Mathematics and Physical Universe

Note: This essay is a response to the essay "Uncertainty in Mathematics" indicated below,

Mathematics is a man-made system of knowledge; even though it is based on some experience but is not beholden to it. Its development is only a few thousand year old.

From experience of how two similar physical things when combined become double the individual thing is an example of rudimentary logic. But logic is also man-made. Therefore, mathematics by itself cannot predict physical phenomena, it has to be corroborated by experience. British philosopher, Hume, put a death knell to the hypothesis that logic alone, including mathematical logic, to be the touch-stone of reality. The ultimate validator of reality is experience.

But here is the agonizing drama of physics. In pursuit of understanding the physical universe physicists have sought the help of mathematics. It is because, within limitations, the physical universe behaves mathematically. In Einsteinian expression: "Our realization hitherto justifies us in believing that nature is the realization of the simplest conceivable mathematical ideas." But we know that he was proven wrong. Even after putting thirty years of relentless effort, and using some very imaginative mathematics, with the help of some outstanding mathematicians of his time, he failed to arrive at Unified Field Theory.

So, all this quarrel among mathematicians: Hilbert, Turing, and Goddel is meaningless to me. For a rigorously formulated system of logic, that is what mathematics ought to be, Turing and Goddel's objections to Gilbert's axioms are invalid.
Quantum Mechanics has done more harm to the basic principles of physical

research than anything else since the ancient cosmology tried to choke it in its infancy. Just because human beings are unable to find simultaneously the location and momentum of an elementary particle quantum mechanists have jumped to a preposterous conclusion that universe at its smallest level works by chance and that there is no past, present, and future. This absurdity has been propounded with the same demonic passion that ruled human mind for most of its history when it was under the grip of religion. It also shows that human beings are human beings, instinctively unscientific and spiritual. But we have seen such aberrational periods cross human history from time to time. When we again move from the darkness to the re-enlightenment we will curse ourselves how we fell under the treachery of Quantum Mechanics. If anyone believes that the physical universe in not ruled by laws, he should leave science and work for Wall St.

Suffern, New York, Aug. 27, 2015
www.kaulscorner.com
maharaj.kaul@yahoo.com

UNCERTAINTY in MATHEMATICS

(From Walter Issacson’s Book, The Innovators, as quoted by Mr. Devinder Kaul)

Events at the subatomic level are governed by statistical probabilities rather than laws that determine things with certainty. Turing believed that this uncertainty, and indeterminacy at the subatomic level permitted humans to exercise free will- a trait, would seem to distinguish them from machines. In other words, because events at subatomic level are not predetermined, that opens the way for our thoughts and actions not to be predetermined. Turing also had an instinct that, just as uncertainty pervaded the subatomic realm, there were also mathematical problems that could not be solved mechanically and were destined to be cloaked in indeterminacy.

At that time, mathematicians were intensely focused on questions about the completeness and consistency of logical systems, due to influence of David Hilbert. In 1928, at a conference, he posed three fundamental questions about any formal system of mathematics.

1.Was its set of rules complete, so that any statement could be proved or disproved using only the rules of the system. 2.Was it consistent, so that no statement could be proved true and also false? 3.Was there some procedure that could determine whether a particular statement was provable, rather than allowing the possibility that some statements were destined to remain in undecidable limbo? Such as Fermat's last theorem for a¬¬n+bn=c n there is no solution when n is greater than 2. Goldbach's conjecture – every even integer greater than 2 can be expressed as sum of two primes. Hilbert thought that the answer to the first two questions was yes, making the third one moot. He put it simply- There is no such thing as an unsolvable problem'. K.Godel, polished off the first two of these questions with no and no. In his "incompleteness theorem" he showed that there existed statements that could be neither proved or disproved. By coming up with statements that could not be proved or disproved, Godel showed that any formal system powerful enough to express the usual mathematics was incomplete. He was also able to produce a companion theorem that effectively answered no to the Hilbert's second question. That left the third of Hilbert's questions-that of decidability or as Hilbert called it, the "decision problem". Even though Godel had come up with statements that could be neither proved nor disproved. It would require that we find some method for deciding whether a statement was provable. When Max Neumann taught Turing about Hilbert's questions, the way he expressed 'decision problem' was this: Is there a "mechanical process" that can be used to determine whether a particular logical system is provable?

