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## Consciousness and Science: an Advaita-Vedantic Perspective on the Theology–Science Dialogue

BHARATH SRIRAMAN and WALTER BENESCH

**Abstract** *In modern science, the synthesis of “nature/mind” in observation, experiment, and explanation, especially in physics and biology increasingly reveal a “non-linear” totality in which subject, object, and situation have become inseparable. This raises the interesting ontological question of the true nature of reality. Western science as seen in its evolution from Socratic Greece has tried to understand the world by “objectifying” it, resulting in dualistic dilemmas. Indian “Science,” as seen in its evolution from the Vedic times (1500—500 BCE) has tried to understand the world by “subjectifying” our consciousness of reality. Within the Hindu tradition, the Advaita-Vedanta school of philosophy offers possibilities for resolving not only the Cartesian dilemma but also a solution to the nature of difference in a non-dualistic totality. We also present the Advaita-Vedanta principle of superimposition as a useful approach to modern physical and social science, which have been increasingly forced to reject the absolute reductionism and dualism of classical differences between subject and object.*

**Key words:** *Advaita-Vedanta; Consciousness; Dualism; Hindu philosophy; Hindu theology; Indian science; Monism; Shankara; Super-imposition; Upanishads; Vedas*

### A historical survey

Present day Hinduism can be traced back to the 1017 hymns of the *Rig-Veda*<sup>1</sup> (c.1500 BCE). The *Rig-Veda* is often viewed as *the Hymn of Creation*, giving specific ritualistic details to the Vedic Indians about sacrifices to the Gods to achieve salvation. Many of these rituals are still practiced by the Brahmins in modern day India. Although the *Vedas* primary emphasis was on describing the glory of various Gods in the natural and human world, with heavy emphasis placed on the rituals, many passages lend themselves to theological introspection. The answer to the ephemeral human question “Who created the universe” is answered in the 10th *Rig -Veda*<sup>2</sup> with a fairly “typical” sky-god explanation of creation and the nature of the object world. However, there are passages in the *Rig-Veda* that express doubts about the sky gods and radically turn towards “consciousness” as preceding the sky-gods. For instance, one of the passages in the *Rig- Veda* states:

Who verily knows and who can here declare it, whence it was born and whence comes this creation?

**The gods are later than this world's production.** Who knows, then, whence it first came into being?

He, the first origin of this creation, whether he formed it all or did not form it,

Whose eye controls this world in highest heaven, he verily knows it, or perhaps he knows not.

The Rig-vedic suggestion of “gods” as a later invention is reflected upon in the first commentaries to the *Vedas* namely the *Upanishads* (c. 600–400 BCE). The fundamental difference between the *Vedas* and the *Upanishads* is that whereas the former seems concerned with “answers,” the later is concerned with the possibility of posing the questions or questioning. The *Upanishads* criticized the *Vedas* as being overtly ritualistic, and directed focus on the human being instead of the Gods. Thirteen of these commentaries, called the *Principal Upanishads*<sup>3</sup> focussed on ontological questions such as the nature of reality, and the role of humans in this reality. The *Upanishads* rejected the Vedic rituals and sacrifice as an answer to human salvation, and instead contemplated on human consciousness to determine this answer. In the *Vedas*, one would want to go to the ‘sky-gods’ at death whereas in the *Upanishads*, one is asking what is death? The *Upanishads* rejected the polytheism of the *Rig-Veda* and attributed creation to *Brahman* (the Absolute). This is poignantly illustrated in the *Chandogya Upanishad* when Indra (the king of the sky gods)<sup>4</sup> is portrayed as a student that seeks enlightenment and understanding and is barely able to understand the meaning of *Brahman*.

Attempts to determine accurately the nature of *Brahman* only lead to the realization that the finite capacity of the intellect cannot comprehend the infinite nature of *Brahman*. Was the ultimate generalization that captured the essence of the universe beyond the scope of the human intellect? The Upanishadic quest was to discern the nature and origin of consciousness (thinking). Nearly two and half thousand years later Wittgenstein observed this and said that the great mystery is not “what” things are but “that” they are. The *Upanishads* ultimately characterized *Brahman* as “*neti, neti*” (not this, not this), i.e. “One knows what something is if one knows what it is not.”<sup>5</sup>

It is generally accepted that the schools of philosophy that originated in India after 400 BCE, either rejected the Vedic religion (e.g. the Jainas and Buddhists) or viewed themselves as an offshoot of the Vedics. In this paper, we focus on one of the six philosophical schools of thought that emerged from the Vedic tradition, namely the *Vedanta* school and its offshoot the *Advaita Vedanta*.

