transformation of some sort takes place.

That question can't be resolved happily within these pages. Suffice it to say that with each increase of complexity there is a leap between the predecessor and the higher stage. So, at this point we have a movement first, from:

Emptiness and Nothing to a Universe with space and time,[58] then

From an undifferentiated Universe to distinct clusters of organized matter in stars, galaxies, and planetary systems, then

From that organized material to self-replicating Life, then

From Life to Consciousness of the external world, then

From Consciousness to Intelligence in relation to survival, then

From Intelligence to Self-Conscious rational reflection, then

From Self-Consciousness to Freedom and the Moral Law, then

From Freedom to Spirituality, beyond which is very little but imagination.

Let's not mistake the intent of this description. This is a view of physics that relies deeply on the movement through time by the instrumentality of natural laws which we are in the middle of understanding and the beginning of explaining. The ancient cosmologies do not go in the direction which relies heavily on naturalistic logic and understanding. The final steps to freedom and spirituality are deeply contested from a materialistic viewpoint,[59] yet these steps are included because it is too early to shut off

[58] This is not the place to mull over the issue whether God created the universe, or whether the universe sprung into existence on its own. Though this issue is interesting, of course, it cannot be resolved except by fiat declaration, then the long string of logic over evidences that point to one resolution or the other.
[59] Materialism will be defined as we go along. As a theory, materialism takes as an axiom that there is no such thing as non-material being. That is, spirit, souls, ghosts, etc. are nothing more than fictions of our

the discussion with the highly restrictive view emerging from naturalism. It is more than clear that consciousness remains a puzzle to those who cannot imagine a universe more complex than what the laws of chemistry allow, that universe found in a naturalistic, materialistic worldview. However, our experience and history must allow for the broadening of our scope past the quibbles of religion and materialistic philosophy. We should not contend about the existence of consciousness, but rather try to understand it on its own terms. We should not exclude it logically from the discussion just because some elementary theory tells us it can't exist. There must be something wrong with the theory then since all people are conscious of their consciousness, by whatever name that might called.

Each advance in complexity in this chain of being carries the information and logic of its predecessor state. For example, living beings do not cease to be chemical beings just because they are more complex than their underlying chemistry. But neither can the laws of chemistry explain without remainder the processes of life. There is more information invested in life itself than is encompassed by the laws of chemistry. Life is a larger, more inclusive system than chemistry. This seems also to be the case between mere life and self-conscious life in persons. One's self-consciousness can't be explained merely in terms of the mechanical processes of life. Something more complex than life itself must explain self-consciousness.

The great chain of being as we have it in this short synopsis is more than could be accomplished with the limited tools of ancient cultures. And none of them could have developed it in the modern fashion. Nor can the ancient cosmologies be explained

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imagination.

within the modern one. The oral histories that granted the ancients their forms of culture do not exist any longer, except, of course, in some tribes largely unaffected by the modern world. The modern cosmology, based on physics and chemistry; material and life sciences; political, moral, and spiritual practices all correspond with the real world more exactly than any of their predecessors, though in all humility we must insist that our apprehension is only in a middle state of completion.

The Standard Timeline

The standard timeline[60] for these events is well known by a variety of evidences. And though we categorize everything from freedom (implying morality) through spirituality (implying transcendence) as important, they fall very late in time, say, sometime within the last 200,000 years.[61] Our discussion of these will follow the section on the timeline.

On the scientific scale of years, the universe is approximately 13.7 billion years old. The first 10 seconds comprise the plasma universe. This beginning marks an extremely fast expansion. Plasma is the first form that matter takes of the four possible forms. We all know that matter takes solid, liquid and, gaseous states. Plasma is of much higher energy where the atomic forces that hold matter together are too weak to influence the form it takes. Plasma is like a gas, except that there are no elements, only the energetic primal components and electrical charges of ordinary matter. Within

[60] The Timeline of the Formation of the Universe, <https://en.wikipedia.org/wiki/Timeline_of_the_formation_of_the_Universe>, accessed April 22, 2016.
[61] That figure is extremely fuzzy. It may be modified when we know more. And depending on what people consider spiritual behavior, the figure may be extended much further into the past. If respecting the dead and burying the dead with artifacts for the next life counts, then the figure for spiritual behavior must be extended back not only to humankind's earliest ancestors and near relatives like the Neanderthals, but to animals like elephants who ritualize the deaths of their kin.

minutes the universe sorted out its components into hydrogen and helium. The expansion of the universe slowed as gravity took hold. Within 70,000 years matter dominates, and within 400,000 years the only available light is from the cosmic microwave background radiation. In 100 million years stars begin to form. Visible light begins to dominate the universe at 600 million years and galaxies begin to form.