Turing showed that Hilbert's decision problem was unsolvable. Despite what Hilbert seemed to hope, no mechanical procedure can determine the provability of every mathematical statement.

Godel's incompleteness theory, the indeterminacy of Quantum Mechanics, and

Turing’s answer to Hilbert’s third question all dealt blows to a mechanical, deterministic, predictable universe

---

Quantum Mechanics And Reality

Ever since the curiosity of man was at times rewarded by provable answers, his intellect steadily grew. After the stunning successes of Galileo and Newton’s scientific works, intellectualism began to grow in power to rival religion. By the 19th Century many thinkers strongly believed that man’s intellect, given the resources of experience and time, was capable of fathoming the mysteries of the physical universe.

Newton’s physics was a gigantic milestone in the history of man. It unveiled the large-scale architecture of the universe, while many phenomena waited for the application of its principals to unlock their secrets. Man’s knowledge of nature grew richer when Einstein rejected Newton’s understandings of time, space, and gravity and formulated Theory Of Relativity to replace them.

But with the discovery of a discrete and irreducible quantum in the transference of radiation energy, Max Plank in 1900, reluctantly unleashed the phenomenon of discontinuity in the atomic world. Bohr’s model of the atom in 1913 engaged many physicists’ thinking about its plausibility and consequences. Further research in the atomic world indicated that Bohr’s neat and simple model was untenable.

As more understanding of the underpinnings of the atom was sought, the old question of whether light was a wave or a particle resurfaced, even though in the last 200 years it was accepted as a wave. On the strength of Plank’s discovery of the quantum of radiation, in 1905 Einstein concluded that light had a particulate nature, and the particles were later dubbed as photons. How did a negatively charged electron exist in the neighborhood of the positive nucleus? How did an atom absorb and radiate energy? Did the electron move around a nucleus or was it stationary at a point? The inner mechanics of the atom were a puzzle.

In 1924 de Broglie proposed the theory of matter waves in which particles could also exhibit wave characteristics. In 1925 Heisenberg proposed Matrix Mechanics, a matrix-based mathematical description of the mechanical system within an atom, incorporating de Brogilie’s idea, and only including the observable variables. That is, he used atom’s spectroscopic properties like frequency and intensity, which were observable; while the position and momentum of an electron were excluded, as they were not observable. However, they could be deduced indirectly.

In 1926 Schrodinger proposed Wave Mechanics, using de Broglie’s postulate on electron waves, where the particles were “bunched-up waves.” Matrix Mechanics understood atom and its components to be particles, while Wave Mechanics understood them to be waves. Later Schrodinger and Dirac showed that Matrix Mechanics and Wave Mechanics were equivalent. Born renamed Matrix Mechanics Quantum Mechanics and stated that the wave in Wave Mechanics denoted not a classical wave but a probability wave, which indicated the probabilities of the location and momentum of a particle at a given point and time, and not the actual location and momentum. Later, in a new interpretation of Quantum Mechanics it was discovered that it already had the elements of the “probability wave” built in it. In the end Quantum Mechanics won the battle over Wave Mechanics.

Further development in Quantum Mechanics came in 1927 from Heisenberg who postulated the Uncertainty Principal theory, which became its cornerstone. Since position and momentum of quantum entities like electrons were not precisely observable, Heisenberg theorized that the more accurately you measured one, the more inaccurate would the other’s measurement go. Exactly, the product of the uncertainties in the simultaneous measurements of the position and velocity of a quantum particle cannot be less than half of Plank’s rescaled constant.

There is no proof for Uncertainty Principle; it is just a supposition, a mathematical construct expressing the idea of a physical reality, without a theoretical foundation or an experimental confirmation. Such an assumption followed because measurements in the quantum world significantly disturb the quantum entities, unlike in the macroscopic world we are used to.

Inability to precisely identify position and momentum, also energy and time of its occurrence, in quantum world on account of the smallness of its objects, Uncertainty Principle would have been acceptable, but Quantum Mechanics states that nature is so built that there is inherent randomness in its architecture. This is the egregious notion of nature that is so disturbing, as modern science has believed that everything in the physical universe happens because of a cause. To abandon that structure of cause and effect at the most fundamental physical level of nature is unacceptable to many thinkers of the world.

