

Mochus the Proto-Philosopher

Author of the Ancient Theory of Atomism

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Abstract. An examination of the oldest accounts of natural philosophy reveals that Mochus, commonly known as Moses the Hebrew lawgiver, was the first known natural philosopher and the original author of atomism. A study of the oldest known atomistic writings of the Indian Jain, Nyaya and Vaisheshika schools, the Greek schools of Democritus, Plato and Aristotle, the Roman philosopher Lucretius, and the eastern Islamic philosopher al-Ghazali of the Asharite School appear to reveal various aspects of the ancient philosophy of atomism dating back to the 13th century BC. This ancient atomism appears to be more relevant for describing the building blocks of quarks and leptons in elementary particle structures than the chemical atom of modern science, where the atom is the smallest part of a chemical element that retains the chemical properties of that element. The atomism of Mochus reveals how God created and continually sustains all matter in the universe in terms of the solitons of the electromagnetic fields that emanate from Him.

Introduction. Every once in a while a science researcher stumbles across some information that scientists have forgotten about. This article describes one such discovery. When the author was doing historical research for his book **The Universal Force Volume 3 – An Electrodynamic Model for the Atom and the Nucleus**, he found that ancient societies acknowledged Mochus as the proto-philosopher, i.e. the first or original natural philosopher, and the original author of atomism.

Who was Mochus? Mochus, the Phoenician, is listed by Diogenes Laërtius, the principal biographer of Greek philosophy, as the proto-philosopher. [1] Athenaeus of Egypt (2nd century AD) claimed that he authored a work on the history of Phoenicia. [2] Strabo (64 BC -21 AD), on the authority of Posidonius (135 – 51 BC), speaks of Mochus (1391-1271 BC) or Moschus of Sidon as the author of the atomic theory and says that he was more ancient than the Trojan wars (1260 to 1249 BC).[3] He is also referred to by Josephus (37 – 100 AD) [4], Tatian (110-180 AD) [5] who said that “men ought to believe the more ancient authority of Moses than the Greeks who had borrowed from Moses, as from a spring, without acknowledgment and in many cases had perverted what they took”, and Eusebius (263-339 AD).[6] The 17th century Cambridge Platonist Henry More (1614-1687 AD) traced the origins of ancient atomism back, via Pythagoras and Moschus, to Moses the Hebrew lawgiver.[7] Colin Maclaurin in his four volume series on the philosophies of Isaac Newton (1643-1727 AD) records that Isaac Newton agreed with Henry More’s conclusion. [7]

What was the original atomic theory attributed to Mochus? Unfortunately copies of the early writings of Mochus on atomism have not reached our time directly. At that time very little was written down but mostly transmitted verbally from generation to generation. However, it appears that they were known to the ancient Greeks and other nearby societies such as the Indian, Islamic, and Roman. If Mochus was indeed the Hebrew Moses, then there was probably a religious aspect to the original theory of atomism. In any case it may be possible to piece together the original theory of the atom by combining the atomistic ideas of these nearby societies in a coherent fashion. Many of them appear to have emphasized those aspects of “proto-atomism” that fit their culture or religion.

Indian Philosophy. In India the Jain [8, 9], Ajivika and Carvaka scrolls on atomism date back to the 6th century BC. The Jains taught that all atoms were of the same kind, producing different effects by diverse modes of combinations. The Nyaya and Vaisheshika schools later developed theories on how atoms combined into more complex objects. [10] Atoms first combine in pairs (dyads), and then group into trios (triads), which are the smallest units of matter. [11] Note that the modern day Standard Model of Elementary Particles has pseudoscalar mesons with spin 0 made of pairs of quarks and baryons of spin 1/2 made of trios of quarks.

Table 1 Pseudoscalar Mesons of Spin 0 Baryons of Spin 1/2

Particle Symbol	Particle Name	Quark Structure		Particle Symbol	Particle Name	Quark Structure
π^+	Positive Pion	$u\bar{d}$		P	Proton	Udu
π^-	Negative Pion	$d\bar{u}$		N	Neutron	Dud
π^0	Neutral Pion	$d\bar{d}$		Λ	Lambda	Dus
K^0	Neutral Kaon	$d\bar{s}$		Σ^+	Positive Sigma	Usu
D^-_S	Negative Strange D	$s\bar{c}$		Σ^0	Neutral Sigma	Dus
B^-	Negative B	$b\bar{u}$		Σ^-	Negative Sigma	Dds
η_C	Charmed Eta	$c\bar{c}$		Λ_c^+	Charmed Lambda	Udc

Jains believe that souls (Jiva) exist as a reality, having a separate existence from the body that houses them. Jiva is characterized by cetana (consciousness) and upayoga (knowledge and perception). Though the soul experiences both birth and death, it is neither really destroyed nor created. Decay and origin refer respectively to the disappearing of one state of soul and the appearance of another state, these being merely the modes of the soul.