The birth of our solar system took place approximately 4.6 billion years ago, 9.1 billion years from the beginning. Our sun is probably a second or third generation star. The earth coalesced from interstellar gas and dust as did the other planets, moons, and asteroids, comets, etc. in our planetary system. The birth of biology in the earth begins around 3.8 billion years ago, and complex cellular life around 1.25 billion years ago. Land animals and plants appear around 500 million years ago.

The emergence of distinctly human life is a question for biology, anthropology, and archaeology, though some trace the most distinctive feature of humans, bipedalism,[62] to around 7.5 million years ago. The evidence for the first distinctive tool use by early people, is around 2.5 million years ago. Modern tool use began around 50 thousand years ago, and some of the earliest evidences of agriculture and human civilization are found around 12 thousand years ago.[63]

One cannot give a date of the origin of spoken human language, one of the most distinct features of human rationality, because we lack evidence. Any guess about the beginning of human language is dependent on a variety of other assumptions about the progress of human development. So, guesses about the origins of human language

[62] Walking exclusively on two legs, while most mammals walk on four legs.
[63] Human Evolution <https://en.wikipedia.org/wiki/Human_evolution>.

range from 2.5 million years ago to 50 thousand years ago. But we do have the records of the emergence of written language, the time when humans began to write their own histories and keep accounts of their possessions. Current evidence shows us that language systems like Mesopotamian cuneiform, Egyptian hieroglyphics, or the Chinese glyphs show up in history around 5,500 to 6,000 years ago. But there are evidences of symbol use as far back as 20 thousand years or more.

It is not essential to human life or even flourishing that each or every part of this narrative is adopted in one's intellectual journey. There are good reasons to further examine both the presuppositions and data of these models, but they have a much more secure provenance than the supposed scientific facts of anything recorded in ancient holy texts, none of which are more than about 35 to 40 centuries old, and many much younger. That doesn't mean that the holy texts contain errors, but that using them to interpret modern history is an anachronism that often writes over the solid evidences already generally accepted. That doesn't mean that the histories they record are incorrect. We have good evidence that the Bible's history is the best one supported by archaeology for a well fleshed out narrative of many ancient peoples of the Middle East. Archaeology in the Middle East consistently finds itself in agreement with the Hebrew scriptures, even though often it has disputed the truthfulness of these accounts within the last three hundred years. But it must be realized that the purpose of the Bible was, without exception, to influence the behavior of its audience. So there are inconsistencies in the variety of historical reports in the Bible that leave readers without

a secure footing, and waiting for external evidence.[64]

And if one were to say, as the Muslims do that the Qur'an is perfect, the word of God, without error, then one has to ask why there are varieties of interpretation, leading unfortunately to wars and other conflicts. This is certainly also true of Judaism, Christianity, Hinduism, Buddhism, and the large variety of other religions and philosophies that appeal to texts of a certain kind. The fact that people can't agree on the interpretation of their central texts, leaves the job of resolving those interpretations to external evidences, and human reasoning.

Critical thinking about scientific evidences as found here, good reasoning, and a variety of other considerations play a part in securing the best interpretation of these texts, as also they do in securing the best interpretation of the cosmos, the laws of nature, and our place and purpose in the world. Philosophy and its seasoned responses to these contentions can play a nurturing role for students of the cosmos. It is for this reason that philosophy as a subject is included in almost every academic project. And academic projects that do not include it may well fail to give a fair account of their reality for the reasons cited in this book. Philosophy, in this sense is first diagnostic, then nurturing, but not necessarily directive. The conclusions people reach, though not entirely subjective, will still result in a variety of interpretations, even between individuals who are otherwise similarly disposed. To say that the desire for uniformity in the products of education is the goal is to ignore what education really does, that is, it encourages people to use the tools of inquiry, without forcing uniformity in the outcome