There are several interesting parallels between the early Vedic society and the pre-Socratic Greeks such as the polytheism in both societies, as well as the detailed rituals and sacrifices outlined for humans to appease the Gods. There are also many striking similarities between Greek and Indian mythologies. Strangely enough, the polytheism in both these societies gradually evolved to a belief in a divine principle of “Oneness”, called “*Rita*” by the Vedic Indians and “*Moirai*” by

the Greeks. This leads one to wonder whether there were any contacts between the Vedic Indians and the pre-Socratic Greeks. There are several theories about plausibility of such a connection. Two oft quoted and widely accepted explanations are the archeo-geometric and linguistic explanations.

The archeo-geometric<sup>6</sup> explanation suggests that the fire altars used by the Vedic Indians and those used in Mesopotamia and Greece show remarkable geometric similarities especially in the specific mathematics required for their constructions. Based on this discovery, it was suggested that there was contact between the Vedic Indians and the pre-Socratic Greeks sometime around the 1700 – 1400 BCE period in time. The region of Bactria, on crossroads between these two civilizations, is likely to have absorbed some of the rituals of the invading Vedic-Aryans<sup>7</sup> passing through this region on their migration towards to Indian subcontinent. The archeological excavations at the Bactrian-Margianian complex reveal temples with fire hearths similar to altars found in the Indus Valley. Togolok is approximately equidistant from Athens and Banaras “almost 2000 miles as the crow flies. Our nomads ... [h]ad to pass through deserts, circumvent rivers, lakes seas, often carrying food and other necessities ... [t]hey did not carry bricks, notebooks or paper. The transmission of knowledge was oral ... [r]itual geometricians that went along on these expeditions carried not only their language but also their science in their heads. There is plenty of evidence that supports it<sup>8</sup>”

Linguistics classifies both Sanskrit and Greek in the Indo-European language group, with Sanskrit belonging to the Indo-Iranian subgroup. The linguistic evolution of the Indo-Iranian languages corroborates the plausibility of ancient Iran serving as the crossroads of contact between the pre-Socratic Greek and Vedic societies.<sup>9</sup> Linguists today accept that Greek, Latin, and Sanskrit have common origins. At least a thousand words illustrate the similarities in classical Greek, Latin, and Sanskrit. For instance, “father” is “pitri” in Sanskrit, “pätair” in Greek and “pater” in Latin. The Sanskrit word “manas” meaning mind or “pertaining to human” is identical in Greek and has offshoots in many languages such as Latin and German. The plausibility of communication between the Vedic Indians and pre-Socratic Greeks via ancient Persia has also gained acceptance among scholars specializing in Indo-Iranian civilizations. “Even in periods when means of transport and communication had not been developed, oriental civilization penetrated into the West. Iran and Greece were in contact with each other, and many Indians found their way to Greece through this contact. Asoka’s<sup>10</sup> missions to the West, and Alexander’s influence on Egypt, Iran, and North West India, produced a cross-fertilization of cultures.”<sup>11</sup>

## Motivation for this paper

The motivation for this paper is simple; to present a viewpoint that is rarely heard in contemporary theology – science dialogues. In spite of the many parallelisms in Vedic and Greek societies, ensuing developments in Indian Science have gone unnoticed by Western Science historians. Some scholars of Eastern civilizations

have attributed the lack of attention to Indian Science to the modern day *status quo* of “*le miracle grec*, according to which science originated in Greece and is, therefore, in essence ‘Western’.”<sup>12</sup> The lack of attention is also attributable to a variety of other reasons. First of all the contributions to science and mathematics in Vedic and post-Vedic India were deeply intertwined within the grammarian, philosophical, and theological commentaries on the Vedas by the various post-Vedic schools. Second, these works were translated from Pali, Prakrit, and Sanskrit into western languages only with the advent of colonialization in the last 300 years. We believe that the historical developments in Indian science and its symbiotic relationship with theology can contribute to the present day debate on the compatibility of theology and science.

