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Revelation of interrelatedness in the universe

Richa Kela
Research Scholar, Department of Philosophy, University of Delhi, Delhi, India, India

Abstract
There is no doubt that as the time evolves, we observed the evolution not only in science but also in tradition. From classical to modern science, it has transformed a lot. Later on it was seen the influence of Vedanta in Science. With the successful theory of entanglement, the result discloses that elements are conscious and even interact with each other. They behave differently when someone is looking them closely. This quantum physics is compared with Advaita Vedanta (non-dualism) and Mādhyamika (school of Buddhism). This paper aim is to affirm the reality that in this globalized world everything is interdependent or relative in the universe. The disturbance in one can affect the other. It might be seen that the way of showing reality is different in all of them but ultimately, they are reaching at the same end.

Keywords: entanglement, pratītyasamutpāda, cause-effect, vedanta, non-dualism

1. Introduction
Science has made a remarkable mark with its progress; right from the beginning of century to the present day. From presenting a picture of creation of universe by elucidating big bang theory and now moving towards the 'super unification', science has reformed extensively. This reformation is not under any pressure of religion or tradition. Rather it is completely based on the experiments performed. Earlier scientists work according to the causal-effect relation, that everything is determined (fixed) in this material world and differences are real but with the formation of quantum physics, it starts affirming that there is no real difference at any level between two electrons. This affirmation in quantum physics is compared with philosophy found in Upaniṣad i.e. Advaita which believes in non-dualism. Nāgārjuna uses the term 'advaya' which mention the same. Newtonian science is perfect at macro level. When electrons are observed, or inferred, determinism argues they will behave in the same way but quantum physics suggests interaction of electrons is there which hints towards non-dualism. Electrons behaviour differs and this gives a new thought that it is only possible when there is some level of consciousness in them. Without consciousness, they cannot interact with other. In this paper, I will focus on the progression of science and its comparison with Vedantin philosophy and Pratītyasamutpāda of Buddhism as they all reveal the same idea of interconnectedness in the Universe.

Evolution in Science
There has been significant modification from Classical Newtonian physics to Modern Quantum physics. Physics entered both at macro level and micro level. At macro level, it constructs a picture of universe and at micro level atom or matter is dematerialised and form small atomic objects. It was difficult for physicists to analyse whether these subatomic objects are particles or waves. 'They are better described today as 'events' in the sub-atomic world, or 'interconnected patterns of dynamic energy' as physicists Fritjof Capra likes to call them[1]. But in earlier times, there was a debate regarding the discovery of ultimate particle which is absolute (real). When these subatomic objects are observed, sometimes they act like waves and sometimes particle. This dualism of wave-particle was seen as contradiction as only one could be applied in experiments as real. 'According to the expectation of atomic theory, it should be possible to reduce an object to its independent elements to is mathematical laws, or to its simple and fundamental principles [2]. This view is influenced by Greek who reduce variable into permanent by mathematical law as fundamental object cannot be found in the complex world which we live in. But substances do not have independent existence. And if substance do not have its own existence then atomic theory to find out one independent, stable atom fails.

Reality in quantum physics is expressed by four notions: complementarity, four interactions which includes Electro-magnetic force, strong interaction forces, weak interaction forces and force of gravity. In 1927, the physicists Niel Bohr contributed to quantum physics by complementarity approach that wave and particle complement each other. It is impossible to separate between two. They are dependent upon each other. Similarly, electro-magnetic force also signifies the union (coming together) of two objects. For example, when you move a magnet in circular near iron, it attracts the iron to it. Strong interactions are seen in nucleus which hold firmly electrons and protons whereas weak interactions are when there is a discharge of nuclear particle from dynamic energy of interactive forces. Finally, force of gravity holds our feet on the ground or when we throw stone upwards, it falls to the

1 Jitatmananda, Swami. 1986, First edition. *Modern Physics and Vedanta*. India: Paras Prints, Mumbai.Chapter 1. Whither Physics today? pp.1
2 "The metaphysical foundations of quantum physics". Pg. 30-47 pp.30

surface. With this we can say that no electron exists as single particle. There are two or more than two particles involved in this interaction.

In the words of the physicists and Nobel prize laureate Gerard 't Hooft:

> "An electron is surrounded by a cloud of virtual particles, which it continuously emits and absorbs. This cloud does not consist of photons only, but also of charged particles, for examples electrons and their anti-particles, the positrons. […] Even a quark is surrounded by a cloud of gluon and pair of quark and anti-quark" [3].