In Jainism Dharmatattva is the medium of motion and Adharmatattva is the medium of rest. They depict the principles of motion and rest. They are not rest or motion by themselves, but they mediate motion and rest in other bodies. These are related to the modern day notions of fields and conservation of energy and momentum.

Akasa (Space) is a substance that accommodates souls, matter, the principle of motion, the principle of rest, and time. It is all-pervading, infinite and made of infinite space-points. The media and/or space referred to correspond to something like the modern electromagnetic field or the aether or the vacuum.

Greek Philosophers. In the West atomism emerged in the 5th century BC with Leucippus and his student Democritus (460-370 BC). [11, 12] Most likely the atomic theory of Mochus influenced both Greek and Indian culture, because it originated between them and was first in history by six or seven centuries. Democritus came from a wealthy family and travelled extensively speaking to natural philosophers throughout that region of the world and would undoubtedly have been exposed to the work of Mochus.

The Greek atomists theorized that nature consists of two fundamental principles: atom and void. The word atom comes from the Greek word “atomos” which means uncuttable (matter). These philosophical atoms were indestructible, immutable and surrounded by a void (with no atoms of matter) where they collide with the others or hook together forming a cluster. Clusters of different shapes, arrangements, and positions give rise to the various macroscopic substances in the world. Atomism included the notion of conservation of motion. In modern day language that would include conservation of energy and momentum.

The Greek philosopher Plato (427-347 BC) argued that atoms randomly crashing into other atoms in the void could never produce the beauty and structural forms of the world. In Plato's **Timaeus, (28B-29A)** the character of Timeaus insisted that the cosmos was not eternal but was created.[13, 14] One part of that creation was the four simple forms of matter known as fire, water, air, and earth. But Plato did not consider these forms of matter to be the most basic level of reality, which was much smaller and based on mathematical or geometrical constructions. These simple bodies were geometric solids, the faces of which were, in turn, made up of triangles as shown in Figure 1. The square faces of the cube were each made up of four isosceles right-angle triangles and the triangular faces of the tetrahedron, octahedron, and icosahedron were each made up of six right-angle triangles.





Element	Polyhedron		Number of Faces	Number of Triangles
Fire	Tetrahedron		4	24
Air	Octahedron		8	48
Water	Icosahedron		20	120
Earth	Cube		6	24

Figure 1 Plato's Geometry of Fire, Air, Water and Earth Corpuscles

Sometime before 330 BC Aristotle (384 – 322 BC) asserted that the elementary forms of matter, i.e. fire, air, earth, and water, were not made of individual atoms, but were continuous arrangements of large structures composed of atoms. Aristotle considered the existence of a void (modern day vacuum or aether or field), which was required by atomic theories, to violate physical principles. This approach looked at matter in terms of its various states such as solid, liquid, gas, and plasma energy. In Aristotle's view change took place by the transformation of matter from one state to another. This theory is called hylomorphism.

Hylomorphism is a philosophical theory, developed by Aristotle, which conceives of being as a compound of matter and form. [15] Matter is that out of which an object is made. For example letters are the matter of syllables. A second example is clay. Clay is matter relative to a brick, because a brick is made of clay. However bricks are matter relative to a brick house. Thus matter is a relative term where an object counts as matter relative to something else. Change is considered a material transformation in which matter undergoes a change of form.

According to Aristotle's theory of perception, we perceive an object by receiving its form with our sense organs. Forms include complex qualities such as shape, color, texture, flavor, weight, etc.

Aristotle also applied his theory of hylomorphism to living things. He defined a soul as that state which makes a living thing alive. [16] Life is a property of living matter. Therefore a soul is a form, i.e. a property or set of properties belonging to the matter of a living thing. Furthermore a soul is related to its body just as form is related to matter.

