

Monism

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Devanagari Transliteration (ITRANS) Scheme.

अ	आ	इ	ई	उ	ऊ	ए	ऐ	ओ	औ	अं	अः	ऋ	ॠ	ऌ	ॡ
a	Aa A	i	Ii I	u	Uu U	e	ai	o	au	aM	aH	RRi R^i	RRI R^I	LLi L^i	LLI L^I

क	ख	ग	घ	ङ
ka	kha	ga	gha	~Na N^a

च	छ	ज	झ	ञ
cha	Cha/ chha	ja	jha	~na JNa

ट	ठ	ड	ढ	ण
Ta	Tha	Da	Dha	Na

त	थ	द	ध	न
ta	tha	da	dha	na

प	फ	ब	भ	म
pa	pha	ba	bha	ma

य	र	ल	व	श	ष	स	ह	ळ	क्ष	ज्ञ
ya	ra	la	va/ wa	sha	Sha shha	sa	ha	La lda	kSha xa	j~na GYa

श्र	त्र	ह्र	र्ग	ं	गं	ँ	गँ	ः	दुः	ँ	गँ	ऑ	गॉ	ऽ	ॐ
shra	tra	hra	rga	.n	ga.n	.N	ga.N	H	duH	.c	g.c	o.c	go.c	.a	OM

०	१	२	३	४	५	६	७	८	९
0	1	2	3	4	5	6	7	8	9

N.B. A subset of this scheme is used in this article to transliterate Sanskrit words.

Monism

0.0 Orthodox Monism

0.1 Song of Creation:

*nAsadIya sUkta*¹ [नासदीय सूक्त] of *RRigveda*² [ऋग्वेद] is one of the oldest known inquiries of Creation. It is in Mandala 10, serially as well as chronologically last Mandala of *RRigveda*. Following is a well known metric rendering of the *sUkta* in English³:

Then there was neither Aught nor Nought, no air nor sky beyond.
 What covered all? Where rested all? In watery gulf profound?
 Nor death was then, nor deathlessness, nor change of night and day.
 That One breathed calmly, self sustained; nought else beyond its lay.
 Gloom hid in gloom existed first - one sea, eluding view.
 That One, a void in chaos wrapt, by inward fervour grew.
 Within it first arose desire, the primal germ of mind.
 Which nothing with existence links, as sages searching find.
 The kindling ray that shot across the dark and drear abyss--
 Was it beneath? or high aloft? What bard can answer this?
 There fecundating powers were found, and mighty forces strove--
 A self supporting mass beneath, and energy above.
 Who knows, whoever told, from whence this vast creation rose?
 No Gods had then been born—who then can e'er the truth disclose?
 Whence sprang this world, and whether framed by hand divine or no--
 Its Lord in heaven alone can tell, if even he can show.

1 *nAsadIya sUkta* is a hymn of *RRigveda*; '*nAsadAsit*' is the first word of this hymn.

2 *veda-s* are the sacred literature of Indo-Aryans preserved from antiquity by oral tradition. *Rgveda* [RV] is the most ancient amongst the four *veda-s*. Recent multi-disciplinary data suggest that RV might had been composed earlier than the dessication of the Sarasvati (Ghaggar) river - that is before c.2000 BC.

3 Reference: Translation from 'Original Sanskrit Text' by J. Muir (5 volumes)

nAsadlyā sUkta is notable for using the term 'That One [*tad ekam*] [त्द् एकम्]' for the Origin and for its open position on the Creation-Creator. The seeds of monism⁴ and agnosticism can be seen in this *sUkta*.

0.2 Vedic Monism: *nAsadlyā sUkta*'s 'That One' is followed by various shades of monism in later vedas: (a) Orthodox monism traces the whole of existence [World] to a single source. It sees only one 'eternal reality' and views World as its appearance. (b) Supramonism sees all inclusive reality; both existence [*sat*] and non-existence [*asat*] are part of it. (c) Pantheism equates Creator with Creation. It sees God not as transcending nature but immanent in it. (d) Monotheism separates Creator and Creation. Creator creates, controls and destroys (merges with) its own creation. (e) Metaphysically all these views converge if we accept the relativity of reality. We may call this convergence as 'relativistic monism'.

Vedic monism is based on the theme of *brahman* [ब्रह्मन्] and *Atman* [आत्मन्]. The word *brahman* originated from the Sanskrit verb '*bRRiha*' [बृह] which means 'to grow' or 'to burst forth'. Originally *brahman* was used to describe the mystical power of *mantra*-s [metrical hymns]. It was later used in *upanishad*-s⁵ to describe the source of the Universe or the one eternal reality. *Atman* in *RRigveda* is mentioned as 'breath' or 'life-force'. Gradually it acquired the meaning of Self or soul.

4 According to analytic philosophy, monism is categorized as: (a) substantial monism [only one substance], (b) attributive monism [only one category], (c) absolute monism [only one substance, one category]. The last one can only be (d) idealistic [only mental is true] as against (e) materialistic [only physical is true, mental can be reduced to the physical] and (f) neutral [mental and physical may be reduced to third entity, a common substratum] (ref Wikipedia).