Quarks which are elementary particle have never been observed as independent. They are always co-joint with other and even when one tries to separate them, new quarks start forming. This unification of two quantum objects give rise to theory of Entanglement by Schrodinger:

> 'When two systems, of which we know the states by their respective (state vectors), enter into temporary interaction due to known forces between them, and when after a time of mutual influence, the systems separate again, then they can no longer be described in the same way as before, viz.by endowing each them with a (state vector) of its own [4].

For example- when I slap someone on face by my hand, then my hand and his face are entangled with each other. Though they are not one, but their quantum states are inseparable. For the time being, they cannot be separated from each other. Leibniz's *Principle of Identity of Indiscernible* describes it same or identical with each other. But Physicists observes it as two objects by giving Quine's principle of "weak discernibility" [5] which mentions no object can have its own relation with itself. Further there is correlativity or co-arising of properties between two entangled objects. This means that they are neither identical nor separated from each other but are independent upon each other. Einstein *theory of relativity* also illustrates the same thing somehow. Example of water can illustrate to describe this relativity. Water in three forms as solid liquid and gaseous shows that neither of these are same with each other nor different from each other, but they give rise to succession (co-arising)

'Physicists John A. Wheeler said: 'We find the world strange, but what is strange is us [6, 7]. The strange in us is that we are finding it difficult to accept the unification in the universe. Physicists are moving ahead to find uniformity by revealing the inter relatedness. This unity is not merely between mass and energy but also scientist and experiment (one who observes and other who is been observed) are involved and that is heading to omnijective universe.

Pratītyasamutpāda of Buddhists

Pratītyasamutpāda is very important in the tradition of Buddhism, it means everything is dependent upon each other. The intention of Buddhism philosophy is to explain suffering of this world as humans only and not imposing any other supernatural power. You are suffering because of your own reason (past karmas). And with this, Buddha enlighten us with four noble truth. Buddhism does not believe in permanent soul. He believes you are the cause of your own state, and only you can get rid of this suffering by following nirvana which can be achieved by eight-fold path. There are twelve links which connects us from past to future i.e. from avidyā to aging and death. And this link is seen as moving towards causality. After the death of Buddha, early Buddhists took pratītyasamutpāda seriously and interpreted it as causation. Although Buddha never said so. But Hīniyānist translated it as theory of causation. Everything has cause, nothing is permanent. After Hīnayāna, Nāgārjuna came and he interpreted Buddhism philosophy as theory of interdependence. Everything is dependent on each other outwardly and inwardly. For Nāgārjuna, both substance and qualities are dependent on each other. Although they are dependent on many other things also. But if everything is dependent upon each other, it will lead to reductio ad absurdum and thus he mentions Śūnyatā. Ultimate reality is Prapanch Śūnyatā (it cannot be described) Nāgārjuna denote this as advaya.

i) Nāgārjuna and Candakīrti on Śūnyatā

There are different interpretations on Śūnyatā by different scholars. 'Some have interpreted it to signify nihilism, void or vacuity while others interpreted in sense of non-exclusiveness [8]. According to Nāgārjuna and Candakīrti, śūnyatā can be explained by focussing on three main points: (1) no two substances in this world are same or identical. (2) knowledge of particular object or substance is fresh knowledge, it neither precedes from anything nor succeed to further knowing. (3) three methodologies are used: Sarvadharmaśūnyatā, sarvapadārthaśūnyatā, sarvabhāvaśūnyatā. In *Mādhyamakaśāstra,* Nāgārjuna explains Śūnyatā is nothing else but pratītyasamutpāda by combining philosophical and logical thought process. It can be compared with flame of candle. One flame succeeds the other flame. It is not permanent. Greek philosopher Heraclitus, states you cannot bath twice in same river because it is a continuous flow, nothing is constant. But the problem of confusion arises when we try to relate things as this is cause and other is effect. Mādhyamika, neither affirms satkārya vāda nor asatkārya vāda, cause is not the final cause of universe which is identical with effect nor cause is different from effect. Cause and Effect both are independent upon each other. But we try to connect their states, different modes, things and relate them with our experience to each other with the use of language. When we relate them with predicative language, obviously predicates that we are referring to one object we might refer it with another object also and this does not correspond with the (1) point as mentioned above. Language is possible only when