In the West the atomic theory of Leucippus and Democritus was ignored for about 2,000 years in favor of the teachings of Aristotle, because his student was Alexander the Great.

Roman Philosophers. The Roman philosopher Titus Lucretius Carus (99-55 BC) wrote in his famous book **On the Nature of Things** (60 BC) that “Nothing can be created out of nothing”. [17] Thus atoms must be composed of something such as the electromagnetic field, the vacuum, or the aether.

Islamic Philosopher al-Ghazali. Atomistic philosophies are found very early in Islamic philosophy and were influenced by earlier Greek and Indian Philosophy. [18,19] Like both the Greek and Indian versions, Islamic atomism had the potential for conflict with the prevalent religious orthodoxy, but it was favored by orthodox Islamic theologians and flourished in some leading schools of Islamic thought.

The most successful form of Islamic atomism was in the Asharite School of Islamic theology, most notably in the work of the theologian al-Ghazali (1058-1111 AD). In Asharite atomism, atoms are the only perpetual things in existence, all else in the world is “accidental” and lasts only for an instant. Nothing accidental can be the cause of anything else. Contingent events are not subject to natural physical causes, but are the direct result of God’s constant intervention, without which nothing could happen. Thus nature is completely dependent on God, which meshes with other Asharite Islamic ideas on causality, or the lack thereof. The Asharite theory of atomism has more in common with Indian atomism than it does with Greek atomism. [20]

Islamic Philosophers in Spain. Other traditions in Islam rejected the atomism of the Asharites and expounded on many Greek texts, especially those of Aristotle. [21] An active school of philosophers in Spain, including the noted commentator Averroes (1126-1198 AD) explicitly rejected the thought of al-Ghazali and turned to an extensive evaluation of the soul proposed by Aristotle. Averroes commented in detail on most of the works of Aristotle and his commentaries did much to guide the interpretation of Aristotle in later Jewish and Christian scholastic thought.

Summary of Ancient Atomism. If one assumes that much of the ancient expressions of atomism are bits and pieces of the original atomism of Mochus, one should be able to construct a coherent view of the original atomism that would have been appropriate for Moses the Hebrew lawgiver to have expressed.

From the oldest Indian philosophers one obtains the idea that all atoms are of the same kind producing different effects by diverse modes of combinations. These atoms can

combine in pairs (dyads), trios (triads), etc. There is a medium between atoms that mediates motion and causes conservation of energy and momentum. Souls have a separate existence from the matter of the body that houses them.

From the oldest Greek philosophers one obtains the idea that nature consists of two types of medium, i.e. atoms and void. Atoms can combine to build larger matter structures based on geometrical combinations giving rise to a variety of shapes, sizes, and other properties. The void is the absence of material atoms. The four basic forms of matter are solid, liquid, gas, and electric plasma or fire.

From the oldest Roman philosophers one obtains the idea that “nothing is made from nothing”. Thus all atoms are composed of something.

From the oldest Arabic and Spanish Islamic philosophers one obtains the idea that atoms are the only semi-permanent things in existence. All else is accidental and lasts only for an instant. All of the atoms in the universe are a direct result of God’s creation and continuous intervention. All of nature is completely dependent on God’s sustaining it in some manner.

From the Hebrew prophets after Moses one gets the idea that God exerts his power electromagnetically as in “His brightness was like the light; He had rays flashing from His hand, and there his power was hidden.” [Habakkuk 3:4 NKJV] The Psalmist says “By the word of the Lord were the heavens made, and all the host of them by the breath of his mouth. For he spake and it was done; he commanded and it stood fast.” [Psalms 33:6, 9] Also in Hebrews 1:2-3 “But in these last days he has spoken to us by his Son, whom he appointed heir of all things, and through whom also he made the universe. The Son is the radiance of God’s glory and the exact representation of his being, sustaining all things by his powerful word.” Thus the word of God is synonymous with the electromagnetic fields which originate in God and carry out His will.

From modern day science one finds that the ancient atoms are solitons (long lasting or semi-permanent standing wave structures with a stable algebraic topology [22]) constructed from the medium of the electromagnetic field. Winston Bostick, the last graduate student of Arthur Compton, discovered how to make plasmons from the electromagnetic field within electromagnetic plasmas. [23] He proposed that the electron and positron were just simple solitons while other particles were built of more complex geometrical structures of solitons. All solitons are of the same kind and shape, i.e. a toroidal ring.