5 *UpāniShad* [उपनिषद्] means "sitting (*sad*) near by (*upa*) devotedly (*ni*)" to acquire knowledge from the Guru. *upanishad*-s are also known as *vedAnta* (end of *veda*-s) due to their compilation at the end of *veda*-s as also due to their philosophical significance. *upāniShad*-s can occasionally be viewed as symbolic interpretation of sacrificial rites (such as in *bRRihadAraNyaka upāniShad*) and at places, reformist reaction to the excessive ritualism of *brAhmaNa*-s (such as in *muNDaka upāniShad*).

Upanishadic *brahman* is said to be 'one alone without a second' [*ekamevAdvitlyam*] [एकमेवाद्वितीयम्]. It is pure awareness [*praj~nAnam*] [प्रज्ञानम्]. It is "reality, knowledge, infinity" [*satyam, j~nAnam, ana.ntam*] [सत्यम्, ज्ञानम्, अनन्तम्]. It is "pure existence, consciousness, peace" [*sat, cit, Ananda*] [सत्, चित्, आनन्द]. It is 'all pervading' [*sarvagatam*] [सर्वगतम्]. It is eternal [*nitya*] [नित्य] and unalterable [*kUTastha*] [कूटस्थ]. It 'can not be perceived by senses' [*adRRiSya-agrAhya*] [अदृश्य-अग्राह्य]. It is without any attributes [*nirguNa*] [निर्गुण]. It is the 'annulment of all phenomena' [*prapa.ncha upashama*] [प्रपञ्चोशम]. It is indescribable [*neti neti*] [नेति नेति]. It is the 'self within all' [*AtmA sarvAntaraH*] [आत्मा सर्वान्तरः]. It is the 'self innermost immortal' [*AtmA antaryAmi amRRitaH*] [आत्मा अंतर्यामी अमृतः]. It is 'the witness consciousness' [*sAxi chetA*] [साक्षि चेत]. 'If It shines all these shine' [*tameva bhAntamanubhAti sarvam*] [तमेव भांतमनुभाति सर्वं]. 'Through Its radiance all these become manifest' [*tasya bhAsA sarvamidam vibhAti*] [तस्य भासा सर्वमिदम् विभाति]. 'All this is verily *brahman*' [*sarvam khalvidam brahma*] [सर्वं खल्विदं ब्रह्म].

upaniShad-s describe 'acosmic' [*niShprapa.ncha, nirguNa*] [निष्प्रपञ्च, निर्गुण] *brahman* which is attributeless and is beyond space, time and causality. *upanishad-s* also describe 'cosmic' [*saprapa.ncha, saguNa*] [सप्रपञ्च सगुण] *brahman* which is all comprehending, all pervading, and causal.

The idea of *brahman* has been propagated in *upanishad-s* like *aitareya* [ऐतरेय], *bRRihadAraNyaka* [बृहदारण्यक], *ChAndogya* [छान्दोग्य], *Isha* [ईश], *kaTha* [कठ], *kena* [केन], *mANDUkya* [माण्डूक्य], *muNDaka* [मुण्डक], *prashna* [प्रश्न], and *taittirlya* [तैत्तिरीय]⁶. The main elements of monism based on *brahman* and *Atman* appear to be established by 5th century BC in the earlier *upaniShad-s* like *ChAndogya*, *bRRihadAraNyaka*, *aitareya*, and *taittirlya*.

6 Amongst 108+ *upaniShad-s*, these are some of the oldest and *pramANa* (authoritative) *upanishad-s* which are assigned, with the except of *mANDUkya*, to the period 800BC-400BC. Terms '*brahman*' and '*Atman*' are referred frequently in these *upaniShad-s* compared to the third important term '*mAyA*' which was further developed by later monist Schools such as *Sankara's keval advaita*. *mAyAvAda* (illusionism, indeterminism) is the distinguishing feature of orthodox *vedAnta* (see 0.3 and 4.1).

Some later *upaniShad*-s, such as *shvetAshvatara* are predominantly monotheistic. *brahmasUtra*⁷ [ब्रह्मसूत्र] [aphorisms about *brahman*], formulated before 400 AD, restored the primacy of orthodox monism of *upanishad*-s. *brahmasUtra*-s are extremely laconic, hence were interpreted by later seers including *shankara* (see 0.3) in their own ways. This gave Vedic monism the flexibility to be defended and developed through the unending advances of rational thinking.

0.3 *advaita*: *gauDapAda*⁸ [गौडपाद] (7th century AD) and *shankara*⁹ [शंकर] (8th century AD) interpreted the theme of *brahman* to establish the *advaita* [non-dualism] [अद्वैत] system of philosophy. In *advaita*, a cosmic *brahman* is the only absolute reality. Physical Universe [*jagat*] [जगत्] is an illusion which is apparent to *jIva* [sentient being] [जीव] under the spell of *mAyA* [माया]. *mAyA* is the inexplicable [*anirvacanIya*] [अनिर्वचनीय] power by which *brahman* appears as the *jagat*, a flux of matter and causation. *jIva*'s innermost Self [*Atman*] is nothing but *brahman*. *jIva* cannot see the *brahman* = *Atman* unity due to 'ignorance' [*avidyA*] [अविद्या] and 'limitation of body and mind' [*upAdhi*] [उपाधि], both being manifestation of *mAyA*. When *jIva* 'knows' *brahman* = *Atman* unity, it attains the 'eternal state of fulfillment' [*moxa or Summum Bonum*] [मोक्ष] liberating itself from the cycle of rebirths. *advaita* is known as orthodox *vedAnta* [वेदान्त], it being consistent with the monist spirit of oldest *upanishad*-s. *advaita*

7 They are also known as *vedAnta sUtras* and their authorship is given to *bAdarAyaNa* or *vyAsa* (the said author of classical *mahAbhArata*) though it is not known if both are one and the same person. The process of their formulation must have started after the canonization of early *upaniShad*-s, probably during c.500BC- 300BC and concluded in its present form by c.400AD, with the contribution of many exegetes.

