

# Ancient Greek Cosmogony

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This paper was given as a public lecture to open the 2007 Conference of Greek Studies. It discusses some themes in ancient Greek thought concerning the origins of the cosmos, and differentiates Greek philosophical cosmogony from the creation tales that preceded it, in other contemporary cultures and in Greek religion and literature. It discusses some of the principal problems formulated by Greek cosmogonists and the types of solution they suggested, and draws some parallels with similar problems in the origins of life and the elements for the Greeks, and compares some ancient and modern formulations of these problems and their solutions. This paper also draws some contrasts between Greek philosophical cosmogony and early Christian thinking about the origins of the world.

Why should we study ancient cosmogony, ancient theories of how the cosmos came into being? It is an intellectually very rich tradition, with many fascinating ideas and some quite bizarre ones as well. Ancient cosmogony shows some interesting differences between the views of the first philosopher/scientists and other traditions in antiquity. The creation tales we have from ancient religion and ancient literature are markedly different in their nature to the cosmogonies offered by the philosophers. There are also some interesting relations between ancient and modern cosmogony. The ancients formulated for the first time many of the types of questions we still address in cosmogony. While the questions are recognisably similar, they have different forms in ancient and modern contexts. What then determined how the ancients phrased these questions? The ancients also formulated for the first time some of the types of answers we still use in cosmogony. Again, while there are recognisable similarities, there are differences in how the ancients phrased their answers. What sort of answers did the ancients deem to be acceptable? There are also some broader origins questions which were addressed in antiquity. There are questions not only of the origins of the cosmos, but also of zoogony, the origins of life, and of the origins of the four elements earth, water, air and fire. To understand some of the odder answers to these questions, we need to understand some of the debates and principles relating to theories of how the cosmos came into being.

What sort of cosmogony did the ancient Greeks do? We need to make two distinctions here, between what came before and what came after. Prior to the ancient Greeks, and indeed within Greek religion and literature, there were many creation tales.<sup>1</sup> What is different about what the early philosophers do? Their accounts aimed to explain how a cosmos came into existence. Cosmos here is not a neutral term, like the modern terms “world” or “universe”. The ancient Greek *kosmeo* meant not merely to bring into order, but had strong implications of to bring into good order. For the early Greek philosophers, that meant several things. They were parsimonious in what they thought existed in a cosmos. What did exist behaved invariantly: in the same circumstances, it did the same thing. They would accept only one, non-contradictory account of the cosmos. The cosmos was a natural place.<sup>2</sup> This was in sharp distinction to creation tales which supposed many gods, demi-gods and mythical mortal creatures. The gods often behaved morally quite poorly, and their behaviour was unpredictable. Societies often had many of these creation tales, without ever trying to settle on one definitive, non-contradictory account. The gods had the ability to interfere with the processes of the natural world, and did so on a frequent but unpredictable basis. A common early view was that disease was a punishment sent by the gods. The act of cosmogony itself was often seen in procreative terms, usually as a sexual act between two gods but also in places as the ejaculation of a god.

The earliest philosophical accounts of cosmogony come from the Milesian philosophers, Thales, Anaximander and Anaximenes in the fifth and sixth centuries BCE. Thales thought that the cosmos was generated out of water, Anaximander out of a substance called the unlimited, and Anaximenes that it was generated out of air. They believed that the processes which generated the other elements out of their original substance were entirely natural processes and were still to be seen today. So for Anaximenes, air changed into the other Greek elements of water, earth and fire either by a process of compaction or of rarefaction.

In a sense the Greek philosophers were the first people to do cosmogony. The question I would ask here is this. Did other tales of creation aim at the production of a cosmos, a parsimonious, invariant, natural world? The answer to this is no. These tales suppose many gods without a justification for the existence of those gods, those gods do not behave invariantly and frequently interfere with the processes of the natural world. One can also ask if the processes by which the cosmos comes about in these tales are natural and invariant processes, and again the answer is no. So if we take cosmogony as any creation tale, the Greeks were the first to do philosophical cosmogony. If cosmogony involves the generation of cosmos, then they are the first cosmogonists. This is not to say that the first philosophical cosmogonists were atheists. Rather, where they believed in a god there was a parsimonious justification of a

<sup>1</sup> On this see KRS (1983), Kirk (1970 & 1974), Frankfort (1946), Prichard (1969), Vernant (1965), Gregory (2007) Ch. 1 & 2.

<sup>2</sup> See Gregory (2007) ch. 1.