One of the fundamental differences between science developed in post-Socratic Greece and post-Vedic India was the focus. While the Greeks following the Aristotelian tradition focussed on nature (object), the post-Vedic Indians focussed on mind (subject). The Aristotelian approach to science was empirical and placed a heavy emphasis on perception through the senses. Aristotle rejected the Platonic notion of the mind’s capacity to intuit/discern a priori reality and instead proposed an *a posteriori* or empirical methodology whereby knowledge is acquired by the mind. Aristotelian science was axiomatic and deductive in nature with the aim of explaining natural phenomenon. The underlying assumption of Aristotelian science was that all natural objects were fulfilling a potential determined by an actual prior natural object. For instance, a seed becomes a plant because it is merely fulfilling its potential of becoming a plant. Science historians today agree that Aristotle was an empiricist, who believed that knowledge is gained via observation, experimentation, and experience. The question of whether or not Aristotelian science was the origin of dualism is still a matter of present day debate.<sup>13</sup> Recent scholarship on post Renaissance science and natural philosophy traces a rich intellectual lineage centered on “scholasticized Aristotelianism” from 17th century natural philosophy, to medieval thinkers like Aquinas, to Aristotle.<sup>14</sup> Francis Bacon (1561–1626), however, rejected the Aristotelian tradition and formulated the inductive method for science with the goal of prediction, and suggested a “probabilistic or fallibilistic criterion of knowledge which went on par with the emergence of probability in Pascal’s time.”<sup>15</sup> Although the limits of Bacon’s inductive method to determine antecedent causes were revealed by the peculiarities of quantum mechanics, the method of systematic observation to generate inductively scientific principles became one of the methodological paradigms for modern science. One consequence of Aristotle’s empiricist tradition was the acceptance of the notion that knowledge of the external world was derived by an active soul,<sup>16</sup> which was in essence separate from that world.<sup>17</sup> This led to a growing acceptance among 17th century natural philosophers in the notion of duality (or dualism). René Descartes (1596–1650) is considered the founder of this belief system since he initiated the mind-body problem. Cartesian dualism essentially proclaims that we are composed of two distinct and basic substances, namely the soul (mind) and matter. Matter was the material substance that extended into the world and took up space, whereas the soul was a thinking substance, which was not “localizable” in space.

“If these two aspects (soul-matter) are to be held in equal balance, it seems that it will have to be in some way more subtle than mere juxtaposition.”<sup>18</sup> The problem of dualism can be reformulated as follows: “One can think of subject and object as two unique and separate natures, neither of which is reducible to each other. The question of course in such a dualistic assumption is ‘how do these two natures relate to each other?’ For example, if man is a body and a soul and they are qualitatively different from each other, how can they influence and determine one another?”<sup>19</sup> The Indian philosophical school of *Vedanta* confronted the problem of dualism nearly fifteen centuries before Descartes proposed it in the western world. It was resolved by the *Vedanta* Indian philosopher Shankara (c. 788–820 CE) in the *Advaita-Vedanta* by explaining the role of consciousness in everyday experience and the knowing process.

In the remainder of the paper, we summarize the essence of the *Advaita-Vedanta* in order to develop a definition of human consciousness. This is followed by a discussion of the *Advaita-Vedantic* “principle of superimposition.” We present numerous examples from modern day science to illustrate the richness of these areas of interaction. We conclude by discussing the implications of the *Advaita-Vedantic viewpoint* for present day science.

