

Atoms and Void

For twenty-five centuries, influential philosophers, theologians, and scientists have argued over physical concepts on the nature of *matter* and *space*. Relying upon philosophy, or at best deduction (the weakest of scientific methods), ancient “Greek thinkers in search of things essential and universal” developed some preliminary but persistent notions about primordial substances such as water, earth, air, and fire. From such notions, the atomic school of Leucippus and Democritus gave the original concept of atomism: “atoms, the elementary corpuscles of matter, are indivisible”; atoms are hard, small and impenetrable objects; “infinite in number, ...they are in constant and eternal motion.” Yet they differ among themselves in “shape, arrangement and position.” [Bernard Pullman, *The Atom in the History of Human Thought*, pp. ix, 18, 32-33, Oxford University Press (1998)]

Another atomist, Epicurus, taught that space consists of absolutely nothing, since objects made of atoms move through space so easily. The motion of atoms led Epicurus to the second fundamental premise of atomism, the idea of *void*. *Void* is a term more precise than *space*—a modern term that can mean a spatial fluid, a medium for the propagation of light waves and electric fields, or *absolute space* that provides a privileged position for observing motions of bodies.

Aristotle combated the premises of atomism with the concept that the movement of any object is the result of *direct mechanical contact*. And to Aristotle, the motions he observed were clear evidence that space is filled with something that touches everything. Aristotle was an antiatomist who denied the void and promoted the *law of cause and effect*. His antiatomistic views were well-received over many centuries and continue into the present era.

The earliest Greek philosopher-scientists granted *eternality* to atoms. Epicurus agreed and added to atoms an inherent power that is cherished by modern scientists and revered by modern philosophers. This new power was called the “deviation of atoms” whereby an atom spontaneously moves or “swerves” from the path of its motion. The greatest spokesman for atomism, Lucretius, described the famous swerve in his popular poem: [Copley (tr.), *Lucretius: The Nature of Things*, p. 34, W. W. Norton & Co. (1977)]

Here too is a point I'm eager to have you learn.
Though atoms fall straight downward through the void
by their own weight, yet at uncertain times
and at uncertain points, they swerve a bit—
enough that one may say they changed direction.

Among modern thinkers, the concept of the atom's “swerve” has not been dismissed along with other primitive or erroneous ideas of ancient Greek scientists:

- One modern writer calls the “swerve” a “great stroke of genius.” [Copley, p. xii]
- Niels Bohr incorporated this power of the atom into his model of the atom where an orbiting electron changes its orbits and energy spontaneously in what is known as the “quantum leap.” [R. C. Sproul, *Not A Chance*, p. 37-54, Baker Books (1994)]
- The Heisenberg Uncertainty Principle is a fundamental principle of Quantum Mechanics which asserts that random processes in elementary particles constantly create new positions and motions of fermions (material particles, such as electrons) with the simultaneous appearance of bosons (force carrying particles, such as photons).
- In yet another example of the power ascribed to the atom by ancient and modern atomists, the lighter atoms are said to collect themselves into planets, stars, and galaxies where they evolve into heavier elements by stellar thermonuclear synthesis, then into molecules, next into biologically important molecules, next into simple living cells, and finally through many stages into complex living creatures of every kind. [Howard Van Till, *Basil and Augustine Revisited: The Survival of Functional Integrity*, Origins and Design **19**(1)36, pp. 26-35 (Summer 1998)]
- Modern physics *assumes* that elementary particles have fundamental properties and even proclaims a power inherent within these atomistic particles to display several properties—including size, magnetic moment, angular momentum, inertial mass, stability, and the ability to appear as a particle or a wave (depending upon how the particle is being measured in certain experiments).

These amazing powers ascribed to atomic particles are incredible to other physicists who note inconsistencies in logic and with experiment. In order to retain popular atomistic models of elementary particles, modern physics also finds it expedient to modify or ignore well-established physical laws. Today, some physicists routinely replace laws of electromagnetism with new “force laws” in order to predict forces over short range (as inside the atom) and for early time periods (as during the first moments following the Big Bang).

Discoveries by chemists in the nineteenth century revealed properties of atoms and matter that permitted (1) a periodic classification of the elements, and (2) descriptions of structure in matter far more insightful than the ancient view that atoms were all hard little objects of various size and shapes. The stunning advance in chemistry soon provided huge benefits by exploiting the use of materials in the fields of medicine, consumer goods, fabrication, etc.