Another modern day scientist, William J. Hooper [24], discovered that charged elementary particles, such as the electron, were not only made out of the electromagnetic field, but variations in the field around them due to their structure extends to great distances. If God

is the source of the electromagnetic field in nature, then this explains how he could create and sustain all the atoms and matter in the universe in terms of the electromagnetic field.

Hooper [24] also discovered that there are three types of electric and magnetic fields. One of these types is due to velocity effects from Lenz's Law causing it to have the property that it cannot be shielded. Thus the electromagnetic field exists everywhere in the universe.

The Birth of Chemical Atomism. The scientists and philosophers during the Renaissance and later caused a redefinition of atomism by incorporating the notion of the atom into chemistry. In chemistry the most elementary chemical substances were called elements and compounds. Elements were said to consist of atoms. These atoms were the smallest amount of an element that retained all the properties of that element. Originally they were thought to be indivisible as in ancient atomism, but experiments later revealed that chemical atoms consisted of elementary particles called electrons, protons, and neutrons. Then with the invention of accelerators, various experiments showed that elementary particles have internal structure and consist of even smaller particles called quarks, leptons, and bosons.

Dalton's Atomic Theory Based Upon Atomic Weight. From an analysis of the relative weights of atoms in water, ammonia, carbon dioxide, etc. by chemists of his time, John Dalton (1766-1844) was able to formulate his Law of Multiple Proportions. He then proceeded to publish a table of relative atomic weights. Six elements appear in this first table, namely hydrogen, oxygen, nitrogen, carbon, sulfur, and phosphorus with the atom of hydrogen assigned the atomic weight of 1. Note the occurrence of groups of 2, 3, 4, 6, etc. components of various molecules.

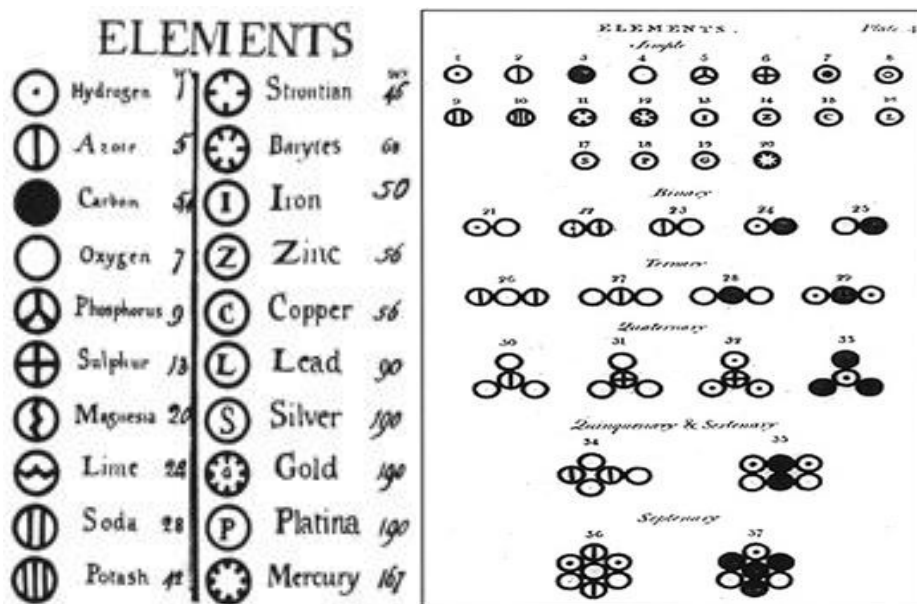


Figure 2 Dalton's Table of Elements and Concept of Molecules

In 1803 John Dalton proposed an “atomic theory” with spherical solid atoms based upon their measurable relative mass and radius from the volume of a gram molecular weight of the element. Assuming that atomic combinations take place in the simplest possible way, he arrived at the idea that chemical combination takes place between particles or atoms of different weights. This notion differentiated his atomic theory from the Indians and the ancient Greeks, such as Democritus and Lucretius, who considered that the smallest parts of matter consisted of the same type of atoms only.