8 He wrote *kArikA* (commentary) of *mANDUkya upanishad* which has pivotal elements of *advaita*. His work bears traces of Buddhist *yogAcAra* and *mAdhyamaka* Schools. He is said to be the teacher of *shankara*'s teacher. *kArikA*'s reference in Tibetan Buddhist literature suggests that he could be in 6th century or even earlier (c.500) in which case Sankara's "teacher's teacher" may be taken as eulogy.

9 He is the most acknowledged systematizer of *advaita* (788 - 820 AD) though many hold him to be in 7th century (borne @ 686 AD). His commentaries on *upaniShad*-s, *brahmasUtra*-s and *bhagavad gItA* are the basis of *advaita* as a system.

systematized by *shankara* is also known as *keval advaita* [KA] [*advaita* only] [केवल अद्वैत].

Later *advaita* versions dispense with *mAyA*'s mysterious role, acknowledge *saguNa brahman* [सगुण ब्रह्मन्] as the principle reality, and inject theism. In pantheistic 'pure non-dualism' [*shuddha advaita*] [शुद्ध अद्वैत]¹⁰, *brahman* itself takes the form of physical world and souls. In the scheme of organic pantheism ['qualified non-dualism' or *vishiShTha advaita*] [विशिष्ट अद्वैत]¹¹, *brahman*, souls, and World are real and different from each other but latter two are organically dependent on the *brahman* like a body is dependent on its soul. In 'dualistic non-dualism' [*dvaitAdvaita*] [द्वैताद्वैत]¹², souls and World are one with the *brahman* but at the same time different from It, like a ray is one with and different from the Sun. *dvaitAdvaita* is a supra monist theme where *brahman* is assumed to be both cosmic and acosmic, suggesting that It has not exhausted Itself in the creation of Universe. There is also a dualistic version of *advaita* [*dvaita*] [द्वैत]¹³ where *brahman*, souls and World have independent existence but latter two are subordinate to *brahman*.

In general, Indian philosophic mind has latched on to the idea of monism right from the days of *RRigveda*, till today, for more than three millenniums. Western thought too arrived at similar ideas¹⁴ through Parmenides (5th century BC), Plotinus (3rd century AD) and later Berkeley, Spinoza, and Hegel (17-18th century AD) (see 2.0). We can however safely say that orthodox monism is the indigenous and one of the main themes of the Indian Philosophy.

10 Protagonist: *vallabha* (1481 - 1533 AD)

11 Protagonist: *rAmAnuja* (1056 – 1137 AD)

12 Protagonist: *nimbArka* (13th century AD)

13 Protagonist: *madhva* (1199 – 1278 AD)

14 Western monism may have traces in Judaic antiquity (ref Wikipedia).

1.0 Inverted and Relativistic Monism

1.1 Buddhism and Jainism are Indic Schools which do not trace their origins in *veda*-s. Buddhism however, can be seen as bringing to logical conclusions certain Upanishadic speculations while Jainism has some commonality with orthodox *sA.nkhya* [सांख्य]¹⁵ and *vaisheShika* [वैशेषिक]¹⁶ schools. Both these schools have common trait of separating philosophical content from theology. *gautama buddha* [गौतम बुद्ध] (founder of Buddhism) and *vardhamAna mahAvIra* [वर्धमान महावीर] (protagonist of Jainism)¹⁷ were contemporaries in 6th century BC in India. These two streams of heterodox philosophies, particularly Jainism, were present at the time of oldest *upaniShad*-s in one form or the other.

There are four major Buddhist schools which were established during 2nd century BC to 2nd century AD: *vaibhAShika* [वैभाषिक]: There is new reality every instant of time; *sautrAntika* [सौत्रान्तिक]: Reality can only be guessed; *yogAchAra* [योगाचार]¹⁸: Reality is nothing but its knowledge; *mAdhyamaka* [माध्यमक]¹⁹: There is no absolute reality; as a corollary only nothingness [*SUNya*, शून्य or void] is behind the appearance of the World. *mAdhyamaka* Buddhism is also known as *SUNyavAda* [शून्यवाद] or voidism. *SUNya* is much like *nirguNa brahman*, but *mAdhyamaka* does not acknowledge it as the substratum reality. This scheme can also be termed as Inverted Monism because only 'becoming' or flux has been granted reality while 'being' has no reality. Being is equated with 'nothing' or void.

15 Indic philosophy which assumes that everything is the interplay of two main elements: a transcendental spirit (*purusha*) and the physical element (*prakRRiti*).

16 Another pluralist realist Indic School whose protagonist *kaNAda* conceived atoms.

17 *mahAvira* is said to be preceded by 23 seers, at least one of them, that is *pArShvanAtha*, claims historicity of 8th century BC.

18 Brothers *vasubandhu* and *asa.nga* (1st century AD) were the protagonists of this school. *vasubandhu*'s *abhidharma kosha*, partly preserved in Sanskrit, is considered to be the basic authority.