3 Ibid, pp.38

4 Bibol, Michel. "Quantum Entanglement and Interdependence: Examination of an Analogy." 43-65. pp.52

5 Ibid pp.54

6 Jitatmananda, Swami. 1986, First edition. *Modern Physics and Vedanta*. India: Paras Prints, Mumbai Chapter

7 . Whither Physics today. 3

8 Marathe, M.P. 1980. "Nāgārjuna and Candrakīrti on Śūnyatā." *Indian Philosophical Quarterly* 531-540. pp.531

distinctions of words are there in worldly things. 'No matter what dharma we are talking about, it is incapable of bringing out uncommon and peculiar nature of any svalakṣaṇa (peculiarly unique things) [9]. It means dharmas are not given independently. Our recognition that dharmas are given independent to particular thing is illusion. Thus, language is unable to bring out unique characteristics of thing. Nāgārjuna here mentions by śūnyatā as saṁvṛiti-satya (svabhāva śūnyatā) Some examples related to co-arising or interconnectedness;

Sense organsà Eye → performs an act of visualisation. By viewing different colours, we perceive eyes are working.

Relation of Father-Son → Suppose someone asks me what is your father age? Then my father age would be same with the age of mine. This is because he became father only when I was born. Before that, he was not a father.

Thus, anything of this world is dependent on some other thing from certain reason.

When two persons are in love at that time, subject → object → love itself is involved.

This co-arising is a result not of our creation but of our actualising these possibilities.

Now I will discuss one example here briefly to uphold the notion of interdependence more clearly.

ii) Concept of Movement

The movement taking place relates to three conditions: space covered, mover and movement itself. 'Without motion the divisions of space into the traverse, yet to be traversed, etc., cannot be made; and motion cannot be understood without these distinctions [10]. Now to understand the concept of 'space into the traverse' think about how we move. As foot, itself consists of different parts, it will divide into the one that is already been traversed and other that is going to be traversed. In the moving body, it become difficult to distinguish the space. This brings out the notion that space in itself is nothing here, it is related to movement only. It has no inherent property on its own. Now talking about mover, is the mover anything in itself without the movement? 'The difficulty here is fundamental one and concerns the substance-attribute relation. The activity (motion) can be conceived neither as identical with mover nor as different from him [11]. The mover fails to be mover until he is not related to the activity i.e. motion.

Nāgārjuna claims they are neither identical nor separated from each other. They are interdependent upon each other. Without one, discussion of other is absurd. Lastly, movement itself is necessary to relate all these. There is no real time and space peculiarity that can be distinguished from inter-relatedness.

Vivekananda teaching to the West: Practical Vedanta (unifying principle)

Vivekananda travel from India to west, to transform the minds of people and save them from materialistic world. 'In the late 90s of the 19th century none was more conscious or concerned than Vivekananda with the clouds of storm that were gathering on the horizon of the West which was dreaming of making the earth a materialistic heaven [12]. After the Darwin theory, Religions of West were disturbed. Darwin theory disapprove the creation theory that Bible states. This makes people to move towards Industrial Revolution (Newtonian physics) that suggests matter is the only reality. Swami Vivekananda feels Industrial Revolution is destroying the whole world not only West. Environmental crisis is one among so many problems that degrades the planet. Vivekananda believes, no religion can save the world but a practical rationality i.e. Vedanta (by Upaniṣad belief) can work on the minds of the people of West.

'On July 16, when the first bomb was experimentally exploded in the desert area of Alamogordo, and as the stupendous dazzling conflagration lit up the entire sky, Oppenheimer, standing ten thousand yards away began to hum spontaneously the lines from Gita:

> If the radiance of a ten thousand suns
> Were to burst into the sky
> That would perhaps be like
> The splendour of the mighty one [1, 13, 14]

This observation directly impacts the thought process of different scientist. They start following Vedantin and grasping the concept of Indian mysticism such as māyā, avidyā, Brahman. Brahman is the ultimate one, by knowing which everything is known. Upaniṣad refers ātman as Brahman. In Advaita, Ātman is referred in three concepts; one, that resides in individual as soul. Second, as essence of all things (present in all beings). Third, as ultimate Brahman. Similarly, quantum physics is heading towards ultimate by referring omnijective universe where observer is not different from observed.

