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HIST 1941

December 11, 2013

How did approaches to knowledge of nature relate to, or involve, ideas about God and the divine in the period from Greek antiquity to the end of the seventeenth century?

The Demiurge[1], the Creator, God. From the period of Greek antiquity to the end of the seventeenth century, the understanding of this divine concept shaped the pursuit of knowledge in the sciences and natural philosophy. Various notions about creation and motion consistently relied on the idea of God throughout this period. God's position as the guarantor of truth also greatly colored approaches to knowledge.

An oft debated question in the study of natural philosophy during this period was Creation; how the celestial and terrestrial regions came into being. For Plato (423 BC – 348 BC) the answer could be found conceptualizing the so called "Demiurge", "[t]he divine craftsmen"[2]. According to Plato the Demiurge fashioned the world out of the chaos of material that was present before he got to work upon it. As for things on earth and elements of nature like trees, the Demiurge represented their divine form (in the World of Forms[3] in his mind) on Earth (the World of Becoming) as best as he could with the limited materials available to him on the

[1] Lindberg, David C., *The Beginnings of Western Science*, University of Chicago Press, Chicago, 2007: page 36.
[2] Lindberg, David C., *The Beginnings of Western Science*, University of Chicago Press, Chicago, 2007: page 36.
[3] Dear, Peter, Lecture, *The History of Science in Europe*, September, 2013.

terrestrial realm. Clearly the Demiurge, Plato's God figure, was the sole power that could bring about creation.

In the 12th century the popular view on this matter in Latin Christendom, expressed by the French teacher Thierry of Chartres (Died circa 1156 AD) was a slight variation of Plato's. "Thierry wrote a commentary on the six days of creation… to explain the specific sequence of God's creative activity as described in Genesis [in the Bible]."[4] Thierry explained that God created the four elements (the same four that Plato's Demiurge created- earth, fire, water and air) and in turn these quantities interacted to create the world as it appeared then, as well as plant and animal life. In Thierry's model God created the initial chaos as well (unlike in Plato's). Though here there are aspects of created elements regulating themselves what is abundantly clear is the role of God at the very beginning of creation. Thus assumptions about God's fundamentality as the Creator were accepted from very early on in intellectual tradition, and not questioned at all in the period till the end of the seventeenth century.

Established undisputedly as the Creator, it is apparent that God's power in other areas would be explored. Motion in the celestial realm is one such area. Beginning with Aristotle (384 BC – 322 BC) natural philosophers observed that the celestial region of planets and stars experiences some sort of motion. Aristotle defined this motion as the infinite, uniform and circular motion of the "celestial spheres"[5], each to which one of the planets was attached. The outer spheres in turn move the inner spheres. As for the initial cause of this motion Aristotle defined a ""Prime Mover," a living deity"[6] that moved with perfect uniform circular motion. The other spheres were set in motion by this sphere not through direct contact with it, but through the

[4] Lindberg, David C., *The Beginnings of Western Science*, University of Chicago Press, Chicago, 2007: page 210.
[5] Lindberg, David C., *The Beginnings of Western Science*, University of Chicago Press, Chicago, 2007: page 60.
[6] Lindberg, David C., *The Beginnings of Western Science*, University of Chicago Press, Chicago, 2007: page 60.

desire to emulate its perfect circular, ceaseless motion. Clearly, God's power as the creator was spurring philosophers to ascribe other powers to him. That God had a hand in things like maintaining celestial motion as discussed above became fundamental assumptions that contemporary and subsequent philosophers began taking for granted when establishing their own philosophical systems.

A pertinent example of this was René Descartes' (1596 AD – 1650 AD) theory of the creation of the celestial realm. Descartes maintained that world began with undifferentiated matter and space extending in all directions[7]. Now, Descartes found himself needing an input or stimulus for the space and matter to reorganize itself to resemble the current world. So, relying on the established certainty of divine power, Descartes purported that it was God who supplied a "jolt of motion"[8] into this undifferentiated mess, that it could begin moving. Descartes believed that matter and space shared the same fundamental property of "extension"; meaning that the space they occupied could not be shared with anything else. So if space or matter were to move it would have to move anything that obstructed its motion out of the way, forming eddies like fish in a pond[9], that in turn caused more motion. Assuming this property, the initial push was enough to let the motion of the particles of space and matter reorganize themselves into the current world. Similarly, Isaac Newton (1642 AD – 1727 AD) brought God's power over motion to the terrestrial realm. In 1716 in a new section of the *Principia* called the "General Scholium"[10] he sympathized with the idea of the divine hand in bringing about motion. He argued that the imperfection in his system of Universal Gravitation is precisely what dictated the necessity of

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[7] Dear, Peter, Lecture, *The History of Science in Europe*, November, 2013.
[8] Dear, Peter, *Revolutionizing the Sciences: European Knowledge and Its Ambitions, 1500-1700*, Princeton University Press, Pinceton, New Jersey, 2nd ed, 2009, page 86
[9] Dear, Peter, Lecture, *The History of Science in Europe*, November, 2013.
[10] Dear, Peter, *Revolutionizing the Sciences: European Knowledge and Its Ambitions, 1500-1700*, Princeton University Press, Pinceton, New Jersey, 2nd ed, 2009, page 161

God's hand in motion, that every now and then, "God must fix the whole system up again before it gets too much out of kilter."[11] Thus we see the power of God becoming a more and more fundamental assumption in natural philosophy during this period.