Then, in the same century, came the great discoveries by Michael Faraday about magnetism and the insight of James Clerk Maxwell that electromagnetic field energy resides in space. These discoveries of electromagnetic energy show that space is not void but filled with non-material energy of electric and magnetic fields. One body can exert a

force on another body from a distance, and the *law of cause and effect* applies to all natural events. The ancient dilemma was finally solved: *where space is void of material objects, another material object can move through it, and an electromagnetic force can operate through it.*

Aristotle and Epicurus were both wrong! The discovery that electromagnetic field energy resides in space and the application of electromagnetic field theory (EFT) led to the advances in technology that gave us electric motors, generators, radio, television, and computers—laying the basis for modern technology and propelling the industrial revolution to unimaginable achievements.

The scientific discoveries made in the nineteenth century on the nature of the atom and the void could reasonably be expected to be incorporated into scientific models and theories at some time during the twentieth century. But this has not happened. Old ideas die hard! Instead, twentieth-century physicists retained the atomistic philosophy of materialism in the form of its original concepts: *first*, matter is composed of many kinds of ever-smaller atom components (now called fundamental particles), and *second*, space is still a void that excludes all space mediums including the ether (the prestigious elite of modern physics have largely ignored the application of EFT, preferring to apply quantum mechanics and leave the application of EFT to engineers).

Quantum Theory (QT) and Einstein's Theories of Relativity became the pillars of modern physics, even though the logical bases of science, causality and the Scientific Method, frequently had to be ignored. And thus, the twentieth century saw physics adopt new models and theories established more by consensus than certainty.

Modern atomists justify their theories using the same argument as the ancient atomists, claiming that ordinary experience doesn't apply to the small world of atoms where force laws are supposed to be different and random events have a much larger impact. The ancient atomists justified their theories with the same argument about things that are small and hard to verify: [Copley, *Lucretius: The Nature of Things*]

But that no atom ever swerves at all
from the perpendicular,
who could sense and see? [p. 34]

Atomic nature all lies far below
our powers of observation;
hence since atoms cannot be seen,
their movements, too, escape us. [p. 36]

Modern physics employs the Standard Model of Elementary Particles to describe the components of matter. And several other theories are used to describe the forces and motions of objects; the most important of these are QT, Special Relativity Theory (SRT), and General Relativity Theory (GRT). In spite of strenuous efforts to integrate the many force and matter theories, the goal of a single theory remains a challenge to physicists. In

1998, the achievement of this goal became so important that some physicists have attempted to extend QT to cover what previously was left to EFT. This extension, called *quantum field theory*, is still based on the atomistic principles of *atoms* and *void*: (1) matter consists of many kinds of small particles, and (2) space is void, empty of any ether or electromagnetic fields. In order to exclude an antiatomistic force explanation by EFT, the application of QT was usually limited to cases where the distance between objects is small, about the size of one atom. Until recently, Quantum Field Theory maintained an uneasy coexistence with EFT.

But incredible claims were made in 1998 that *bosons* (force-carrying particles moving between objects) not only explain forces over short distances between electrons, protons, neutrons, and quarks, but also can replace the theory of electromagnetic forces between large objects such as the plates of a charged capacitor and the poles of permanent magnets. However, one can easily demonstrate with two bar magnets and a plate of copper that the force between the magnets is not at all lessened by inserting the copper between attracting or repelling poles of the magnets. Evidently there are no *photons* (bosons, so-called “particles” of light) traveling between the magnet poles as light, since copper (or any other non-ferromagnetic material) stops light and radiation of other wavelengths.

A second theory, SRT, is used to predict forces between objects separated by greater distances. Critical analyses of SRT have revealed many inconsistencies within the theory. Even the author of the theory, Albert Einstein, acknowledged that the Second Postulate of SRT, the *Principle of Constancy of the speed of light* was “an assumption at first glance quite irreconcilable with the former one [the *Principle of Relativity*].” Furthermore, the assumptions of SRT lead to “curved space” which is outside the common experience that space is flat and described accurately by three-dimensional Euclidean geometry. Fundamentally, SRT is a way to modify electromagnetic field theory; thus, SRT denies particles and acknowledges fields—following atomism regarding *matter*, but denying atomism regarding *void*.