### The *Advaita-Vedanta* and consciousness

The *Advaita-Vedanta*<sup>20</sup> of Shankara finally resolved the Upanishadic dilemma of the nature of *Brahman* as well as the western dilemma of dualism previously discussed. The main text of the *Advaita-Vedanta* school is the *Vedanta Sutras of Badrayana*,<sup>21</sup> on which Shankara made extensive commentaries. The underlying premise of *Advaita-Vedanta* is that “consciousness” defines existence as opposed to existence precluding consciousness. According to Shankara, the *Upanishads* are a self-consistent whole *if given the proper interpretation*. Shankara calls *Brahman* the ultimate reality or pure consciousness. In other words, an “intelligibility” characterizes the nature of the universe, its ordered essence and its ordered appearing but is not a “part” of it. Human beings are “conscious” beings and therefore cannot be viewed as separate from *Brahman* or pure consciousness. Shankara calls human consciousness *Atman* (or the Self), a manifestation or emanation of *Brahman*. If one makes the analogy of the “human body” as *Brahman*, and one of the vital organs as *Atman*, then it is easy to see that a vital organ cannot play the role of a “spectator” as its very existence is intrinsically connected to the entire body. Therefore, human consciousness (*Atman*) cannot play the role of a spectator in pure consciousness (*Brahman*) because it is a manifestation of *Brahman*. According to Shankara the reason why humans are unaware of the connection between *Atman* and *Brahman* is because empirical experiences in the everyday world create the illusion (*maya*) of an individual self with qualities and attributes that are not real (which makes one believe in an ego). Empirical experiences are often characterized by a principle of “superimposition” where one mistakes the “apparent” for the real. For instance, a person that is suffering of thirst often superimposes the image of water onto the surroundings and experiences the

mirage of water in a desert. A person who has suffered the loss of a child or a loved one might sometimes “see” this person in another, in the apparent appearance or movements of another person. One experiences “superimposition” during twilight when a rock or a tree is mistaken for an animal or a person. Shankara gave the analogy of a magician (*Brahman*) that conjures tricks and makes things appear or disappear, which deceives the people in the audience (*Atman*) but not the magician himself. The question then is if human experiences are often illusory, how does one determine or grasp the true nature of *Brahman*. There are several stories in the *Upanishads* in which a disciple seeks to understand the true nature of *Brahman* and asks God to teach him or her *Brahman*. Shankara points out that the answer to this question is found in the *Upanishads* itself and given as *Tat twam asi* (That art thou). In other words, we are *Brahman*, or that *Atman is Brahman*. These two entities *Atman* and *Brahman* are ontologically the same. This is the non-dual or monistic nature of Shankara’s philosophy in the *Advaita-Vedanta*. But then again this raises the question of actually grasping this or coming to the realization that *Atman is Brahman* given the fact that superimpositional and illusory experiences (*maya*) constantly blur this distinction. Shankara says that the illusion of *maya* is a necessary condition because “right knowledge cannot operate without a knowing personality, and since the existence of the latter depends on erroneous notions that the body, the senses, . . . and so on are identical with, or belong to the Self of the knowing person. For without the employment of the senses . . . right knowledge cannot operate.”<sup>22</sup> Shankara claimed that ignorance (*adhyasa*) caused by *maya* helps one recognize that “empirical” reality is dual, where one mistakes one’s Self to be different. However, this ignorance can be overcome and the non-dual nature of *Atman-Brahman* can be realized by studying the Vedantic texts and acquiring “real” knowledge of the nature of human consciousness. When this happens, *maya* no longer controls our day-to-day experiences. This results in the notion of “I” ultimately disappearing and the experience of oneness with *Brahman*.

The difficulty of studying our consciousness was recently posed as follows: “There is a particular difficulty in thinking about consciousness, because its presence is constitutive of all our known experience. Without it, we would have no knowledge whatsoever. Introspection simply reveals the current object of consciousness—what we are thinking about now—but not consciousness itself, which is as invisible and vital as the air we breathe.”<sup>23</sup>

## A definition of human consciousness

One might define human consciousness as the *possibility* of attending/intending, and describe specific experiences and their interpretations as *possibilities* for consciousness as attentions and intentions. Experiencing is a synthesis of *of* and *for*. Alternatively, from the position of Shankara and *Advaita-Vedanta*: the *possibility* of superimposing and the *possibilities* for superimposition. We encounter an excellent example of this synthesis when we seek to explain and/or define ‘self’ or ‘world’. Any explanation, interpretation, definition, etc. is an attending/intending flow with at least five aspects.