[64] None of the inconsistencies reflect substantial disagreement. It often looks like the inconsistencies are perhaps transcription errors more than substantive disagreements between writers and editors.

of that inquiry by means of indoctrination. Anything else is not really education. For those who require uniformity of belief, education is an unbounded threat. But those who allow all the evidences to remain as a constant meditation will find that relation to truth which marks the mature individual of any society. Unfortunately, maturity is as much a threat as the truth is for many societies, and there is no guarantee of safety or security in maturity. The reward of a well-rounded education is confidence and reasonable evidentially supported self assurance.

Much is yet unknown, and much that is unknown is not even known to be unknown. Each horizon we cross delivers its own unique set of resolutions, problems, and puzzles. At each step along the way we are forced to adopt new and unfamiliar structures and objects while at the same time adjusting or abandoning prior ones. But some objects of our knowledge remain as persistent guideposts for future explorations no matter how many horizons we cross. These elements seem to persist, no matter how we categorize them, explain them, or even explain them away. Philosophers in history have categorized these objects as **First Principles**.

Metaphysics and its diminishment…

Metaphysics is a variety of idea that attempts to understand and place all that exists within carefully constructed categories, what we would call universal truths. As such, it attempts to be guided by ideas that are both intuitively obvious and logical, what I have referred to above as First Principles. At first, it is Aristotle in the fourth century BCE who defines a set of categories so that all which is known of nature [φυσις, or physics], and all that follows such knowledge is part of our worldview. What follows the

knowledge of physics is metaphysics [μεταφυσις], that is, whatever is not physics, or our knowledge of nature, is to be compiled in a volume that is explained in terms of its relation to nature without the exactitude or perfection of a physical science. Each subject must be accorded the certainty that it deserves. For Aristotle, the first principles guide the distinction between physics and metaphysics, what he calls Wisdom. First principles are the basic rules, or axioms of knowledge. These first principles are separated into causes and knowledge resulting from the practices of not only knowing how things work, but also knowing why.

Aristotle's views about what constitutes first principles are different from our view both of the usefulness of first principles and the applicability of any of the categories that are derived from them. It may be immediately disappointing to find out that this text calls into question the possibility of first principles, axioms of thought, but the reader must understand that these first principles are useful, whether their use in any absolute sense can be defended as true. The reason Aristotle counted them useful is that they generated the categories of our understanding. Part of the problem Aristotle leaves us with is that these axioms are first generated by physics, or what he understood of the natural world. Extend these physical principles through logic and you find the limits of the knowledge of the physical world.

For example, the four elements of the ancient Greek worldview are: Earth, Air, Fire, and Water. Other civilizations included a select variety of other things. You can find these and variations of these throughout the ancient world. For instance, the Chinese included wood as an element. So what Aristotle knew was that causes and effects of physical things all related to these four elements. What we know today is that none of

these four elements have any relation to anything we would call first principles. They are either molecules like water, composed of two atoms of hydrogen and one atom of oxygen, or collections of elements like air or earth. Air is composed of about 78% nitrogen, and around 20% oxygen with trace elements like carbon dioxide, methane, helium, and a variety of other gasses. So speaking of air or water as elemental is just a mistake, and categories based on the supposition of those as elements are probably wrong as well. Really, we know Aristotle's categories were mistaken. If he was mistaken about the elements of the physical world, he couldn't have been correct about reality that he couldn't strictly categorize, those things that were outside physics, or metaphysics.