Dalton listed compounds as binary, ternary, quaternary, etc. or molecules composed of two, three, four, etc. atoms. Thus the structure of molecules or compounds can be represented by whole number ratios. This allowed chemists to write symbolic formulas for various compounds such as carbon dioxide which consists of one carbon atom combined with two oxygen atoms as CO_2 . In a way this still agreed with the ancient atomists that had atomic structures combining in dyads, triads, etc.

Dalton’s atomic theory led to the establishment of the following rules that are still considered relevant in chemistry today:

1. All matter is made of atoms. Atoms are indivisible and indestructible.
2. All atoms of a given element are identical in mass and properties.
3. Compounds are formed by a combination of two or more different kinds of atoms.
4. A chemical reaction is a rearrangement of atoms.

Today we know that atoms can be destroyed via nuclear reactions, but not chemical reactions. Also there are different kinds of atoms (differing by their masses) within an element known as “isotopes”. All isotopes of an element have the same chemical properties, but different atomic weight and a different number of internal elementary particles.

Newton and the Mechanical Concept of Matter. In 1704 Isaac Newton proposed a mechanical universe with solid masses in motion. This mechanical concept eventually became the foundational idea associated with the Bohr and Sommerfeld models of the atom where small solid masses or electrons orbit the nucleus.

Thompson’s Discovery of the Electron. In the late 1800’s J. J. Thompson (1856-1940) discovered the electron. He used what was called a cathode ray tube, or an electron gun. The bulky picture tube of old television sets consist of a cathode ray tube. Thomson used the cathode ray tube with a magnet and discovered that the green beam it produced was made of negatively charged particles. After performing many experiments, he found that the mass of one of these particles was almost 2,000 times lighter than that of a hydrogen atom.

From this Thompson deduced that these particles must have come from somewhere within the atom and that Dalton’s model of the atom was incorrect in stating that atoms could not be divided into smaller pieces. Then Thompson went one step further and determined that these negatively charged electrons needed something positive to balance them out in the neutral atom. So, he concluded that they were surrounded by positively-charged material. This became known as the “plum pudding: model of the atom. The negatively charged plums were surrounded by positively charged pudding.

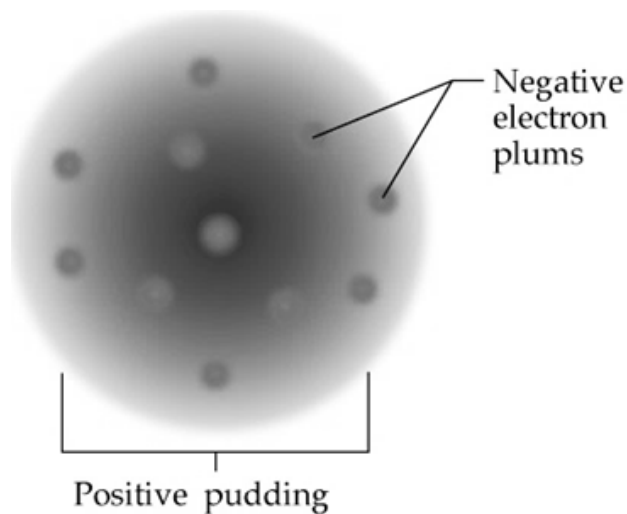


Figure 3 Thomson Plum Pudding Model of the Atom

Rutherford's Alpha Particle Scattering Experiments. In 1909 Ernest Rutherford designed an experiment to use the alpha particles emitted by a radioactive element as probes of the structure of gold atoms in a gold foil. The scattering results that he obtained indicated that atoms of atomic number N have a central positive charge of $+Ne$ and are surrounded by N electrons of charge $-e$. [25] From purely energetic considerations of how far particles of known speed could penetrate a central charge of $100 e$, Rutherford was able to calculate an upper limit to the radius of the gold nucleus of $3.4 \times 10^{-14} \text{ m}$. The gold atom was known to be 10^{-10} m in radius implying that the positive central charge was less than $1/3000^{\text{th}}$ of the diameter of the atom.