A third theory, GRT, is used to predict forces in space. GRT claims that space is curved by the presence of large objects; supposedly, GRT explains the force of gravity and even predicts that starlight will move along a curved path, a “swerve” that follows the so-called “space-time warp.” Space is not void, according to GRT, but filled with gravitational fields. True atomists say the effects of force on objects are caused by gravitons (a special kind of force-carrying particles), not gravity fields. Attempts to integrate GRT with QT into a single atomistic theory are unsuccessful without assuming the existence of gravitons—which have never been directly observed. GRT cannot even be integrated with SRT to create the single force theory that Einstein desired, for the reason that both describe space as “curved” with a space-time warp but use a different amount of “curvature” based on different equations (one generated by Minkowski and the other generated by Riemann).

In spite of nineteenth-century discoveries, few twentieth-century physicists thought that the essence of an electron or a proton is electric charge. Most particle physicists still consider electrons to be point-like particles whose properties of spin, magnetic moment, and mass are inherent properties. Unlike the ancient philosopher-scientists of Greece who thought an atom must be composed of a primordial substance—water, earth, air, or fire— twentieth-century philosopher-scientists ignore or deny any substance whatsoever to an elementary particle. In QT, the quarks and point-electrons simply exhibit whatever fundamental properties that are useful in mathematics equations to predict natural phenomena.

In contrast to these point-particle theories, between 1915 and 1990 four physicists independently proposed an identical ring model of the electron consisting of electric charge. This atomistic assessment of the composition of matter permitted the *derivation*, instead of the *assumption*, of electrical, physical, and chemical properties of matter at the level of particles, atoms, and molecules.

Today, based on *elementary particles composed of electric charge*, and *forces derived from electromagnetic fields*, Common Sense Science (CSS) is completing a theory of matter and space that is grounded in logic, consistent with experimental data, agrees with the current operation of the fundamental laws of physics, accurately predicts new natural phenomena observed in nature, and provides for natural processes on the basis of self-evident principles of *objective reality*, *causality*, and *unity* existing throughout the universe.

In terms of the historical conflict between atomism and antiatomism, Common Sense Science adopts only those concepts of atomism and antiatomism that can be integrated into a self-consistent theory of physics. CSS recognizes a few elementary particles that have a durable existence independent of any human observation or perception. We accept the concept that space is mostly devoid of material objects; yet space is not completely void since it is clear that radio waves and electro-magnetic fields of all types and frequencies occupy space—one field even passing through other fields in accordance with the principle of superposition and the evidence for propagation. And, while ancient and modern atomists ascribe power to the atom for *random* physical events, CSS proceeds upon the *law of cause and effect*.

As an emerging theory grounded in proven scientific methodology, Common Sense Science has demonstrated a strong ability to advance scientific knowledge. A few fundamental concepts provide the foundations for a scientific theory of matter:

- The universe consists of *material particles* and *space*. Material particles (as elementary particles) are composed of electric charge whether found in isolation or as aggregates of matter. Space represents the great expanse which has no properties other than a concept of location, and is mostly void and without any kind of space medium except for electric fields and magnetic fields.

- Fundamental natural phenomena observed in the universe proceeds from an underlying electrical character of matter and energy. Elementary particles always possess *electrostatic charge*, and the presence of this charge produces the properties of particles and atoms.
- Energy also resides with varying intensity and form in space in the form of electric and magnetic fields (including light and gravitational fields). Changes in the intensity or shape of electric and magnetic fields propagate through space with a great but finite velocity. Light of all wave-lengths is self-propagating with a great but finite velocity.
- All particles and atoms in the universe are of finite size, and the electrical fields surrounding charged particles not only interact with other charged particles in the void but with other charge elements distributed within the same object.

The great task before us has been to describe matter in a rigorous way that accounts for its nature, its motions, and its interactions with radiant energy. The effort to depict matter on a scientific basis that minimizes assumptions and avoids inconsistencies became possible by rejecting some popular assumptions and adopting other features drawn both from atomism and antiatomism. Judging by the success to date, significant advances in technology can be expected from the consistent application of the Scientific Method to the study of atoms and the void.