What he did do was further examine things we take for granted and try to categorize them. This is not so much a mistaken declaration, as an experiment in descriptions. Again, it may be easier to illustrate this with an example. The soul, [ψυχη, psyche, from which we get words like psychology] is for Aristotle equivalent to life itself, the principle that distinguishes living from non-living things. He asked penetrating questions about what life was and how something is alive. He didn't come up with a good answer, but he did give us a variety of answers that though they are incompatible with each other, all tell a story about what life is in some fashion or other. In other words, though he couldn't tell us what the soul was, he described a variety of ideas of what it seemed to be. In that his work is informative. He furthers our inquiries, though he doesn't conclude them. The value of this sort of examination is that he explored a variety of ways that reality appears to us. Unfortunately, these inconclusive musings of his led and misled thinkers for thousands of years in their own researches. It is some of

these ideas that Bacon was trying to eliminate. The ancient tradition of following Aristotle's lead hampered the exploration of reality itself. But today we still have a wide variety of views about what life is, about what the soul consists of. Are they correct? Unfortunately, asking whether our speculations are correct is unanswerable even at this moment. We are incapable of offering more than well-qualified guesses about what the soul is. And many of those guesses are incompatible with each other, relying on systems of thought which are speculative on other accounts, not based on certifiable evidences. And the most broadly held non-religious view is that the soul does not even exist.

So, though Aristotle offered no answer, his metaphysical speculations have guided most of the speculations about what the soul consists throughout subsequent history. Some of his answers are no worse than our best physical explanations. You must see that the story of what the soul is still resides within the realm of those things which may not be physics. But physics has encroached on much of the territory that used to belong to metaphysics. We no longer have to speculate about what the elementary constituents of the universe are, even though we don't know everything about them. We have a fairly good outline that is highly fruitful, and predictive. It is consistent with our best observations even though we know it is not the whole story. So the realm of those things which reside in metaphysics is diminishing. The use of metaphysics, though not coming to a close, is being more tightly constrained by what physics reveals about the world, about ourselves as biological elements of the world, and about our conscious, self-conscious, rational minds.

In addition, the scientific worldview is more generated by what is probable than

what is universally true. And that is somewhat unsatisfying to those who want “the answer.” It turns out that humans may not be able to claim what is universally true, at least not without offering what may make our claims false. And even though some claims people make might be universally true, our grasp of them as being universal will never itself be universal. Our perceptions, rationalizations, and understanding are all less than universal and our expression of these claims will never themselves be universal.

Following is a short excerpt from Aristotle’s book the Metaphysics. I want you to observe its subtlety and the care with which he begins the conversation with us, his students. Note that he is interested in establishing some things that are universally true for everybody. So the first word in the first paragraph tells us something he wants us to think is true for everybody. Whether he succeeds in this assertion, you must decide for yourself. But the evidence he gives for this is compelling on a certain level. That is, it is probably true for most people. The evidence seems true, so it is not unlikely that the conclusion he starts with is correct. It is simple to understand, makes the universal claim that “all men by nature desire to know,” and points to the physical sense of seeing to convince us that his conclusion is true for us. Seeing “makes us know” and helps us to distinguish “differences between things.” The same could be true of hearing, or smell, or the other senses, but Aristotle uses the strongest and most obvious sense to make his case stronger.

It is this universal truth that the category of metaphysics is concerned with. To square Aristotle’s view of the world with modern physics may require that his

"universals" turn out to be probably true with caveats about when they are not or might not be. For example, not everyone has the sense of sight, and even people who have sight do not judge the things they see identically. The perception of visual distinctions may be impossible for a blind person. Even a sighted person can often make mistakes about what they see. The human mind, we have learned, can often mislead us so that our perceptions and interpretations must be carefully examined before accepting them. That is, not to say anything about our ordinary navigation around our local world, but when we judge things, we need to understand more than what our tribe, den, marketplace, or theater interprets for us. Making those judgments is neither a trivial task nor is it possible using bare experience without reflection. Common sense interpretation of the world may not, and has proven not to be universally true. We need something more.

After Aristotle's remarks, we will examine some more of his claims.

Metaphysics

by Aristotle[65] a selection

Written ~350 B.C.E

Translated by W. D. Ross

Book 1: Part 1

[65] <http://classics.mit.edu/Aristotle/metaphysics.1.i.html>

ALL men by nature desire to know. An indication of this is the delight we take in our senses; for even apart from their usefulness they are loved for themselves; and above all others the sense of sight. For not only with a view to action, but even when we are not going to do anything, we prefer seeing (one might say) to everything else. The reason is that this, most of all the senses, makes us know and brings to light many differences between things.