1. The 'observer, interpreter, explainer';
2. The 'interpreted, observed, explained' or experienced object which is the context to which the interpreter refers;
3. The process of 'interpreting, observing, explaining';
4. The 'interpretation, observation, explanation' that emerges from 1–3; and
5. The 'awareness' of and ability to distinguish the preceding four aspects of this continuum and to focus upon them individually and collectively, assigning each significance and value.

It is within this fifth aspect that perspectives occur on the other four and upon number five itself. Every aspect of this continuum provides a vast number of possibilities *for* consciousness, while consciousness *as* the possibility of the totality is not reducible to any particular aspect, and is the source most clearly reflected in the fifth aspect.

This five-aspect continuum seems to us implicit in all subject-object-process-language-understanding relationships. The challenge is to preserve the totality of "consciousness *as* possibility" while utilizing and/or emphasizing particular aspects within it as possibilities *for* consciousness. Otherwise, we confuse the aspect with the whole or perhaps adopt the illusory "perspective of no perspective"—which is also a very important "version" of *maya*. It is the processing of "consciousness as possibility" that is the source of exploring, explaining, defining—the possibility for theorizing, theologizing, biologizing, cosmologizing, psychologizing. It is the processing of "consciousness as possibility" that discusses the "possibilities for consciousness" in the contexts of the sciences, arts, and humanities.<sup>24</sup>

Referring to consciousness as the "possibility of possibilities," preserves the dynamic of thinking and perceiving (*minding*) without limiting this dynamic either affirmatively or negatively by restricting these processes to a specific possibility or interpretation. It is consistent with Shankara's *Adhyasa-bhasya* (commentary on superimposition) outlined in his introduction to the *Vedanta Sutas of Badarayana*.<sup>25</sup>

Any distinguishing between *possibility* of and *possibility* for generates a number of "process" or "superimposition" paradoxes. For example, as the source of explaining, defining, interpreting, we cannot reduce ourselves as explainers and definers to our explanations, definitions, or interpretations. Any attempt to do so leads either to dogmatic absolutes or spiraling regressions of concepts and terms. This does not mean that we cannot talk about ourselves. It does mean we are not our statements. The 'world' as we experience it and are aspects of it, is a "Nature/Mind"<sup>26</sup> continuum that manifests itself in "imitating processes" in nature, and in "imaging" and "imagining processes" in human thinking. This combination of *in* the world and *of* the world generates paradoxes in our attempts to know and explain mental and/or physical processes.

We use several quotes to illustrate that the nature and significance of these paradoxes was clearly recognized in classical philosophical traditions East/West. For example, the *Kena Upanisad* poses them in its questions as to the nature and origin of knowing and understanding:



By whom impelled soars forth the mind projected?  
By whom enjoined goes forth the earliest breathing?  
By whom impelled this speech do people utter?

The answer, however, provided by the Vedic forest sages (Risis) is less an answer than a lesson on answering:

There the eyes go not;  
Speech goes not; nor the mind.  
We know not, we understand not...  
It is conceived of by him by whom It is not conceived of.  
He by whom It is conceived of, knows It not.  
It is not understood by those who [say they] understand It.  
It is understood by those who [say they] understand It not...<sup>27</sup>

The practical yet mystical Chinese Taoist, Chuang Tzu chose to speak of the unspeakable, however, ...

Heaven and earth were born at the same time I was, and the ten thousand things are one with me.

We have already become one, so how can I say anything? But I have just said that we are one, so how can I not be saying something? The one and what I said about it make two, and two and the original one makes three. If we go on this way, then even the cleverest mathematician can't tell where we'll end, much less an ordinary man .... Better not to move, but to let things be!<sup>28</sup>

And Sextus Empiricus in his discussion of the Greek Socratic philosopher, Gorgias of Leontini claimed that Gorgias was the father of three fundamental propositions:

... firstly that nothing exists, secondly that even if anything existed it could not be known by men, and thirdly that even if anything could be known by anyone it could not be communicated to anyone else.<sup>29</sup>

This perspective was affirmed by Gorgias' contemporary, Socrates who "knew that he did not know." Socrates possessed, what the modern Chinese Philosopher, Feng Yu-lan would call *no-knowledge*, as opposed to ignorant individuals who have *no* knowledge.<sup>30</sup>