19 Protagonist *nAgArjuna* (2nd century AD) wrote *mUlamAdhyamakakArikA*, one of the most acknowledged treaties of philosophy in Sanskrit.

1.2 Jainism [*syAdvAda*] [स्याद् वाद्] speculates seven combinations of realities out of 'is [*asti*] [अस्ति]', 'not is [*nAsti*] [नास्ति], and 'unpredictable [*avAkyavyam*] [अवाक्यव्यम्]'. In this pluralistic realism 'being', 'non-being', and 'probable' can stand together to represent the composite reality of *syAt*²⁰. *syAdvAda* holds that all knowledge is probabilistic and conditionally true. *syAt*'s reality is mutable, contextual and relative; hence *syAdvAda* can also be termed as attributive monism or relativistic monism.

Buddhism and Jainism are known as heterodox Indic schools as against orthodox Indic schools, namely *sA.nkhya* [सांख्य], *yoga* [योग], *nyAya* [न्याय], *vaisheShika* [वैशेषिक], *mImAMsA* [मीमांसा], and *advaita* [अद्वैत]. Except *advaita* no other Indic school shows clear monist-absolutist (non-dualist) tendency though monotheist tendencies are seen in *nyAya* and *yoga* schools. Indic Schools other than *advaita*, *nyAya* and *yoga* are generally silent on "God" while *advaita* subordinates the God [*Ishvara*] [ईश्वर] by relegating it to the 'relative' level.

2.0 Western Monism²¹

Parmenides (5th century BC, Greece) held that multiplicity and mutability of all existing things are but an appearance of a single eternal reality. He formulated the principle that "all is One".

Aristotle (4th century BC, Greece) conceived God as the unmoved prime mover (*primum mobile immotum*) who is indivisible, spaceless, sexless, emotionless, eternal and the cause and purpose of the whole world. It is pure energy, a magnetic force. It is also 'self-conscious'.

20 *syAt* is Sanskrit word which means 'potential of being' (that is 'may be'). *syAdvAda* suggests that reality can be perceived from many points of view and each view-point yields different conclusion (*anekA.nta*). No single view but their combinations may offer the total picture.

21 Early Western monism of Parmenides, Aristotle, and Plotinus has parallels with its counterpart in India suggesting a possible contact between the two classical civilizations of Greece and India.

Plotinus (3rd century AD, Egypt?) and his successors postulated an all sufficient unity, the *One*, from which emanated the Divine Mind [*Logos*], and below that, the World Soul.

Descartes (17th century AD, France) viewed God as the 'initiator' who gave the 'initial push' after which the Universe including souls have managed their own affairs without His help. Metaphysically Descartes was a dualist. He proposed mind-body dualism.

Berkeley (17th century AD, Ireland) saw the physical World as an idea in the mind of God. He denied material existence independent of cognition. The Universe, according to him exists because it is being perceived by the God.

Spinoza (17th century AD, Holland) conceived God as a framework - all is in God, all lives and moves in God. For him laws of nature and eternal decrees of God were one and the same. His metaphysics can be termed as logical monism - the doctrine, that the world as a whole is a single substance, none of whose parts are logically capable of existing alone.

Kant (18th century AD, Germany) formulated attributeless noumenon whose existence can be reasoned but can not be perceived. He saw it as an antithesis to phenomenon.

Hegel (18th century AD, Germany) saw God in the wholeness of the Universe, as a single harmonious system since, 'part of the being can not exist in isolation'.

James (19th century AD, US) opined that God is continually seeking to improve not only the World but Himself. God is 'God in the making', and conceptualized God as a 'Process'. He termed consciousness as nonentity, a mere echo left behind by disappearing soul. Further, he abolished the distinction between mind and matter implying that there

could be some thing anterior to both. This idea was later developed by Russell in the name of 'neutral monism'.

Bergson (19th century AD, France) accepted that consciousness in humans is connected with the 'brain' but argued that this may not be the case in lower forms of living beings. He suggested that consciousness is coextensive with life and equated God with life.

Whitehead²² (20th century AD, Briton) saw 'primordial nature' of God in the 'eternal (platonc) objects' and 'consequent nature' of God in the frequently changing 'actual (material) entities'. He attempted a metaphysical unification of space, time, matter, and events. For him nature was a structure of evolving process.

Russell (20th century AD, Briton) conceived *neutral monism* of physical and phenomenal properties. He proposed that phenomenal properties could be fundamental properties and both physical and phenomenal properties could be two aspects of the same underlying reality.

3.0 Monism of Physics²³

The concept of Energy and its equivalence to matter is central to the monism of Physics. Energy follows four most fundamental laws of Physics:

- Conservation of Energy [CE]
- General Relativity [GR]
- Uncertainty Principle [UP]
- Law of Entropy [LE].

22 Whitehead and Russell were contemporaries. Both were mathematicians & philosophers and collaborated to write Principia Mathematica.

23 The general trend is to use the term 'reductionism' which speculates that everything is reduced to the physical laws in the form of mathematical propositions. This is applicable to working of minds too.

3.1 Conservation of Energy [CE] says that for an isolated system energy cannot be created nor can it be destroyed, but can be transformed from one form to another. After Einstein established matter-energy equivalence this law became really a mass-energy conservation law. CE is a basic (axiomatic) law and is not derived from any other physical law, but experimentally verified innumerable times. Although real life systems are not isolated, the law can be applied to them with appropriate abstraction.