By nature animals are born with the faculty of sensation, and from sensation memory is produced in some of them, though not in others. And therefore the former are more intelligent and apt at learning than those which cannot remember; those which are incapable of hearing sounds are intelligent though they cannot be taught, e.g. the bee, and any other race of animals that may be like it; and those which besides memory have this sense of hearing can be taught.

The animals other than man live by appearances and memories, and have but little of connected experience; but the human race lives also by art and reasonings. Now from memory experience is produced in men; for the several memories of the same thing produce finally the capacity for a single experience. And experience seems pretty much like science and art, but really science and art come to men through experience; for ‘experience made art,’ as Polus says, ‘but inexperience luck.’ Now art arises when from many notions gained by experience one universal judgement about a class of objects is produced. For to have a judgement that when Callias was ill of this disease this did him

good, and similarly in the case of Socrates and in many individual cases, is a matter of experience; but to judge that it has done good to all persons of a certain constitution, marked off in one class, when they were ill of this disease, e.g. to phlegmatic or bilious people when burning with fevers—this is a matter of art.

With a view to action experience seems in no respect inferior to art, and men of experience succeed even better than those who have theory without experience. (The reason is that experience is knowledge of individuals, art of universals, and actions and productions are all concerned with the individual; for the physician does not cure man, except in an incidental way, but Callias or Socrates or some other called by some such individual name, who happens to be a man. If, then, a man has the theory without the experience, and recognizes the universal but does not know the individual included in this, he will often fail to cure; for it is the individual that is to be cured.) But yet we think that knowledge and understanding belong to art rather than to experience, and we suppose artists to be wiser than men of experience (which implies that Wisdom depends in all cases rather on knowledge); and this because the former know the cause, but the latter do not. For men of experience know that the thing is so, but do not know why, while the others know the ‘why’ and the cause. Hence we think also that the masterworkers in each craft are more honorable and know in a truer sense and are wiser than the manual workers, because they know the causes of the things that are done (we think the manual workers are like certain lifeless things which act indeed, but act without knowing what they do, as fire burns, —but while the lifeless things perform each of their functions by a natural tendency, the laborers perform them through habit);

thus we view them as being wiser not in virtue of being able to act, but of having the theory for themselves and knowing the causes. And in general it is a sign of the man who knows and of the man who does not know, that the former can teach, and therefore we think art more truly knowledge than experience is; for artists can teach, and men of mere experience cannot.

Again, we do not regard any of the senses as Wisdom; yet surely these give the most authoritative knowledge of particulars. But they do not tell us the ‘why’ of anything—e.g. why fire is hot; they only say that it is hot.

At first he who invented any art whatever that went beyond the common perceptions of man was naturally admired by men, not only because there was something useful in the inventions, but because he was thought wise and superior to the rest. But as more arts were invented, and some were directed to the necessities of life, others to recreation, the inventors of the latter were naturally always regarded as wiser than the inventors of the former, because their branches of knowledge did not aim at utility. Hence when all such inventions were already established, the sciences which do not aim at giving pleasure or at the necessities of life were discovered, and first in the places where men first began to have leisure. This is why the mathematical arts were founded in Egypt; for there the priestly caste was allowed to be at leisure.

We have said in the Ethics what the difference is between art and science and the other kindred faculties; but the point of our present discussion is this, that all men suppose

what is called Wisdom to deal with the first causes and the principles of things; so that, as has been said before, the man of experience is thought to be wiser than the possessors of any sense-perception whatever, the artist wiser than the men of experience, the masterworker than the mechanic, and the theoretical kinds of knowledge to be more of the nature of Wisdom than the productive. Clearly then Wisdom is knowledge about certain principles and causes.

End selection of Aristotle's Metaphysics

In the second paragraph Aristotle tells us that our senses can distinguish between different levels of intelligence and apprehension of the world. Some of this seems commonsensical. But some is known to be incorrect. Bees can hear, and can we so easily distinguish between animals that have memory or not? I'm pretty certain mosquitos do not have any significant memory. But does a mouse or a chicken remember anything? Well, yes. So how far down the scale of complexity do we distinguish between what sort of animals can remember and what sort do not. I'm not sure that any such distinction wouldn't be arbitrary even with the extensive data we have already compiled. So, can these observations and distinctions count as grounds for first causes or principles? Not really, but they do seem like they could support at least a distinction between people and the rest of the animal kingdom. Part of the point to this exercise is to understand that even though Aristotle's definitions and observations may be wrong, he points out something fairly obvious about human rational superiority. He is not here asking whether that is good or not, but whether it

serves any purpose at all.

