the general science journal

# Philosophical and Practical Implications of Quantum Mechanics

**Sunil Thakur**
**Sunil.thakur@norlabs.org**
**www.norlabs.org**

**Abstract: Quantum mechanics makes some very significant observations about nature. Unfortunately, these observations remain a mystery because they do not fit into and/or cannot be explained through classical mechanics. However, we can still explore the philosophical and practical implications of these observations. This article aims to explain philosophical and practical implications of one of the most important observations of quantum mechanics – uncertainty or the arbitrariness in the behavior of particles.**

Richard P. Feynman, Robert B. Leighton, and Matthew Sands observe,

"*We have implied that in our experimental arrangement (or even in the best possible one) it would be impossible to predict exactly what would happen. We can only predict the odds! This would mean, if it were true, that physics has given up on the problem of trying to predict exactly what will happen in a definite circumstance. Yes! physics has given up. We do not know how to predict what would happen in a given circumstance, and we believe now that it is impossible - that the only thing that can be predicted is the probability of different events. It must be recognized that this is a retrenchment in our earlier ideal of understanding nature. It may be a backward step, but no one has seen a way to avoid it... So at the present time we must limit ourselves to computing probabilities. We say "at the present time," but we suspect very strongly that it is something that will be with us forever - that it is impossible to beat that puzzle - that this is the way nature really is.*"

This statement sums up the quantum mechanical view of the world. This world is about uncertainties, dualities, paradoxes, and probabilities.

Richard Feynman observes, *"A philosopher once said, "It is necessary for the very existence of science that the same conditions always produce the same results." Well they don't!*"

If this is so then, how can science exist in the universe?

Fortunately, science is not about tossing up the coin in the air to make a decision; it is about making definitive statements.

There is no doubt about the validity of the observations of these great scientists; we do see the uncertainty in the behavior of the particles and not just in the behavior of the sub-atomic particles but even in case of atoms.

The atom of a radioactive element may survive for billions of years or it may disappear next moment; an atom in the atmosphere may combine with the atom of another element or it may just live a lonely life for years without forming a bond with any atom. In BE-condensate, we find that some atoms (of the same element) are hyper energetic and hence are hyper active. These hyper active atoms have to be virtually kicked out of the condensate to allow it to cool down to the temperatures close to the absolute zero temperature.

Since we are discussing behavioral aspects of the particles, let us bring in some philosophy to add some spice to our discussion.

Popular science-philosophy books ask, 'Do particles have mind?'

Aha, what an interesting question! To answer this question, we must define mind but how do we define mind.

Mind is not a physical entity that can be defined through its physical or chemical properties. Like gravitational force, mind can only be defined through the effect it produces.

Mind can only be defined as a non-physical entity that generates varied behaviors and varied responses by the entity it belongs to.

There is no other way we can identify and define mind. When an entity produces predictable responses then we term the entity as 'mechanical'. Our own instinctive reactions are supposed to be mechanical; we do not get enough time to apply our mind to certain situations in which message does not even have time to reach the brain and in such situations we react instinctively and mechanically and therefore our responses are predictable. Application of mind is supposed to produce non-mechanical behavior.

Going by this definition, we may say that particles do have mind.

Now, we move to the next question, 'Do particles make conscious decisions?' Do particles weigh the options available to them before they make a decision? Well, this question cannot be answered scientifically because we cannot even know what goes inside the mind of even a human being so how can we understand the mind of a particle?

Therefore, we must leave this question unanswered as we do not want to waste our time on something that cannot be explained scientifically.

There is another important question that quantum mechanics throws at us, 'Are we a participator in an experiment? Does an observer affect the result of the experiment?'

Yes, an observer affects the result of the experiment because an act of observation is an interaction between the observed and the observer. However, in most cases the affect may be too small to have any significant practical implications on the result of the experiment. The point we miss is that an experiment does not end when a result of a procedure is obtained. An observation or a procedure becomes an experiment of science due to its interpretation to establish cause and effect relationship. This is where we enter in an experiment and this is where subjectivity steps in, in the field of science.

Let us now return to the probabilities.

What is a probability?