What was the need to create such a theory? Men working in science are subjected to same human weaknesses as men everywhere else. Men working in the newly evolved quantum science in 1920’s had wanted to give a closing to their findings and theories. They desperately wanted to reach the bottom of the quantum world. In their extreme eagerness to settle the knowledge of the basic building blocks of the physical universe, they even sacrificed its cardinal principle of cause-and-effect principle.

Quantum Mechanics states since the act of measurement in the quantum world disturbs the object being measured; therefore, you will never have complete information on the mechanics of the object. Measurement defines what is being measured.

Look at some of the strange implications of Quantum Mechanics. Since it believes nature is inherently random, when a quantum object goes from position A to position B, it is supposed to have no definite position during the travel; in fact, the object can take every possible path connecting positions A and B. It could take a path around the buildings in the neighborhood of the site of the experiment being performed or it could go around the star Alpha Centuri. This is called the alternative histories of the reality. That is, all possible histories could have taken place between a particle’s past and present locations; there is no unique history. Every time you look at a quantum object a new present reality is created and correspondingly there exist a range of its past and future realities.

Since the positions and velocities of quantum particles are unknown at any instant unless you make their observations, so therefore their pasts as well as futures are also unknown. It is only when you take measurements of their positions, momentums, and energies you create their present, and then you can project their probabilistic pasts and futures. Also, when you look at the universe of quantum particles, your “looking” disturbs it, that is, you will never know what it was like just an instant before your observation. You will never know exactly what the universe actually looks like at any time. Also, by observing it you are creating a new reality every time. So, we have a set of possible universes we live in.

Look at another application of Quantum Mechanics called delayed-choice experiment. Wheeler considered photons emitted by powerful quasars billions of light-years ago, which could now be split and refocused toward earth by the gravitational lensing of an intervening galaxy. By such an experiment, which is totally beyond our capabilities at this time, we could set up an interference of the two split beams. But if we used a device in our laboratory to find which of the two paths one of the light beam has travelled the interference will disappear, even when that decision to have an interference was taken by the beams billions of years ago.

This is all according to the standard Quantum Mechanics; conclusions with which many scientists disagree. All such bizarre scenarios have emerged from the probability interpretation of Quantum Mechanics.

Heisenberg’s state of mind during the search of a theory for the quantum world has been well documented. To begin with he detested philosophical aspects of Physics. If left to himself he would not have formulated the Uncertainty Principal. It was because of the heavy prodding of his boss Bohr that he desperately sought an explanation for why his 1926 theory on Quantum Mechanics downgraded the direct verification of position and momentum of quantum particles. In his frantic search for a theory he was reminded of what Einstein had once said about some situation in physics that it was the theory that decided what we can see. So, taking refuge from Einstein’s philosophy Heisenberg’s theory was going to prevent the simultaneously accurate measurements of the position and momentum of quantum particles. Heisenberg has stated that Bohr was not a physicist, but a philosopher.

Heisenberg thought that Einstein in his formulation of Theory Of Relativity abandoned the intuitively understandable and time-honored notion of the simultaneity of events. He thought that since Einstein gave up the popular notion of simultaneity because it was immeasurable, so he could also abandon the exact simultaneous measurements of position and velocity because that was not practically possible to do so. But that understanding of the formulation of Theory Of relativity by Heisenberg was flawed. Einstein had qualified that under certain conditions two events happening apart can qualify as simultaneously happening events. Also, Einstein never abandoned the-cause-and-effect principle. Heisenberg was desperate to explain his intuitive physical ideas by some theory, which Bohr insisted was necessary in order to conform to correspondence principal.