Can CE be applied to Universe as a whole? Can Universe be treated as a set? Can it be an isolated system?²⁴ What could be the total energy of the Universe? Universe is continuously expanding, and it is not clear if we can apply the laws of motion to such an expansion. If however, we apply the GR field equations to the motion of expansion of the Universe, we get the total Energy of the Universe to be zero. This suggests that Universe might have popped out of 'nothing' or was always there with balanced positive and negative energies. Zero energy condition allows the Universe to exist for an indefinite period of time. It also allows the creation of matter (positive energy) to balance the negative energy required to separate the regions against the gravitational force without violating the CE.

3.2 General Relativity [GR]²⁵ states that measure of space-time curvature equals measure of matter-energy density. UP together with GR postulates space-time and matter-energy to form one dynamic evolving entity (see 3.3).

24 'Motion Mountain' (2006) explores many such questions and concludes that concept of Universe does not make any sense. This concept, however, transcends into mathematics via set theory as Universal Set – ref Randall Holmes (2005).

25 GR blurs the boundary between platonic space and physical space. Spacetime of GR behaves both as platonic entity (Gravity is nothing but geometry of spacetime) as well as physical entity (it is causally bound to the material objects). It seems that platonic world of mathematics is not only driving the physical world but also has taken the form of physical entity (spacetime).

GR predicts space-time singularities. Expansion of Universe as observed by Hubble, points to the Big Bang hypothesis wherein Universe is supposed to have inflated from the Singularity. UP allows the Energy to be borrowed from 'nowhere' without violating Plank's energy-time inequality (see 3.3). This paves the way for creation of matter and subsequent 'inflationary' Universe. The very fact that Energy can be borrowed from 'nowhere', presupposes the existence of Energy independent of Universe and assigns to it the status of That One [*tad ekam*].

The initial motivation of Einstein while developing GR [General Relativity] and SR [Special Relativity] was the famous Mach Conjecture. It says that physical theory can be developed based on interrelationships between bodies or particles and that it is not necessary to assume absolute existence of space and time as a background or as a conveying medium. Some of the current attempts to formulate quantum theory of gravity do not assume the space and time to be absolute but treat them as emergent properties.

3.3 Uncertainty Principle [UP] was discovered by German scientist Werner Heisenberg. UP states that: The position and momentum of a particle cannot be determined precisely at the same time and is governed by the equation " $\Delta x \Delta p \geq h/2$ " where 'd' and 'p' are uncertainties in position (space) and momentum (mass*velocity) respectively and h is the Planck-uncertainty constant. Similar relationship also exists for energy - time pair²⁶ and these relationships indicate that:

²⁶ Such inequalities have been established for many physical observables. They result from the fact that Nature imposes maximum and minimum limits on all physical entities. Beyond these limits there is Indeterminacy and physical reality collapses. This is the generalized UP, or rather more appropriately basic Indeterminacy Principle (IP). IP is the foundation of Quantum Theory (min action, min charge), Relativity Theory (max force, max speed), and Thermodynamics (min entropy, max temperature). (see, Motion Mountain – online physics text by Christoph Schiller).

- Space-time, mass, and energy-momentum are interwoven and are possibly attributes of the same entity.
- Planck-uncertainty constant defines the limit of physical reality for space-time and in turn for other physical observables.

Planck constant appears in the basic equation of energy quantum. It sets the lower limit for observable energy by the equation $e = h \cdot f$, where f is the frequency of the electro-magnetic (light) wave. For a given frequency, electro-magnetic Energy will always be the multiple of $h \cdot f$, which is the energy-quantum [photon]. Although photon does not have mass, it can have momentum as defined by the energy equation ($e^2 = (pc)^2 + (mc^2)^2$) of the particle. Photon has both particle like and wave like properties. It has particle like momentum and quantized energy, a localized physical existence. It has also a mathematical wave like, non-local and holistic spread, a platonic existence. French scientist de Broglie extended this concept to general matter and gave dual existence to material bodies as well. The wavelength (w) of the matter waves is given by the same photon energy equation where by $w = h / p$. The duality of particle-wave as well as energy-time UP is implicit in photon energy equation $e = h \cdot f$. This dual 'physical - platonic' aspect leads to the ontological challenge of our time - the 'measurement paradox'²⁷.

Austrian scientist Erwin Schrödinger extended the duality concept still further by formulating the equation to predict the evolution of matter-waves in space-time at microscopic level. This equation includes the mathematical quantity called wave function, which takes into account the duality of matter (particle or system of particles) and maps out its probable behavioral patterns in terms of physical parameters. This

²⁷ The dual nature of matter itself is paradoxical and has spawned number of puzzles which are generally related to the quantum measurement process.

probability wave function or a state vector U is a holistic [non local, Universal], continuous and deterministic function. The state space of U is linear one where multiple state vectors can be superimposed on each other without affecting the space or individual vectors. When we observe [measure] the particle or a system of particles for their physical parameters such as position or momentum, U 'jumps' to generally different, but mathematically related state. This process is known as state vector reduction R that is local, discrete and probabilistic. Immediately after the measurement the Schrödinger evolution [U process] takes over again till the next measurement. Thus, wave aspect of the object is manifested in U process and the particle aspect is reflected in R process. It appears that the R measurement has to be carried out by the 'conscious' observer to be effective. Further, the superimposition of state vectors means that mutually exclusive states are brought into physical domain²⁸ just by a conscious look of the observer! This apparently strange behavior of U and R processes is known as Quantum Measurement Paradox [QMP].