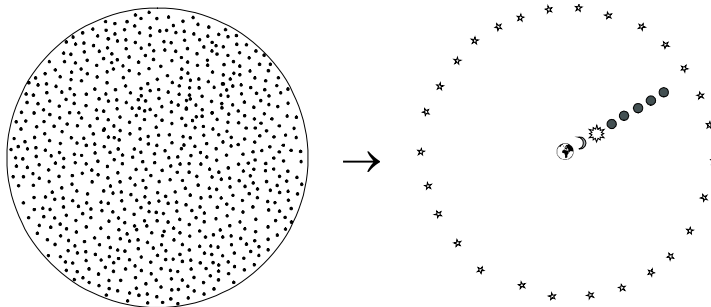
single god rather than a un-argued multiplicity of gods, this god was often equated with or oversaw invariant natural processes, and this god did not arbitrarily interfere with the natural world.

I would distinguish Greek philosophical cosmogony from modern scientific cosmogony as modern cosmogony is predominantly empirical. I would add the important rider though that this distinction is perhaps not so clear cut as it might first appear. While modern cosmogony is now an empirical science, there still remain considerable philosophical issues to be resolved. It is also the case that while Greek cosmogony was predominantly a philosophical activity, observations were used to support cosmogonical theories. Some of the Greeks were able to point to how a current physical process produced a result which they believed to be important for cosmogony.

What sort of problems did the ancients formulate in cosmogony? Parmenides raised the issue of whether anything can come from nothing, whether there can be creation *ex nihilo*. In relation to anything coming from nothing, he asks:

What birth will you seek for it? In what way, from what source did it grow?... What necessity would have driven it later rather than sooner, beginning from nothing, to grow? (Parmenides Fr. 8, 6–10).

This view, that there can be no creation out of nothing, was immensely influential, and there was no Greek philosopher after Parmenides who believed there could be such a thing. Those who believed that the cosmos came into being believed it did so from a pre-existing primordial chaos. The Greek cosmos was typically Earth centred, with the moon, sun, and the five planets visible to the naked eye surrounded by a sphere of equi-distant stars. So chaos to cosmos would be something like this:



The question then was how could chaos become a cosmos? Was it plausible that our cosmos, as a *unique* entity, came into being from a primordial chaos purely by the natural processes known to the Greeks? The answer to that, in the ancient world, was a resounding and unanimous no. It seemed implausible that something as well ordered as our cosmos could come about in this manner. This led to an interesting split of views.

Some, such as the ancient atomists Leucippus, Democritus, Epicurus and Lucretius said that there was an unlimited void, with an unlimited number of atoms in that void. Sometimes the atoms in one area come together to form a vortex. More atoms are dragged into the vortex, and the atoms separate out “like to like”. From this process we get cosmos formation, as earth remains at the centre of the vortex and other particles are distributed to other parts of the vortex. This is not a unique process, and happens throughout the unlimited void and throughout time. So for the atomists:

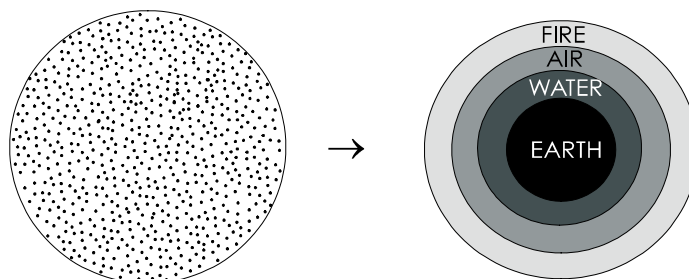
There are innumerable cosmoses which differ in size. In some worlds there is no sun and moon, in others they are larger than in our world, and in others more numerous. The intervals between the worlds are unequal; in some they are arising, in others falling. They are destroyed by collision with one another. There are some worlds devoid of living creatures or plants or any moisture (Hippolytus, *The Refutation of all Heresies*, 1, 13, 2).

Lucretius expresses one of the basic principles of atomists thinking on cosmogony:

So many primordial particles, in a multitude of ways have been propelled by their own weight and impacts for an infinite amount of time, and have made trial of all things their union could produce, it is hardly surprising if they have come into arrangements and patterns of motion like those repeated by this world (Lucretius, *On the Nature of Things* V, 186–194).

So for the atomists we explain the nature of our cosmos by saying that it is one accident among many accidents. Nothing designs or produces the cosmos, it is the chance product of natural processes. For this to be a plausible view though, our cosmos must be the result of one accident among many other accidents.