Bohr was a great physicist and one of the principal architects of Quantum Mechanics, but unfortunately some of his guidance of it was harmful. His creation of correspondence and complementarity principals to shore up the weak structure of Quantum Mechanics was flawed. He believed that nature may not always be comprehensible by human logic and therefore he said, “It is wrong to think that the task of physics is to find out how nature is. Physics concerns what we can say about nature.” Bohr was a true-believer type of a scientist, for whom faith was more important than facts. He thought that since the quantum world was very different from the ordinary world, his two constructs would facilitate its understanding. But since these ideas were unscientific they introduced more mythology to Quantum Mechanics than it already had. Instead of accepting man’s inability to understand the entire quantum phenomena at the present, Bohr and his colleagues, who are collectively called the Copenhagen Interpretation Of Quantum Mechanics, created the two-science theory; one applicable to the quantum world and other to the macroscopic world. Bohr said that Quantum Mechanics demands a “final renunciation of the classical idea of causality.” Einstein, Schrodinger, de Broglie, among the founders of Quantum Mechanics, disagreed with that interpretation. In 1935 Einstein, Podolsky, and Rosens’s paper “Can Quantum-Mechanical Description Of Physical Reality Be Considered Complete? seriously challenged some aspects of Quantum Mechanics. Bohr worked hard over nine months to give his response, which turned out to be weak and unconvincing. Till the end of his life Einstein complained about the incompleteness of the theory of Quantum Mechanics. He could never understand how the wave and particle descriptions of quantum particles were complementary, an idea highly patronized by Bohr. A few months before he died in 1954, Einstein invited Heisenberg to his home, and told him, “I don’t like your kind of physics. There’s consistency, but I don’t like it.”

So, the reality based on Quantum Mechanics is like an Alice-In-Wonderland phenomenon. But we do not have to accept all its tenets. It is quite likely because quantum particles are so minute that they do not behave like the Newtonian billiard-balls in their mechanics, but that does not mean we have to give up causality. We do not have to accept the idea that nature at its minutest level exists randomly, that cause-and-effect principal has to be sacrificed. We can accept our limitations in measurements in quantum world but we still have certainty associated with them in the macroscopic world.

There have been periods in the history of science when certain wrong ideas have persisted for decades. The idea that there was a substance called lumniferous ether enveloping all the matter in the universe, which facilitated the propagation of all electromagnetic waves, was accepted for a very long time, until Einstein decidedly got rid of the concept in 1905. In the same fashion we live in an era when the quantum particles are supposed to move around randomly by their own will. This will also pass one day in future and the causality in nature will regain its absolute sovereignty. Until then we should keep our faith in it.

Suffern, New York, January 19, 2012
www.kaulscorner.com
maharaj.kaul@yahoo.com

Human Mind And Quantum Mechanics

(Response To Some Articles In NeuroQuantology Magazine, Sept. 2011)

It was disappointing to see how most of the scientists writing in the NeuroQuantology magazine (Sept 2011) do not understand what human mind is.

Human mind is not some supernatural entity, which religious people would like to believe, but a man-made program. Mind is the sum total of the best of the knowledge mankind has gathered since the dawn of usable consciousness. It is based on human experience and human ideas. Experience many people are able to understand but most of the people have no clue how ideas are formed in human beings. The old thinking was that ideas come from God. No, they are man-made.

Mind is an attempt to understand reality. So, by the very nature of reality, which is not only the reality outside human beings but also the one inside them, in popular reckoning, there will never be a final understanding of reality.

No mathematical equations can be set up for the human mind. All the articles in the magazine which are talking about having human mind as a variable in the theory of everything equations are deeply flawed, as mind is nothing but a body of ideas, and ideas are not quantifiable and cannot be subject to physical analyses.

It is shocking and deeply dismaying that most of the scientists today are not thinkers, as they should be, but operators, who just apply ready-made knowledge to the problem at hand. There are supposedly 35,000 neuroscientists in the world and most of them have no hang of what human mind is like; they consider it more like a natural phenomenon like gravity and nuclear energy, which can be understood by experiments and equations.

Human mind is unlike any machine. No machine can ever be built which functions like and has the potential of a human mind. The primitive human mind was only concerned with survival. As the survival needs of human beings improved over time the mind started exploring other frontiers. The primitive mind saw strangeness and mystery in everything and it took thousands of years of mental evolution for man to be able to separate the reality outside himself from the reality within him. As he gained confidence in his understanding of the external reality he began to use his abilities creatively. In every action he performed and everything he saw there was a question mark. Man’s need to know is elemental, as it comes from his instinct to survive.