System of many particles can be represented by state vector but its complexity increases enormously because it will be a function on the entire configuration space of the system. Identical particles however, have propensity to get 'entangled' with each other to evolve as a single holistic unit. All entangled particles have individual spatial coordinates but only one common time coordinate²⁹. Entangled particles even when separated by distance act in a holistic manner and exhibit some peculiar connection amongst them³⁰. Entanglement can be cut through by R

28 This effect is dramatically brought to the fore by 'Schrödinger's cat' – a famous thought experiment where cat is both 'alive' and 'dead' in a superimposed state.

29 This absoluteness of time in U is part of the puzzle. This gives holistic effect to the entangled particles.

30 In spin measurement experiments carried out on 'physically well separated' entangled particles, the spin information seems to travel instantaneously breaking the SR speed barrier. It may suggest the existence of platonic space through which this instantaneous communication takes place. It may also suggest that there are two types of time, one absolute time and another SR's relative time. The absolute one could be nothing

process. This process apparently ensures that the Universe is not an entangled whole and objects retain their separate identities in space and time. Who initiate this R process from time to time? Do conscious observers in particular and the Nature in general initiate this process? This is another aspect of QMP.

The probabilistic nature and basic uncertainty of the measurement process prompted many scientists to take a closer look at the so called quantum reality. Quantum physicists like Niels Bohr, Heisenberg and Max Born took a positivist stance, which is known as Copenhagen Interpretation [CI] (1927). It says that the so-called quantum reality of microscopic level cannot be described. The quantum world is microscopic while measurement and its description have to be organized at the macroscopic level and hence we cannot hope to reconcile the two. According to Bohr, U process does not represent the quantum level reality; it only describes the experimenter's knowledge of a quantum system. The R process only gives more knowledge to the experimenter; it is the knowledge that takes a jump and has nothing to do with physical reality. At the logical extreme, the interpretation implies that there is no quantum world; there is only model description based on probabilities evolving with time.

Scientists have been trying to resolve the ontological and epistemological riddle of QMP by suggesting various approaches³¹ within the present day scientific framework.

but the platonic space in which the holistic nature of 'separated' particles is sustained.

31 One approach suggested by Hugh Everett (1957) assigns reality to only U process discounting the R process. It argues that, when measurement takes place, all outcomes co-exist in reality as a grand quantum linear superposition of alternative universes described by the wave function for the entire Universe. This all encompassing Universe is known as Multiverse (or Omnium). The R process then becomes part of U process and only the superposition represented by the universal wave function is taken as real. Since each 'copy' of the Observer has 'consistent' consciousness there will be appearance of the single Universe.

Refer 'Road to Reality' by Roger Penrose (2004); Ch-29 discusses this and other approaches.

3.4 Energy Processes: All activities of the material world can be viewed as Energy transformations. This is the central theme of the physical Universe. In a specific reference frame we can coin the term 'process' to describe the phenomenon of energy transformation. When a process produces motion it is said to do 'work'. In reality one may not find a purely work producing process. In addition to work there is usually dissipation of energy (such as heat) to the environs making the process irreversible. This energy dissipation for isothermal processes is described in terms of change in Entropy, where the change in Entropy is defined as heat energy dissipation (in Joules) per degree of temperature (in Kelvin) between the two states of the process. In practice, the processes are not strictly isothermal [temperature preserving]. Process temperature is normally calculated averaging the temperature of initial and final state of the closed system in which the process takes place.

The Law of Entropy [LE] states that the entropy³² of the closed system never decreases.

LE can establish a sequence of events with increasing entropy with respect to time thereby establishing the arrow of time. When there is no 'effective' motion within the system, that is when the system particles are moving at absolutely random basis, the capacity of the closed system to do useful work [some times called the free energy of the system] has been exhausted and the system is said to have achieved the highest entropy state. The highest entropy state also implies a minimum [tending to zero] free energy state when the arrow of time in respect of the process becomes irrelevant. For a linear and well behaved system the rate of change of entropy [called internal entropy

³² Entropy can also be defined on statistical basis as a measure of randomness of the system. Austrian scientist Ludwig Boltzmann formulated this concept in 1877. By this definition, LE [system proceeds from order to disorder if left alone to the forces of nature] looks almost trivial but it seems to have deep significance for the evolution of Universe.

production] tends to decline and the process generally proceeds towards steady state stabilization. Such a system may be close to zero internal energy state but will not attain the maximum entropy. The steady state is recognized by minimization of heat dissipation [entropy production]. In addition to localized minimization of energy dissipation, the system may display cyclic patterns of mass-energy inflow and outflow through the respective space-time slice. The steady state may not be unique in a sense that the state may be destabilized if displaced beyond certain 'critical' boundary (the basin of attraction) formed around some critical point (attractor)³³. The system then can either move continuously towards maximum entropy state or can stabilize again in some other region to form another steady state. Any real life system need not immediately degenerate into maximum entropy state but can display various patterns of steady state stabilization. The humans (or living beings) themselves are example of open systems displaying multiple steady state patterns.