Plato took an opposite view to the atomists. For Plato, there was a unique cosmos that had been designed and generated by a craftsman god. He was critical of the view taken by the atomists. According to Plato, the like-to-like principle of the atomists would not produce a cosmos, only a sorting of the elements. So he thought the result of atomist cosmogony would be something like this:



So this process, on its own, would not result in a cosmos, but in four separate regions of earth, water, air and fire. Natural processes then were not capable of converting a chaos in to a cosmos, according to Plato. He says that:

Let me put it more clearly. Fire, water, earth, and air all exist due to nature and chance, they say, and none to skill, and the bodies which come after these, earth, sun, moon, and stars, came into being because of these entirely soulless entities. Each being moved by chance, according to the power each has, they somehow fell together in a fitting and harmonious manner, hot with cold or dry with moist or hard with soft, all of the forced blendings happening by the mixing of opposites according to chance. In this way and by these means the heavens and all that pertains to them have come into being and all of the animals and plants, all of the seasons having been created from these things, not by intelligence, they say, nor by some god nor some skill, but as we say, through nature and chance (Plato, *Laws* 889b).

A cosmos for Plato then is an appropriate ordering of opposites that cannot come about simply by chance or by a like-to-like principle. His alternative was that god worked on the primordial chaos and generated a unique, well designed cosmos. Plato's god was conceived as being entirely good, and being free from jealousy. This is significant relative to previous Greek mythology, where the gods were often jealous of each other and of mankind. Plato's god produces the best cosmos possible, with everything in it organised in the best possible way.

There is a modern version of this debate, dealing with a slightly different question. The ancient question of chaos to cosmos has essentially been solved by modern cosmogony. After the big bang, the effects of gravity bring about the formation of galaxies, stars and planets and evolution takes us from the first primitive life forms to the current day. The modern problem though is this. In modern physics, light has a determinate speed, and gravity a determinate strength. Values like these are known as fundamental constants. There is no reason we know of why the fundamental constants have their values. Nothing necessitates these values, they are brute facts. We now know though that for our universe to be the way it is, there has to be a fantastically delicate balance of these constants. The figure typically quoted for this balance is one in  $10^{50}$ . It seems outrageously fortunate that the fundamental constants have this balance. In reaction to this, the modern options are very much like the ancient ones. One option is that our universe is not unique, but one of infinitely many universes. These other universes have different values for the fundamental constants and so work out differently to ours. Another option is that there is some elements of design in the setting of the fundamental constants. This might be the action of god, or there are many variations of the anthropic principle.

One important aspect of ancient cosmogony is emphasised by this comparison. The ancients had no conception of gravity. Of course, they knew of the sort of phenomena we now explain by gravity, but they explained these in other ways. The Greeks could not call upon gravity as an explanation in cosmogony or cosmology.

The effects of this in ancient debate in cosmogony can be seen in discussions in related fields. We might ask: Why does Empedocles give us such a nightmarish vision of how animals first came into existence? He tells us that:

On the earth there burst forth many faces without necks, arms wandered bare bereft of shoulders, and eyes wandered needing foreheads (Empedocles Fr. 57).

These things fell together, encountering each other by chance, and many other things were constantly being produced (Empedocles Fr. 59).

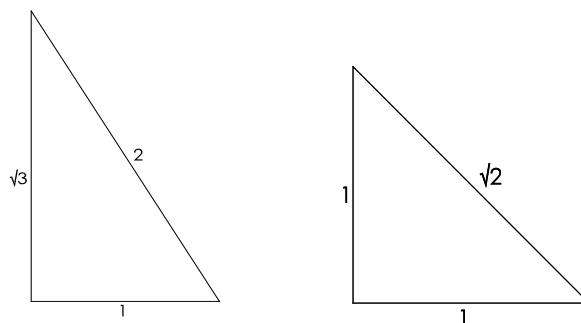
Many sprang up two faced and two breasted, man-faced ox progeny, and conversely ox-headed man progeny (Empedocles Fr. 61).

We only get viable species when all the parts come together to form a pair of animals which can reproduce. Empedocles is attempting to explain the origins of life forms by a multiplicity of accidents. Plato's reply to this is that a craftsman god has designed the human body. The *Timaeus* is quite satirical about this, in its account of the human head:

In order that the head should not roll around on the ground, with its heights and depths of every kind, and be at a loss in scaling these things and climbing out of them, they gave it body as a means of support for ease of travel (Plato, *Timaeus* 44c).

What this also does is undermine the plausibility of Empedocles' account. If the body parts cannot move around, they cannot come into conjunction with one another to form viable species. The issue of plausibility was one that lasted a long time for materialist theories of zoogony. The project of mechanical biology, based on the principle of the mechanical philosophy of the seventeenth century struggled badly. The basic problem for mechanical biology was that organisms appeared able to organise themselves beyond anything the mechanical biology could explain in terms of matter, motion and proximate causes.<sup>3</sup> Ancient material accounts of zoogony also struggled not least because they lacked the mechanical analogues that the later mechanical biology could draw upon.<sup>4</sup> Where material explanations of the origins of life were implausible, there was scope for accounts based on design.