A probability is an irrational, illogical guess; it has no scientific or rational basis. I toss up a coin 10 million times and every time I get tails but no one can say with any degree of certainty that next time I toss the coin, I will get tails only because every time I toss a coin there is 50% possibility of getting heads. Which probability do I consider while calling?

A doctor explains the dilemma of his patient beautifully, when asked about the chances of success of an operation; doctor replied that the probabilities are for doctors and not for patients. Doctor said that he might claim that he had conducted x number of operations and his success ratio was y% but for the patient there were no probabilities because patient either survives or he dies.

Well said doctor! Fortunately, at least doctors do not believe in probabilities or probably they do!

Now, let us bring in a physicist. A physicist will tell you that before one decides on the doctor who must perform the operation, one must check their past record as past record allows us to determine the probability of getting back our person live and healthy. Yes sir, this is what we all do and leave everything else to the god but ask the physicist to guarantee the survival of the patient and the physicist probably will disappear faster than speed of light.

Predicting behavior on the basis of probabilities is the job of the sociologists and not the scientists. A scientist stays away from predicting probabilities. A scientist does not like to toss the coin before he speaks; a scientist likes to make definitive statements.

Fortunately, universe is not so mechanical that we can make accurate predictions about the behavior of the physical entities and luckily, universe is not chaotic; lawlessness does not exist in the universe and hence we can have definite cause and effect relationships. Nature does not control the behavior of the individual particles but it ensures that the result of a particular behavior produces a specific reaction.

Science is not about predicting causes; science is about predicting effects.

There may be uncertainty with regard to the behavior of the particles but there is no uncertainty about the consequences of a particular behavior of a particle. Particles may behave arbitrarily, nature does not.

We may not know whether an oxygen atom may combine with the atom of x element or y element and therefore we cannot predict its behavior but we can say with certainty that if one oxygen atom combines with one carbon atom then carbon monoxide will be produced.

I will like to go back to first quote (Richard P. Feynman, Robert B. Leighton, and Matthew Sands) and have a re-look at the following observation,

*"We do not know how to predict what would happen in a given circumstance, and we believe now that it is impossible - that the only thing that can be predicted is the probability of different events.*"

Sir, I beg to differ. We may not predict the behavior of a particle in any given circumstance but we can predict the consequences of the choice a particle makes, of the behavior a particle produces. This is all science can do and it must restrict itself to predicting the outcome, the effect and not the cause.

An organization cannot predict and control the behavior of its employees therefore it can only make rules that specify the result of every specific behavior of its employees. An organization may or may not follow the rules it has made for its employees and its management may behave arbitrarily but as mentioned earlier, there is no uncertainty in the behavior of the nature.

Nature does not have mind; it reacts, it does not respond. Religious leaders may tend to make us believe that God is very kind but let me assure you that God cannot afford to be kind as he has to maintain balance. More than anything else, god has to be Al-Adl (the just). Nature does answer prayers but only if we pray scientifically and to pray scientifically one must understand the physics of prayer. I will not discuss physics of prayer here but there are scientific reasons to believe that prayer with faith can move mountains. It does not matter which God you pray to, just pray scientifically, pray with all your might; pray with your body, soul, and mind working as one unit; pray with faith and even a stone will answer your prayers. I am yet to find a religion whose followers have not gone through the bad times in life and indeed haven't had good times therefore do not worry about the powers of the entity you are praying to. We have had enough fights, enough wars because of wrong understanding of the religion. Let scientists step in and explain the scientific basis of our scriptures. Every scripture, irrespective of the religion it belongs to, has lot of science in it. Let us understand what we follow. Unfortunately, scientists are becoming more fanatic than the defenders of the various religions. They blindly believe what is told to them.

It is not easy just to react nonchalantly and therefore it is not easy to be god. A judge is supposed to be a highly respected person in the society just because a judge reacts and does not respond. If I believe that I decide the fate of the people then it puts great

responsibility on my shoulders. Only facts and nothing else must affect my decision because one can be unjust in one's decisions but one cannot be logically unjust in one's decisions. In any case, the moment I feel that I have the powers to decide the fate of the people then first thing I will do is to write happiness, health, and prosperity for all. Fortunately or unfortunately, no human being on the earth can decide the fate of any other individual.