We can view Cosmos as manifestation of Energy and all phenomenal properties of the world as emergent properties of physical [matter-energy] processes which obey the physical laws [*reductionism*]. Monism of matter is implicit in Einstein's equation $e = mc^2$. Reductionism expands the ambit of this monism by assigning reality to minds and platonic objects by treating them as emergent properties of physical processes.

Another way of looking at this arrangement is through m-m-m (mind-matter-maths) interrelationships. Any one of these entities could be the

³³ This term is borrowed from process centric philosophies which use mathematical models to describe physical processes. Model structures are assigned realities and are called virtual multiplicities (Delanda 2002). Their causal relationship with physical processes is of a different type than purely physical causation amongst physical entities. Process centric philosophies identify objects by processes rather than by essence.

substratum of the others. For example, (1) mind (idealism), (2) matter (materialism), (3) maths (Platonism) are three substratum based viewpoints. Alternatively, Anterior to all m's there could be another substratum reality, or all three m's could be closely intertwined aspects of the same reality (neutral monism).

QMP forces us to take a second look at the reductionism³⁴. Other entities which challenge reductionism are qualia³⁵ and consciousness³⁶ of sentient beings, particularly of humans. Interestingly; QMP, Gravity, and these entities could be interrelated and may have some commonality of solution (see 4.2 and 4.3).

4.0 Synopsis

Most of the scientists take a positivist view about the reality. Stephen Hawking, for example, says:

"I don't demand that a theory corresponds to reality because I don't know what it is. Reality is not a quality you can test with litmus paper. All I'm concerned with is that the theory should predict the results of measurements."

Monists however, keep on trying to understand the unifying, all encompassing reality of the World. *keval advaita* [KA] is one such attempt. How does it stand in light of the scientific theories of 20th century - General Relativity and Quantum Theory?

4.1 *brahman, Atman, and mAyA*: *brahman* is eternal and hence beyond time, space and causation. Present day popular Big Bang models based on GR postulate 'singularity' from which the Universe originated and may ultimately collapse into. In this singularity space, time or

³⁴ Many scientists accept reductionist explanation in terms of 'environmental decoherence' (see 'Motion Mountain' for the explanation and 'Road to Reality' for counter arguments).

³⁵ It is the raw experiential feel, a qualitative experience of being.

³⁶ Consciousness is any mental state that has qualia. Some times it is known as empirical consciousness, and what remains after subtracting (!) the qualia from the mental state is known as pure consciousness or awareness which can not be qualitatively differentiated further.

causality make no sense. It is the 'illusory modification' [*vivarta*] of *brahman*. She is *mAyA*. She is neither real nor unreal. *mAyA*'s ontological status is inexplicable [*anirvacanIya*] from the empirical [*vyAvahArika*] [व्यावहारिक] standpoint. From the Absolute [*pAramArthika*] [परमार्थिक] standpoint *mAyA* ceases to be and there is only eternal *brahman*.

The mystery of *mAyA* reflects in '*jIva - Atman*' relation. Today, science is likely to say that body (brain) is the seat of entire mental phenomenon including consciousness. KA will not deny that body (brain) is the seat of mind from the empirical standpoint. In fact, KA terms both mind [*antaHkaraNa*] [अंतःकरण] and 'empirical consciousness' [*ego*] as physical [*bhoutika*] [भौतिक]³⁷. KA however suggests that there is something more than the mere physical process that is required to make the *jIva* aware of its own existence. This something is transcendental *Atman*. It is the undifferentiated consciousness, an intelligent principle living beyond individual life and death. We may call it *mAyA* when it connects with the physical apparatus and gets individuated in the form of *jIva*. *Atman* is the substratum of both mind and body of the *jIva*. It is also the substratum of *jagat*. That is, "*Atman* is nothing but *brahman*". *jagat* is the cosmic *upAdhi* of the *saguNa brahman* while *panchakosha* [body, vital self, perception, mind, intellect]³⁸ is *upAdhi* of the *jIva*; both *upAdhi*s being manifestation of *mAyA* and are superimposed on *brahman*.

Sankara introduces *adhyAsa* [अध्यास] [superimposition] as the basis of his metaphysical argument in his celebrated commentary on *brahmasUtra*s. He postulates that *jagat* is superimposed on *brahman* like a snake is seen in a rope in the dark. The superimposition does not affect the

37 *advaita* assigns the relative reality to both body and mind calling them *bhoutika*, and assigns the absolute reality to *Atman*. Although, traditionally *advaita* is termed as a type of idealistic monism, the fact that *Atman* is a common substratum to both mind and body brings it closer to 'neutral monism'.

