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.

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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