

A New Logic Is Required

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On November 2019, the date January 14 was officially proclaimed as the "World Logic Day" at the 40th session of the General Conference of UNESCO in Paris. On this occasion I would like to propose a different new logic in opposition to the classical Aristotelian logic. The Aristotelian logic is based on three fundamental principles. These are:

- 1) The principle of non-contradiction: This principle is also known as "The principle of Consistency", meaning that no theorem (proposition) of the logical system can contradict another theorem (proposition).
- 2) The principle of excluded middle: A proposition can either be true or false. There is no third alternative.
- 3) The principle of identity. All existent has to be identical to itself. For all propositions p , it is impossible for both p and not p to be true.

The world, as Aristotle describes it in his "*Categories*", is composed of substances—separate, individual things—to which various characterizations or properties can be ascribed. Individual things can be grouped into 10 categories or sets. All elements of the set must have the same characteristic. This is the basis of determinism. For example: All humans are mortal, A is a human, thus A is mortal. Here there is no exception. Once we set the initial condition, we end up with a deterministic conclusion.

But Quantum physics is not deterministic; it makes use of probabilities and is a theory based on indeterminism. Therefore the principle of excluded middle does not apply for Quantum mechanics. A proposition can be both true and false, there is the possibility of a third alternative. For example in the micro world of Quantum physics there is the possibility of a third alternative. A particle that impinge on a potential barrier can penetrate through the potential barrier even if the energy of the particle is less than the barrier height. This phenomenon is known as "Tunneling". The tunneling phenomenon cannot and does not happen in the macro world. It can happen in the micro world because all existent has the property of being both a particle and a wave. Tunneling happens when an object behaves like a wave. Behaving like a particle is contradictory to behaving like a wave. Thus, in the micro world of quantum physics the principle of the excluded middle and the principle of identity are violated. An object IS both a particle AND a wave. But it can also be neither a particle nor a wave; something in between which transcends the principle of the excluded middle. I claim that all objects are transcendental because they are beyond ordinary or common experience, thought, or belief.

Nobel prize-winning physicist Richard Feynman said "Nobody understands quantum mechanics." This is because we think according to the principles of the classical Aristotelian logic. If we want to understand the underlying quantum reality of the micro world we need to change our classical thinking system. We need a new logic which can deal with the characteristics of quantum universe. We evaluate our 3-dimensional macro world with the capacity of our 5 senses. But our senses are limited and our common experience of the

macro world is subjective to a large extent. The macro reality is a subset of a much larger set which we can call "transcendental reality". This large set defined as being transcendental, incorporates both the macro as well as the micro worlds. The macro world in which we exist is both external as well as internal. It is nothing but a practical evaluation of our brain, and our brain can only decide on what is based on whatever has been injected to it through the five senses or through indoctrination. If we want to understand the physical phenomena described by quantum theory, then we need a new logic, which can be called **the logic of complementarities**. In this new logic the above three principles of the Aristotelian logic are not anymore valid. The new logic does not make use of the "or" conjunction, but uses only the "and" conjunction.

In this new logic any proposition can be both true AND false. For all propositions p , it is possible for both p AND not p to be true. A proposition can contradict itself AND still be true. It has been shown by the mathematician Kurt Gödel that there are certain propositions in the formal logical system which cannot be decided to be either true or false. Thus the formal logical system that we normally use is an open set, which allows for the existence of a completely different logical system that can explain both the reality of the macro world as well as the reality of the micro world.