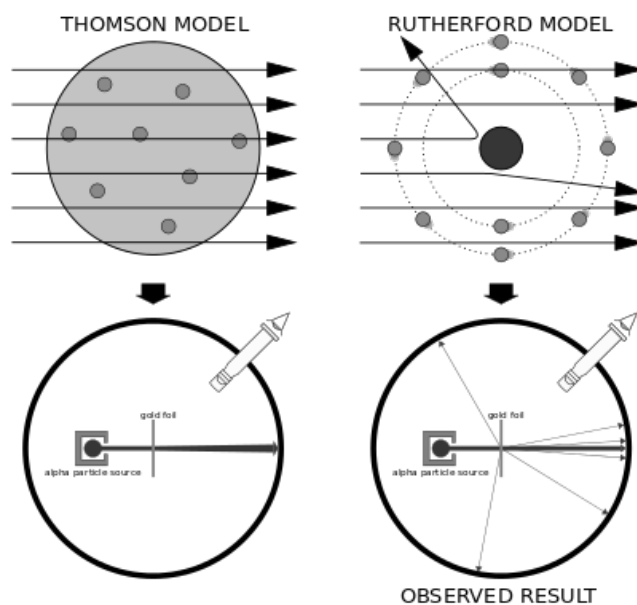


Figure 4 Results of Rutherford's Alpha Particle Scattering Experiments

The results of the alpha particle scattering experiments led Rutherford to propose a planetary model of the atom in which a cloud of electrons surrounded a small, compact nucleus of positive charge. This planetary model of the atom had two significant short-comings. First an accelerating charge is known to emit electromagnetic waves according to the Larmor formula in classical electrodynamics. This would cause an orbiting electron to steadily lose energy and spiral into the nucleus in a small fraction of a second. The second problem was that the planetary model could not explain the observed emission and absorption spectra of atoms.

Bohr Quantum Model of the Atom. These problems were resolved by the invention of quantum theory based on the postulate that light energy is emitted or absorbed in discrete amounts known as quanta. In 1913 Niels Bohr incorporated this quantum postulate into his Bohr model of the atom, in which an electron could only orbit the nucleus in particular orbits with fixed angular momentum and energy with the electron's distance from the nucleus being proportional to its energy. [26]

Sommerfeld Quantum Model of the Atom. Bohr's model was not perfect. It could only predict the spectral lines of hydrogen atoms. It could not predict the spectral lines of multi-electron atoms. As spectroscopic technologies improved, additional spectral lines in hydrogen were observed which could not be explained by the Bohr model. In 1916 Arnold Sommerfeld added elliptical orbits to the Bohr model to explain the extra emission lines in hydrogen, but it still could not explain more complex atoms. [27]

Dirac Relativistic Quantum Model of the Atom. Paul Dirac [28] improved Sommerfeld's model of the atom by taking into account the intrinsic angular momentum (called spin) of the electron about its own rotation axis in addition to its orbital angular momentum. The magnetic field associated with the electron spin can also interact with the magnetic field produced by the electron's orbit to produce spin-orbital coupling effects. Also Dirac added relativistic effects to take into account that the velocity of the electron gets close to the velocity of light.

Quantum Electrodynamics (QED) Corrections. QED is a theory which deals with the quantization of the electromagnetic field, rather than focusing on individual particles. It predicts several corrections to the electron energy. These include the Darwin term which is due to the apparent instant "teleporting" of the electron from one location to another as the vacuum randomly "swallows" one electron and replaces it with another new electron, resulting in so-called jitter motion of the electron as it orbits the nucleus. In addition the electron can emit and reabsorb transient or virtual photons as it appears to momentarily create new particles in apparent violation of energy conservation. However, no violation is acknowledged, since the electron will re-absorb these particles in the time permitted by the energy-time uncertainty principle.

Despite all the work on the models of the atom above, recent observations in the extreme ultraviolet spectra of the atoms of hydrogen and helium have revealed that none of them can explain more than half of the emission spectra of atoms. [29, 30]

Conclusions. The ancient theory of the atom, which has been attributed to Mochus, was claimed to be based upon logic, intuition, and religious revelation. The modern chemical theory of the atom which is based more upon experimental observation than logic and intuition is faltering as more precise data and more types of experimental data are obtained. It appears that the point particle notions incorporated within modern chemical theories of the atom need to be removed and replaced with the ancient atomistic ideas, where elementary particles are composed of substructures like quarks and leptons which are composed of the atoms of Mochus. This is currently being done in two new books being published. [31, 32] **This work appears to give more credibility to the ancient theory of atomism attributed to Mochus, i.e. Moses the Hebrew lawgiver. It describes how God, the originator of all electromagnetic fields, is the creator of all atoms and matter structures and sustains them.**

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