In whatever capacity you work and in whatever organization you may work, always think about the set of the rules of your organization as the framework within which you can help people. I am not suggesting that you should go to any length to help anyone because it may require you to violate the rules. Always remember that one must not help anyone by harming one's own interest.

Law takes away the discretionary powers and universe does operate on some fundamental laws.

Since, nature reacts and does not respond therefore we can have science in this universe. Even though we can confidently say that probability of snowfall in the Sahara desert is zero, we can trust nature to prove us wrong; therefore, science prefers to say that if such and such conditions exist then there cannot be any snowfall or better still that unless such and such conditions exist, there cannot be any snowfall.

Science shall not encroach upon the territories of sociology or else it will create problems for itself.

One cannot understand quantum mechanics because there is arbitrariness in the behavior of the particles; all one can learn from quantum mechanics is that we have our limitations; that we cannot tame nature or even light as some scientists tend to believe. Science must make its followers humble because it shows that nature is the master and therefore we must live a life-style in accordance with the laws of the nature rather than try and tame the nature. Nature knows damn well how to maintain the balance in the universe and in such a big universe, we are too small an entity to even dream of doing anything against the laws of the nature. If a law can be violated then it cannot be a law of nature. Einstein lamented that all the evidences that validate the theory of relativity will come to a naught even if one evidence goes against it. This is the true spirit of a scientist; of a person who knows what science is all about.

Quantum mechanics has made a lot of positive contribution but all its contributions have been achieved when we have concentrated on the effects and not the causes. Today, science has moved away from the nature. The very people who are supposed to keep science alive and kicking, are responsible for its systematic destruction. Our present system expects us to see the world through the glasses it provides even if the glasses distort our perception of reality. Physicists wrongly assume that validity and usefulness of a scientific theory is inversely proportionate to its comprehensibility and hence science *esp.* physics is getting further and further away from the masses. The apples still fall but they no longer shake our minds.

Sooner physics realizes that we needs to make some important corrections in our theories, the better it will be for all of us because we can no longer have a situation where science does not deliver anything significant. The problem no longer remains that no one dares to tell the king that he is naked; problem is that all of us are naked. Problem is that we have come so far on the wrong path that going back is not going to be easy but how far can we continue on a journey that is taking us away from our destination. In last more than 300 years we have achieved a lot; we have moved to the farthest corners of the solar system, we can peep into an atom and find almost an entire universe inside an atom, we have built supercomputers that work at mind-boggling speed, we have even developed clones but we must admit that we cannot explain even one percent of the matter and energy in the universe, we must realize that we still do not have cure for common cold, we must not forget that we can still beat the best of the supercomputer in a game of chess, we must remember that we have still not reached to every human being on the earth, we must accept that natural calamities still cause mass destruction, we must understand that not many people understand the language we speak.

We are pinning great hopes on the CERN experiment but I fail to understand how we can enter into such a costly venture when we are not sure of what we are looking for. We hope that we will be able to detect Higgs boson and if we do not find it then the heaven will not fall because we may find extra dimensions and strings and what not.

What if we are able to detect Higgs boson? Does it resolve the mass-riddle? Does it resolve any of our theoretical problems concerning standard model of particle physics? If it does then let us assume its existence and in fact, at present, we do assume that Higgs mechanism is the only solution to the mass-riddle and yet we have so many unanswered questions.

I am not against the experiment because I know that it will validate my prediction that decay processes in the experiment will be faster than we have noted so far and faster than predicted by us. I have explained the logic behind the prediction in my book, 'Nature of Reality' therefore I will not explain it here but this is too expensive an adventure to validate something that is not going to resolve any issues.

We must not forget that we are spending taxpayer's money and we shall not forget that there are people who do not even get one time proper meals, that there are people who still die of curable diseases, and that there are children who have not even seen a school building.

I understand that the development cannot stop just because some of us have been left too far behind but at the same time, we cannot be irresponsibly frivolous; we cannot be blind to our social responsibilities.

The bottom line is that our actions determine our fate. We manifest the qualities that we decide to manifest. Nature gives us freedom to control our behavior but that is all that we can control. Some of us, including myself, may tend to believe that god sometimes takes undue advantage of being the almighty god that he is but believe me, dice falls exactly at the place it must, exactly in the manner it must, and exactly at the time it must.

**********