An unusual aspect of human brain is that it has a capacity much more than that is needed for mere survival. Just for mere physical survival he did not have to go to art, philosophy, and other mental arenas, although they also have some survival features in them, but it is pure mental sphere of man, much larger than any animal’s, that engages his attention quite a bit, and that appears so mysterious to people. Simply put it, human brain hardware has much more capacity than is needed for mere survival.

Most of the common scientists would like to show that mind is nothing but an extension of brain. By having everything physical in nature, they think, they would be better able to understand the universe. As indicated in Karl H. Pribram's article, "…could we not do the same for brain functions by ridding it of mind." and "…I espoused and helped develop a science of psychology based on phenomenology as it is formed by brain processes." Most of the scientists have no imagination as how the mind and brain are related.

Mind is nothing but a collection of ideas. Ideas about everything: things, actions, feelings, thoughts, etc. Corresponding to everything there is an idea. The ideas are the highest level perceptions of the reality. Primitive man's ideas were quite different from ours. The evolved man was able to connect different ideas about some phenomenon and come up with an understanding of it. Later on we called such understanding theories. There are philosophical theories and there are scientific theories. Most of the human beings are not capable of understanding these theories and they do not need them for survival.

Many scientists erroneously think that we are born with a consciousness. No, we are not. We are born with a physical capability of senses and facilities of the brain to observe things and retain the observations in memory. There is also the capability of looking from different perspectives. Logical thinking and refinement of understanding is purely man-made. Consciousness is something that has evolved. That is why the consciousness of primitive and modern man is quite different.

All the efforts of thousands of scientists in the world to find a physical basis of human mind are doomed to fail. No machine can ever be made that is like human mind. Human mind has grown from its need for survival and then from its capacity to imagine. Both religion and science are the greatest inventions of human mind. There is no ultimate reality. The very fact that human brain depends upon sense impressions for its basic data, all mental constructs are constrained by that. We should be content that we are still able to "understand" a lot of things.

The idea that some universal power empowers human mind is quite wrong. There is no God. Universe and human brain are self sustaining phenomena. Science is an attempt to understand the physical reality without the help of God.

One of the tragic milestones in the human history has been the invention of Quantum Mechanics. When in the quantum realm establishing the common physical attributes like position and momentum of elementary particles became impossible, a theory that nature at its most basic level is not only indeterministic but also probabilistic was developed. The tragedy is that most of the scientists, who cannot think, believe that nature is so built. There is no way that aspect of nature can be proven; although due to human limitations we may not be able to measure its certain attributes beyond a level.

The quantum mechanical idea that observation changes the reality has been taken to absurd levels. The EPR (Einstein, Podolosky, Rosen) logic about Quantum Mechanics' shortcoming has not been refuted. When a bug looks at Alpha Century star how much of it is changed by the observation?

One of the absurd projections of QM used by some people is that all the reality we are aware of is the creation of human observation. Well, human beings are only about 4.5 billion years old, what happened to the universe which existed before that. How can you create something out of nothing?

QM is not a complete theory, something more has to come yet. In the history of science there have been long stretches of time when what we consider now as foolish understanding has prevailed.

QM just cannot be applied to human mind as it non-physical. It could be applied to some operations of the brain. The brain basically observes and remembers but it is the ideas of reality that man has gathered over a long stretch of time that interpret the observations. Therefore, the statement, "According to quantum theory, a system evolves casually until it is observed. The act of observation causes a break in the casual chain. Consciousness is a mark of the break in the strict regime of causality," an observation of one of the scientists in the magazine cannot be applied to human mind. The brain is a mechanical organ, the interpretation of whose work is made by mind, a system of ideas, which has evolved over eons.

Niels Bohr did a great disservice to humanity by giving some unscientific interpretations to QM. His complementary theory was one such theory. Instead of simply saying that the dual nature of some aspects of reality, like its wave and particle nature are irreconcilable, he put forward a theory that these two complement to give the full picture of reality. It is not science but a fairy tale.

When the present curse of QM lifts in future, man's innate rational sense will regain its control, and then we will see what man is: just a small element in the vast cosmos, and his science just an attempt to fathom it.

I curse my fate that I live in a time when materialism and quantum mechanics have significantly wounded some aspects of man's grand imagination.

12 Zeck Ct., Suffern, N.Y. 11.30.12, Rev. 11.15.20
www.kaulscorner.com
maharaj.kaul@yahoo.com