

**Subject:** Science

**Article:** 26

## QUANTUM LOGIC

Doç. Dr. Haluk BERKMEN

During the twentieth century a new conception of nature and a new understanding of reality came to take shape among the community of theoretical physicists. This new paradigm was based on the ideas of Albert Einstein who claimed that space and time is depending on the speed of the observer and also on the idea of Max Planck that energy is transmitted in discrete steps called "quanta". The revolutionizing conceptions of the theory of Relativity and of the theory of Quantum Mechanics started to shake not only the principles of classical physics, but gradually started to transform the concrete sense of reality of the populations at large throughout the world.

The Quantum mechanical reality goes far beyond the microscopic world of atoms and sub-atomic particles and can influence the very basis of our daily social life. The concept "reality" is based on the assumption, that the external world can be observed objectively and that the results of observations are a consequence of pre-existing properties carried by physical systems. Such an understanding of reality is based on objectivity, causality, locality and positivism. These so called "principles" are based on the classical world-view and do not apply to the realm of quantum physics.

Quantum physics accepts that there is an interaction between the observer and the observed and rejects the concept of a continuous linear time running from the past to the future. Events do not have to be completely determined by the past, and cannot be explained by means of observable causes alone. The world is neither totally outside of us nor totally inside of us. Our daily life is an experienced state of entangled events that are both, local and deterministic, as well as non-local and non-deterministic. Therefore, our momentary and instantaneous experiences are not completely determined by the past, but also are not totally random either. Humans have free will and the freedom of choice, but they are also bound by the values and preconceptions of the culture which they live in.

In that sense humans can be compared to elementary particles. The concept of *elementary particle* is a legacy from the classical world-view that accepts that fundamental building blocks of localized and independent material entities form all that is in the universe. Quantum physics has demonstrated that the concept of "particle" should be replaced by the concept of "wave", and that all so-called particles are localized concentrations of energy waves. Waves have no clearly defined boundaries and are not isolated entities.

Mass, on the other hand, is defined as being pure energy according to the famous equation of Albert Einstein  $E = mc^2$ . Here  $c$  is the speed of light that is constant and can be chosen to be equal to 1. Thus, mass is equal to energy and energy can be transformed into massive particles. We know many forms of energy, but energy per se is beyond definition. It is everywhere and at same time nowhere. It is in constant motion and cannot be totally isolated. This is why all things in the universe –from atoms to galaxies- are in a never ending perpetual motion. Nothing is permanent and all things are in a continuous state of change and transformation. Matter is a temporary state of energy concentration and can only exist within certain energy fields, such as the gravitational field and the electromagnetic field.

All points of an energy field are both locally isolated as well as globally interconnected. The points in an energy field are nodes within a global network, which has the capacity to communicate instantaneously and behave as a single and conscious sentient being. All nodes within the **world wide web** can communicate at the speed of light and the internet has become a global communication and information network. We are now experiencing an era where quantum physics reigns supreme and controls all aspects of life.

But unfortunately, we are still thinking with the concepts and biases of the classical world view. Quantum physics tells us that the world is subjective as much as objective. That non-local, faster than light, communication is possible and that the human capacities are far from being exhausted. We have to realize that conscious minds have the power to change the accepted premises of what we call "reality" in unpredictable ways. But in order to achieve such a paradigm shift, we first need to change our understanding and application of logic. The classical **Aristotelian logic** is the main hurdle that stands before us and that needs a fundamental revision (See article **17-A New Way of Thinking**).

According to the classical Aristotelian logic "each thing is the same with itself and different from another", thus "**A is A and not  $\sim A$** ". This is the **law of identity** and is the first of the three classical laws of thought. The other two are the **law of non-contradiction** and the **law of excluded middle**. The law of non-contradiction states that no logical assertion can contradict itself. One cannot say something that is both right and wrong at same time. The law of excluded middle states that any logical sentence can be either true or false; there is no third possibility (See article **19-Law of Included Middle**).

Quantum logic, on the other hand, claims that these three laws of the classical thinking method are not valid any more. In this new logic there is no "or" but only "and".

Any object, irrespective of its size, is both a particle **and** a wave.  
 Reality is both deterministic **and** non-deterministic.  
 The world exists both outside **and** inside of us.  
 The past **and** the future exist in the present moment.  
 Our actions are influenced by both local **and** non-local interactions.  
 Humans are both orderly **and** chaotic beings.  
 We have both a physical **and** a non-physical energetic body.

