

# The Unequal Equal Sign

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Consider the mathematical expression  $2 + 2 = 4$  which is only an equality when the addition operator, +, is fully applied; otherwise two twos do not necessarily make four. As an example, the + operator cannot be used on 2 sheep and 2 cows; however, it can be used if the distinction of sheep and cow are mutually replaced with a more limited term of “animal” to state that the sum of 2 animals and 2 animals equals 4 animals. Similarly, two seemingly unrelated things can be equated if they are both limited to a common characteristic such as comparing only dollars in equating a new house to a wage increase.

The rise in science was built upon the discovery that different objects, forces, or interactions between objects or forces could all be equated together using only four fundamental elements. These fundamentals were introduced around 450 BCE by the Greek philosopher Empedocles who named them *earth*, *air*, *fire* and *water*.

The four elements were the metaphysical causes of physical reality. *Earth* was that unknown thing that gave mass and solidity to objects; *air* was the mysterious element that provided separation, shape or size; *fire* was the source of any energy, vitality or change; *water* was time or the mysterious flow that separated past, present and future as well making changes manifest. The four elements can be compared with the axioms of geometry which are fundamental but cannot be proven.

They were so useful that they became quite widely adopted throughout many cultures as a tool to explain the physical world. Each physical object could be equated to how much of each element it contained and then compared with the elements of other objects. For example, lead had far more *earth* than did wood, but wood had far more *fire*. (Any force or power that caused a change to occur was equated with *fire* which was originally equated to the creative power of the sun.)

Plato in his *Laws* (around 350 BCE) considered that the elements were created by Nature and then became the building blocks for the entire physical world. (Indeed, even today, astrophysicists must use the same but updated elements to describe the creation of the universe.) Plato even placed the elements ahead of the gods arguing that gods were created by the Art (*techne*, another mystical force) of individuals.

Lucretius, two centuries later, applied the four elements to biological processes in his dissertation *On the Nature of Things*. He described the basic life force as another form of *fire* evidenced by breathing or respiration which was actively exchanging gasses or fluids with the environment. Vitality was due to more forceful breathing which was the nearly universal description of the soul (the word soul in several languages means “deep breathing”).

The elements were given various interpretations and levels of importance in different cultures. For example, the Chinese used the element of *air* or empty space to convey more information than *earth* or form in paintings, whereas the West considered *air* to be secondary to *earth*. Similarly, musicians still argue that the emptiness or silence between notes is importance for increasing the energy (*fire*) and flow (*water*) in music compositions.

The element of *fire* has always proven to be a major obstacle to both science and religion since nothing can change without it and yet no one can determine what it is or explain the many different forms it can take. The forms include a nuclear blast, sunshine, food, sound, physical motion or even thought.

There is one characteristic of all forms of energy that opened the door to its description and quantification and that was the actual physical change that resulted from its manifesting. Using the resulting changes to describe the original energy became quite similar to attempting to describe early cultures by their artifacts.

Since it was impossible to define what *fire* or energy is, the first step was to define its various initial forms, such as electricity, light, fuel, mechanical motion or heat. The second step was to describe the end result or product of the flow or exchange of energy. This resulted in the discovery that all of the various results from all of the different forms of energy could be described using only the three elements of *earth*, *air* and *water*. However, the simplified result did not seem to have any logical relationship with the original energy.

This process of equating energy to its final product was made easier by the refinement of *earth*, *air* and *water* to what are now called the dimensional units of **mass**, **length** and **time**. With these three units any final product of energy exchange can be measured by equating the quantity of **Energy** to the quantity of **mass** times **distance** (length) divided by **time**<sup>2</sup>. Distance divided by time is called velocity; thus, the mathematical notation looks like:  $E=mv^2$ . (This equation also forms the basis for Einstein's  $E=mc^2$  where **c** is the velocity of light.)

It is important to recognize that many things are lost in this type of equality, such as equating matter to energy in Einstein's equation or the velocity of mass to a reading light. In the modern materialistic world, no one still has the foggiest idea what *fire* or energy is or how to envision the change of one form of energy into another. The modern world has essentially replaced philosophical and mystical considerations with a very simplified accounting system that files metaphysical powers under their artifacts. This technique is commonly extended to such extremes as equating love to a beating heart or knowledge to a book.

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