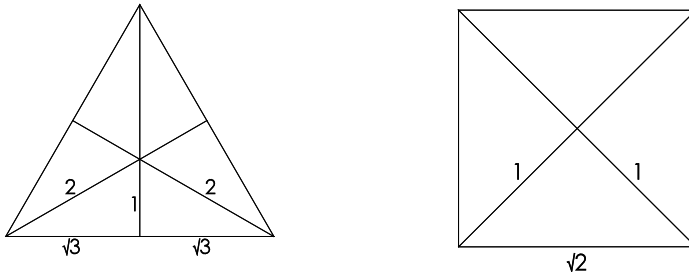
We might also ask why Plato gives us such an elaborate, geometrical theory of atomism. He supposes there are two types of basic particle, which are triangles:



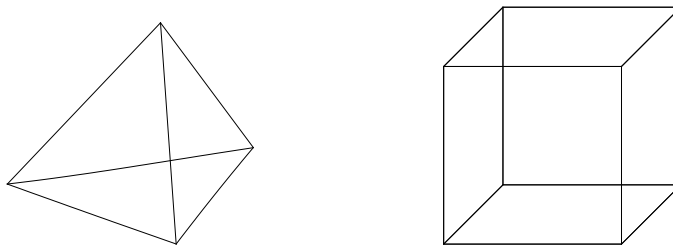
<sup>3</sup> See Gregory (2000).

<sup>4</sup> Cf. Berryman (2003).

These triangles form up either into complex equilateral triangles or squares:



These complex two dimensional figures then form up into three dimensional figures, such as the tetrahedron or the cube:



Plato says that the cubes are earth and the tetrahedra are fire. Octahedra, put together from eight complex triangles are air, and icosahedra, put together from twenty complex triangles are water. The contrast with Leucippus and Democritus is again very sharp here. The shapes and sizes of atoms are unexplained by Leucippus and Democritus who consider them to be infinite in variety and number.<sup>5</sup> Plato is not willing to accept such unexplained multiplicity. He restricts the basic particles to two, mathematically well defined types, designed and created by his craftsman god. The following passage from the *Philebus* might well apply to Leucippus and Democritus:

The indefinite plurality of things and in things makes you in each case indefinite of thought and someone of neither status nor account, since you have never yet examined the number in anything<sup>6</sup> (Plato, *Philebus* 17e).

There are several word plays in the Greek here which associate allowing indefinite plurality in the world with being indefinite in thought and suggest that if you cannot give an account in either words or numbers then you are a person of no account.

I began with early philosophy's engagement with religion. There is also an important later engagement with early Christian thinkers. In Greek cosmogony, there is no creation of matter *ex nihilo*. Nor is there any creation of space. It is also important that Greek gods, including those supposed by the philosophers, were not

<sup>5</sup> See Simplicius, *Commentary on Aristotle's Physics* 28, 8.

<sup>6</sup> Cf. *Philebus* 64e and *Theaetetus* 183b.

omnipotent. Plato's demiurge, the divine craftsman of the *Timaeus*, does his best to impose good order on a chaos, but there are limitations on what he can do. The early Christian theologians both engaged in debate with Greek philosophy, and tried to distance Christian beliefs from pagan views. It is here, not in Greek cosmogony, that we find the first positions where there is a generation of matter *ex nihilo*, and there is a generation of space, generated by an omnipotent god. Nor do we find this explicitly in the Bible. I would agree with several modern scholars that the Bible has no set, clear position on creation *ex nihilo* as opposed to creation from pre-existing matter.<sup>7</sup> I would argue that:

1. There are passages which refer to God's act of creation without referring to pre-existing matter, but none which state there was no pre-existing matter.
2. There are passages which refer to God ordering a cosmos out of pre-existing matter, but none which state that this matter has always existed and has not been earlier created *ex nihilo*.<sup>8</sup>

The debate about *ex nihilo* versus pre-existing matter surfaces in the first and second centuries AD, and by the time of Augustine in the fourth century, *ex nihilo* has become the standard Christian position. For Augustine, an omnipotent God creates everything in heaven and Earth out of nothing:

An omnipotent god has no aid from any material which he did not make himself to generate what he wished to make. If in generating the things he wished to make, he had any help from anything he had not generated, then he was not omnipotent, and that is sacrilege (Augustine, *Genesis against the Manicheans*, I, 10).