The chief difference between animals and people is that when people have experiences they remember, and when they have many similar experiences, they connect them into “science and art.” It is this ability to go beyond a simple memory and response that makes people superior. That is, they are superior in function, but not necessarily in ethical behavior. His remarks here do not extend to ethics.

For ethical behavior, something else is needed. Aristotle offers Wisdom which comprehends first causes and principles, what is called elsewhere First Philosophy, a knowledge of universal causes and principles. So, the final paragraph in our selection suggests that experience which is composed of sense perception, memory, and reasoning about the connections is superior to just sense perception; the artist wiser than one who merely experiences; the craft master superior to one who implements their designs; and in general, theoretic wisdom is better than productive capacity. My only challenge is to the universality of Aristotle’s claims. I speak ethically here when I suggest that we must be more humble than that. We must recognize that even with our great knowledge in this era, we sit at the feet of greater mysteries than ever we have observed before.

Metaphysics is then faced with the inability to make universal claims on the basis of its speculation. Absolutes, though we think or believe they may exist, are not accessible to us in a clear transparent way. Our prejudices, the four idols of Francis Bacon, prevent more than a modest engagement with universal claims. And any understanding of first causes and principles is limited. Let us not, as some like Descartes have done, make the material and the spiritual entirely separate and

disconnected from each other. Let us not also, make the mistake of the naturalists, who eliminate whatever of metaphysics is not understandable from material nature. They deny the very spiritualities that compose rationality, communication, ideation, creativity, and ethos that make possible their examination of the real world.

None of us has the capacity to stand objectively above our own human circumstances to view reality without a certain annoying stickiness, a permanent attachment to the world. The view above the world is both philosophically and religiously a God's-eye view, not a human one. The best we can do is to acknowledge our attachment and prejudices and work around them by opening ourselves to a larger human community of observations. The error of metaphysics is in reaching too far, claiming too much, and remaining unable to establish its claims because of human limitations. That doesn't mean that metaphysics hasn't added much to our understanding, caused us to stretch beyond simple experience yearning for the absolutes that remain just beyond our reach. Drawing out the first principles logically has extended our knowledge appreciably, though we cannot on that account claim certainty. We claim the results of metaphysics because they give coherence to our lives. They place an orderly grid on our unorganized experience giving both common sensical, and the beginning of an *a priori* scientific apprehension of the wider world. And for the thoroughly modern among us, those results are still meaningful even though our personal and collective understanding of them is only partial and probabilistic.

In our readings, I placed Bacon before Aristotle because any venture into the knowledge project requires caution. Bacon provides us an elementary motive and instrument to exercise caution. Aristotle reaches to the heights of human

accomplishment, to the art and mastery of the crafts of theoretical knowledge. Aristotle expands our minds with possibility, Bacon urges restraint because of all the possible ways we can err. Both approaches are required. Early in the Age of Reason (1500-1800) one of the primary tasks for the budding scientist and mathematician, the natural philosopher, was to evaluate the assumptions of what was already set in stone by their predecessors. Usually that meant sorting out what the ancients had done, what they got right and what they got wrong. So, the *Novum Organum*, or New Instrument of Bacon provided a tool to further those explorations by first offering a critique of what went before. In many ways Bacon's work provided the necessary shift to move the conversation forward. But he was not alone. Many of his contemporaries like Galileo Galilei, Johannes Kepler, René Descartes, and many others moved the conversation forward using tools like Bacon's based on the inductive method. Data in hand, they worked toward the expression of mathematical formulas that made it possible for Isaac Newton and Gottfried Wilhelm Leibniz to create a calculus that enabled Newton to define planetary motion in terms of gravity, a foundation for our modern cosmological model.

Without the preliminary critique of the ancients and their contemporary disciples, the Age of Reason would have been stillborn. And it is often the case that any movement forward begins with a critique of what has gone before.