It is clear that the God's authority was increasingly becoming final on regulating scientific systems and discoveries. He was now the guarantor of truth[12]. Thus the Church, representative of the people who did not question the authority of God, was becoming more powerful in the dictation of what constituted valid knowledge and what knowledge should be pursued. Consequently, that which went against the authority of God, or suggested that He had any less power was condemned. The clearest example of this comes in the Condemnation of 1277.

In the thirteenth century several works of Aristotle had been translated into Latin from a variety of sources and with these translations came contentions between some aspects of Aristotelian natural philosophy and Christian Theology. Aristotle's model of an eternal universe that had never been created contradicted the concept of God as the Creator. He also maintained that bodies moved by themselves according to their natures and final causes and thus there was no scope for intervention in the course of nature by God. This clearly went against God's power to initiate and coordinate motion on earth and in the celestial realm. When philosophers like Siger of Brabant began advocating fiercely for the truth of Aristotelianism, undermining God,

[11] Dear, Peter, *Revolutionizing the Sciences: European Knowledge and Its Ambitions, 1500-1700*, Princeton University Press, Pinceton, New Jersey, 2nd ed, 2009, page 161.
[12] Dear, Peter, Lecture, *The History of Science in Europe*, December, 2013.

the Condmentation of 1277 was issued by the bishop of Paris, a list of 219[13] Aristotelian teachings that were banned, and the subsequent teachers of whom would be excommunicated.

The condemnation represented the extent of the power of God in dictating the pursuit of knowledge. Any knowledge that opposed God's power was unhesitatingly quashed. Only philosophy that modified itself to include the power and authority of God was allowed to exist freely. Philosophy thus took on a character of subordination to God when the two clashed and the result was the advent of philosophers like Thomas Aquinas who only advocated doing philosophy because it can "elucidate the truth of faith by the use of analogies from the natural world"[14] and William of Conches[15] who's belief was that "God customarily works through natural powers and the philosopher's task is to push these powers to their explanatory limit."[16] The implications were clear. Approaches to knowledge must involve God directly or indirectly, else they were quashed or given no significance.

This theme is seen once again in the 16th century with Copernicus' *De Revolutianobus*[17]. In it, Copernicus goes against the divinely approved notion that the Earth is the center of the Universe and so after his death, to "save" the theory's validity, a clergymen, Osiander prefaced it to the Pope, saying the theory in the book is only to be reckoned for its mathematical accuracy and is not to be taken as physically true at all. In fact, the entire school of "fictionalists", spearheaded by the Wittenburg Astronomers stemmed directly from the inability to go against what God's power dictated. These astronomers praised Copernicus' model for its mathematical accuracy while simultaneously rejecting its physical truth. Such a contradictory position only

[13] Lindberg, David C., *The Beginnings of Western Science*, University of Chicago Press, Chicago, 2007: page 246.
[14] Ibid, page 242.
[15] Ibid, page 212.
[16] Ibid.
[17] Dear, Peter, Lecture, *The History of Science in Europe*, November, 2013.

came about because of the strength of God's authority, and the lack of power of natural philosophers to go against it.

Yet other philosophers use the power of God constructively. God's power and authority were pivotal in Descartes' establishment of a system of philosophy in response to the Pyrrhonian sceptics of his time. The Pyrhhonian sceptics purported that given the fallibility of human senses and human reasoning, there was nothing that could be taken as true without some doubt or the other[18]. To answer them with a system of philosophy in which some truth could be established Descartes' basic unquestionable assumption was "his own existence: "I think therefore I am"." "In being aware of one's own existence, [Descartes continues] one is simultaneously aware of one's own imperfection… And the concept of imperfection is itself just the inverse of a concept of perfection"[19]. This lead him to the concept of God, the perfect being. Descartes thus showed how the inability to doubt God could be put to constructive use in establishing a philosophical system that contained truth; an effective dismissal of the scpetics.

Thus a belief in the doctrine of intelligent design, God as the Creator and regulator or life on Earth developed by the end of the 17th century in intellectual traditions. Those that questioned this were long ago convinced or silenced, and the contemporary intellectual climate bore significant dependence on God. Through the course of history this dependence was both constructive and destructive to the pursuit of scientific and natural philosophical knowledge.

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[18] Dear, Peter, *Revolutionizing the Sciences: European Knowledge and Its Ambitions, 1500-1700*, Princeton University Press, Pinceton, New Jersey, 2nd ed, 2009, page 82

[19] Ibid, 83.

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