'In 1961 Nobel Physicist Wigner proposed that it is the 'consciousness of the scientist which is itself the hidden variable that decides which outcome of an event actually occurs [15]. Winger is able to find this hidden truth which Heisenberg fails and give it the name of uncertainty principle and Einstein describes it as theory of relativity

Observation effect – It has been witness by physicists that electron or atom behave differently when no one is observing and act shy when someone is observing. This is only possible because they have consciousness. May be its degree varies, but that also varies in being.

It needs to be understood that subjective-objective world is related to each other. This reflection can be seen in Vivekananda teaching of Vedanta which applies to the practical world also.

'Wolfgang Pauli, the noble physicist famous for his exclusion principle, writes in words which are, in fact, interchangeable with the words of Vivekananda: 'From an inner centre the psyche seems to move outward, in the sense of an extraversion, into the physical world…[16]

9 Ibid, pp.534

10 First published, 1955. "Part Two: The Dialectic as a system of philosophy section VII." In *the Central Philosophy of Buddhism*, by T.R.V. Murti, 165-209. Great Britain: George Allen and Unwin. pp.178

11 Ibid pp.180

12 Jitatmananda, Swami. 1986, First edition. *Modern Physics and Vedanta.* India: Paras Prints, Mumbai.Chapter

13 . Vivekananda interprets Vedanta to the West pp.11

14 Ibid pp.16

15 Ibid pp.43

16 Ibid p.45

Consciousness plays an important role in when we talk about interaction between internal world and external world. Through consciousness, others participate into self either in the form of physical or emotional element. Self as conscious being is calm, but later, the waves either in the external form or internal form shakes the consciousness by participating in it. The whole plurality of the universe participates in us and gets internalized, becomes Unity. Then, this unity in mind through consciousness reflects and get diverse as different external objects. For example- Tree. Material world i.e. external world (tree) gives us physical structure which we experience and mind transform and condensed it so much that it becomes solid (grosser part) which we believed it to be true and failed to see the subtle part. Because of this, it creates subject- object duality. One must investigate the subjectivity part by reflecting on self. Mind has the ability to reflect on itself by intentionality and rise above to self-awareness and self-correction i.e. subjectivist transcendental. According to Yājñavalkya, 'self is its own light.' The so-called tree is not different from us. Although Physicists earlier deny this Vedantin metaphysical view. To this Swami Vivekananda says, this is because if they believe in unity and found out the ultimate cause of Universe then science will stop from progressing. But after the observation of electrons that took place in quantum physics their views are somehow like the Vedanta. Language is itself dualistic but it is just to explain that behind this duality, there lies non-duality. In this world of plurality, it needs to know that everything is interdependent upon each other. Just as the bees make the honey and the honey supports the bees, the cosmic forces support the individual beings and individual beings support the existence of cosmic forces. Correspondingly, in quantum physics electron interaction and behaviour are interdependent upon the each other. Thus, this entails the theory of mutual interdependence.

Conclusion

Underlying Reality: Advaita, Mādhyamika and Quantum physics

The underlying reality behind Advaita, Mādhyamika and Quantum Physics is interrelatedness.

Notion of pratītyasamutpāda and Quantum entanglement explain this through denying metaphysical view and essentialism. Buddha remained silent when someone asked him what is ultimate reality. For him, reality is indescribable. The reality in this phenomenal world can only be explained through concepts. And the concepts show us that every object/thing is dependent upon each other. Buddha does not mention any origin or cause of universe.

Quantum Physics on the other hand illustrates reality by their experiments. Though they are now turning towards Vedantin unifying principle. For instance, when rays of light pass through prism it reflects into various colours (rainbow). From one, it shows the diversity. They have transit many levels started from causalityà successionà co-emergence. But they are hesitant to accept the metaphysics of Vedanta that from Brahman is the ultimate cause of world. In recent experiments on electrons, physicists accept the interrelatedness in universe.

Vedanta enlightens reality to us in metaphysical manner. It moves towards non-dualism. It is argued that we can know ultimate reality only realising extreme transcendent and not in this world. But I believe one needs to first reflect the self which is pure to reach towards nondualism, when one believes that this pure 'I' is not different from other. Everything exists in this pure self. Upanishads enlightens us by stating the cause of universe and how manifestation took place. If one understands in a true manner, the notion of interrelated in this universal many problem of contemporary times can be solved.

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