38 These 5-layers do not have one to one relation with KA's *pancakosha* adapted from *taittirIya upaniShad*. The concept of *pancakosha* (5-layered cover) itself may not conform to modern day medical science; it however, does not make any difference to the argument.

substratum. It takes place due to 'ignorance' [*avidyA*] and disappears when we have true 'knowledge' of the substratum. The reality of the 'superimposed' (snake, *jagat*) is secondary or illusory compared to that of substratum (rope, *brahman*). This *adhyAsa* is also applicable to *jIva*. The Self in *jIva* is the substratum of superimposed adjuncts [*upAdhi-s*]. The *jIva*, when brought into the ambit of subject-object relationship, shows that everything other than *Atman* displays objective properties. *Atman* is the 'unknowable knower' or a *sAxin* who can not be the object of further subject-object relationship which otherwise would proceed *ad infinitum*. Since all objects are necessarily and sufficiently limited by time, space, and causation; *sAxin* - the ultimate subject, can not be physical or *bhoutika*. *sAxin*, however, can be Self-conscious subject only if it is qualified by limiting adjuncts. This paradoxical nature of *sAxin* being both ultimate subject of cognition and apparent object of superimposition; being transcendental and at the same time appearing to be physical, is the play of *mAyA* which is said to be beginningless and unspeakable. KA's ultimate idealistic position sees no reality out side the process of cognition. This leads to the cosmic *sAxin* [*Ishvara sAxin*] that provides 'ground' [*adhiShThAna*] [अधिष्ठान] for the *jagat* in the name of *brahman* and enlivens *jIva* in the name of *Atman*. *Atman* = *brahman* is postulated as non-dual, non-relational, non-differentiated, self-luminous consciousness. *mAyA* is the projection [*vixepa*] [विक्षेप] as well as concealment [*AvaraNa*] [अवरण] of this identity.

4.2 *advaita* and Quantum Physics: In Quantum physics, one approach is to take the U process [wave function] as underlying reality, while the reduction R [measurement] as approximation apparent to the Observer. We can compare the state-space of U with *brahman*³⁹ and

³⁹ The state space of U is a linear space suitable for superimposition of complex state vectors. The platonic space of *brahman* too can be considered to have this linearity for superimposition of physical Universe without any causal effect. The role of complex numbers in modeling the physical reality perhaps indicates

Observer with *jIva*. Since the measuring apparatus including Observer's body is also part of the U process, a supra natural entity [call it R-force, *mAyA* or whatever] is required to reduce U to physical reality. This R-force needs to be cosmic [non-local] or acosmic [transcendental] and still causally effective to retain separate identities of objects in spacetime and to impart qualia to the living organisms.

R-force can be seen as physical entity if we can formulate the 'reducing mechanism' in the 'modified' frame work of Physics. We may call this framework as Spiritual Physics or New Physics depending on our dispositions. Penrose, Hameroff et al advocate this 'modification' approach. They propose that a new scientific paradigm may include Quantum Gravity as the 'reducing force' (see 4.3). As for KA, even if this R-force (say, Quantum Gravity) is covered under New Physics and even if other known forces are reduced to it in a new unified, so called 'Theory of All' [TOA], there will remain an indeterminable acosmic component which is beyond any scientific theory; for Reality is beyond that which can be theorized or conceptualized. That is to say, pure Consciousness can not be brought under the laws of Physics. There can not be TOA at the relative level, while at the Absolute level there are no theories!

4.3 Consciousness is central to the *advaita* system. Present day cognitive scientists are exploring consciousness in terms of physical and computational processes.⁴⁰ They are generally divided into camps of: (a) Strong AI⁴¹: consciousness is computational. (b) Weak AI⁴²: consciousness is a physical state of the brain which can be simulated

the virtual (platonc) aspect of the physical processes.

40 Some philosophers make light of consciousness issue (D. Denett: *Consciousness Explained*) while some others treat it as biological phenomenon unique to specific organic material (J. Searle – *The Rediscovery of Mind*).

41 Strong AI (Artificial Intelligence) believes that 'machines' can be made 'conscious' by 'computation' (computer programs running for finite time)

42 Weak AI believes that computational simulation of conscious behavior is possible but that will not evoke human like consciousness in non-biological machines.

computationally but cannot be evoked 'artificially', and (c) Non-computationalist: consciousness is a physical state of the brain which can not be simulated by computation.

Mathematician Roger Penrose thinks that mentality [qualia, awareness, consciousness, intuition etc] is a non-computational⁴³ quantum process. He further proposes that consciousness could be manifestation of universal entity related to gravity which plays a role in the quantum state reduction R in our brain. The reduction might take place in microtubules of neurons. This conjecture is being researched (Hagan, Hameroff; 2000). Penrose believes that only a breakthrough in Physics may bring us closer to the truth. (Ref: Shadows of The Mind 1996; The Large, The Small and The Human Mind 1998). Physicist like Stapp (1993), Goswami (1993), and Shan (2006) believe that consciousness itself could be the ground [substratum] of Universe or it could be playing some causal role in the cognitive process.

Increasing number of philosophers are now acknowledging that consciousness may not be reducible to the physical laws or processes. It could be the basic entity such as matter-energy or space-time (Chalmers 2003)⁴⁴. Alternatively, protophenomenal properties such as consciousness could be located at the fundamental level of physical reality, and in a certain sense, underlie physical reality itself (Russell 1926, Chalmers 2003). This basic theme of consciousness was captured by *upaniShad-s* and *advaita* in the postulate *brahman = Atman*.

43 Penrose uses Gödel-Turing theorem to show the non-computability of human thinking. He argues that though there is no computational way of characterizing the natural numbers, any school going kid knows intuitively what they are. The relation between physical objects and numbers is created in his / her mind without taking recourse to any Turing computational procedure. This shows that mathematical understanding is non-computational and that our thinking (brain process) has non-computational aspect. Computationalists however, believe that this seeming non computability could be nothing but prewired computability or computational complexity of the brain process.

44 Chalmers suggests that qualia may be unexplainable in terms of pure reductionist logic. He terms this as the hard problem of consciousness.

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