So too we can find Augustine saying that:

How, God, did you generate heaven and earth? Clearly it was not in heaven or on Earth, nor in air or on water, as these are part of heaven and earth. Nor did you make the universe in the universe, as there was no place for it to be generated until it was made (Augustine, *Confessions* XI/7).

Let me give a final reason for an interest in ancient cosmogony, and a way in which cosmogony differs from other sciences. There is a sense in which much of modern science, at least on a practical level, has managed to answer Meno's (the learner's) paradox. Plato has Meno ask:

How will you search for this thing, Socrates, not knowing at all what sort of thing it is? For what sort of thing that you do not know will be proposed in your search? Or even supposing that you should meet with this thing, how will you know that it is this thing which you do not know? (Plato, *Meno* 80d).

<sup>7</sup> See Winston (1971):191, cf. May (1994):xi-xiii, Grant (1980):137.

<sup>8</sup> See e.g. Genesis 1:1-1:2, John 1:1, Job 38:4, Isaiah 45:18, 2 Maccabees 7:28, Revelation 22:13.



In a great deal of modern science, we know, at least on a practical level, the form of the answer we are looking for. We can then fill in the specific content. So in a chemical analysis for instance, if we are able to say “This fluid is a solution of Potassium Chloride in water” we at least know we have given the right sort of answer. This does not by any means solve the many fascinating philosophical problems that Meno’s paradox poses, but there is an interesting contrast to be brought out with other areas, such as cosmogony, where it is far from clear what the correct type of answer is or how we would recognise it should we come across it. In cosmogony, we are simply not yet sure what sort of answer is appropriate.

This is not just a matter of competing empirical theories, but of fundamentally different types of explanation. Ought we to suppose there are an infinity of universes? Can we explain our universe as one amid a multiplicity of accidental universes? If there is only one universe is the anthropic principle an acceptable form of explanation? If space and time are created with the big bang, and causal explanations dependent on prior spatio-temporal relations are thereby ruled out, what sort of explanation can we seek for a big bang? If we do not find an explanation in cosmogony sufficiently satisfying, is the explanation inadequate or is our wish for something more satisfying misplaced? Modern cosmogony still struggles with all of these problems. If we still struggle to be sure of the form of explanation appropriate to cosmogony, then we should have considerable sympathy for the ancients struggling with a similar problem.

## Bibliography

- Berryman, 2002  
 S. Berryman, “Ancient Automata and Mechanical Explanation”. *Phronesis* 48:345–69.
- Burkert, 1999  
 W. Burkert, “The Logic of Cosmogony”, in Buxton, R., *From Myth to Reason*. Oxford U.P.
- Frankfort, 1946  
 H & H. A. Frankfort, *Before Philosophy*. Penguin, London.
- Furley, 1987  
 D. Furley, *The Greek Cosmologists*, vol. 1: *The Formation of the Atomic Theory and Its Earliest Critics* (Cambridge: Cambridge University Press).
- Grant, 1980  
 M. Grant, *Miracle and Law in Graeco-Roman and Early Christian Thought*, Amsterdam: North Holland Publishing Co.

- Gregory, 2000  
A. D. Gregory, *Eureka! The Birth of Science*. Icon: London.
- Gregory, 2007  
A. D. Gregory, *Ancient Greek Cosmogony*, London: Duckworth.
- Kirk, 1970  
G. S. Kirk, *Myth*. Cambridge U.P.
- Kirk, 1974  
G. S. Kirk, *The Nature of Greek Myths*. Penguin, London.
- KRS, 1983  
G. S. Kirk, J. E. Raven, and M. Schofield, *The Presocratic Philosophers*. 2nd edition, Cambridge U.P.
- May, 1994  
G. May, *Creation Ex Nihilo*. Edinburgh: T&T Clark.
- Pritchard, 1969  
J. B. Pritchard, *Ancient Near East Texts Relating to the Old Testament*. Princeton.
- Taylor, 1999  
C. C. W. Taylor, *The Atomists: Leucippus and Democritus*. Toronto U.P.
- Vernant, 1965  
J-P. Vernant, *Myth and Thought among the Greeks*. RKP, London.
- Winston, 1971  
D. Winston, "The Book of Wisdom's Theory of Cosmogony". *History of Religion* 11, 185–202.
- Wolfson, 1948  
H. A. Wolfson, "The Meaning of ex nihilo in the Church Fathers, Arabic and Hebrew Philosophy and St. Thomas". In *Medieval Studies in Honour of J. D. M. Ford*: 355–370, Cambridge Mass.
- Wright, 1995  
M. R. Wright, *Cosmology in Antiquity* (London: Routledge).