In these passages, and they are but a fraction of similar texts by other philosophers and other schools, there would seem to be a clear insight that the possibility of *consciousness* or *reflexive self awareness* cannot be reduced to one or more possibilities for *consciousness* as products of nature and/or mind. Some of the most significant illustrations of the application of this insight are found in the logical systems that many classical traditions and schools developed. For example, the Jaina "nayavada," "syadvada," and "saptabhangi," which emphasize subjects and points of view; the Nyaya and Buddhist five part experiential 'syllogism' and the 'catuskoti' which emphasize situational encounters of subjects and objects; and Taoist-Neo-Confucian process logics which emphasize a synthesis of aspects of

and perspective upon subjects, objects, and situations. These are logics in which there is a critical step or rule or level, which will preclude the possibility of mistaking the products of a logic for either the world, or the consciousness thinking of the logician who employs it. One might speak here of a synthesis of *neti neti* and *tat twam asi*. These logics and their traditions represent what we would call the *dimensions* of wisdom or *philosophical space*.<sup>31</sup>

Our personal awareness seems to consist of an unbroken attending/intending process of innumerable particular acts and objects of attention and intention, e.g. sensations, concepts, and feelings.<sup>32</sup> However, the possibility of attending is never exhausted in any particular attention just as intending is not limited to any particular intention. Knowing is a synthesis of focusing upon specific attention and intention *aspects* of this continuum (observations, emotions, physical processes) with *perspectives* upon these aspect foci. It is the perspectives within this continuum that enables us to change our “minds,” to emphasize questions over answers, to shift thinking “levels,” to withhold judging for the sake of further inquiry. Thus, as individuals we are a paradoxical mix of “being” as the *possibility of this attending/intending continuum* combined with specific aspects within it which are the *possibilities for attention and intention*. This validates our proposition to define human consciousness as the *possibility of attending/intending*, and describe specific experiences and their interpretations as *possibilities for consciousness as attentions and intentions*. Experiencing is a synthesis of *of* and *for*. Or from the position of Shankara and *Advaita-Vedanta: the possibility of superimposing* and the *possibilities for superimposition*.

In the next section, we present numerous examples from modern day science that illustrate a rich interaction with the *Advaita-Vedanta*, i.e. the possibilities of superimposing and the possibilities for superimposition. These examples from modern science illustrate the synthesis of nature/mind in observation, experiment, and explanation, especially in physics and biology increasingly reveal a “non-linear totality” in which subject, object, and situation have become inseparable.

### ***Advaita-Vedanta* and science: illustrations of a continuum of interaction**

Scientists in the 20th and 21st centuries have developed the technical tools and the analytic and theoretical maturity necessary for analyzing the nature aspect of the Nature/Mind continuum at unprecedented micro and macrocosmic levels. By doing so, they have reaffirmed the dynamic nature of the whole that was reflected in the paradoxes of the ancients. The result is a view of nature in which processes have supplanted ‘things’ in descriptions and explanations.

By the end of the 19th Century, limitations of the classical Newtonian/Euclidean world-view had become increasingly problematic as physicists began exploring nature at the sub-atomic level. The paradoxes posed by uncertainty, incompleteness, non-locality, and wavelicles, etc. made it seem apparent that in the sub-atomic world observations and observers are aspects of a whole.

...In the quantum principle we're instructed that the actual act of making an observation changes what it is that one looks at. To me, this is a perfectly marvelous feature of nature. ... So the old word observer simply has to be crossed off the books, and we must put in the new word participator. In this way we've come to realize that the universe is a participatory universe.<sup>33</sup>

Biologists have found that methodological reductionism, i.e. going to the parts to understand the whole, which was central to the classical physical sciences, is less applicable when dealing with living systems. Such an approach may lead to a study, not of the "living" but of the "dead." Since, in the examination of highly complex living systems "only by ripping apart the network at some point can we analyze life. We are therefore limited to the study of 'dead' things."<sup>34</sup>

One of the most important shifts in the natural sciences in modern times has been away from the view of a simple and complete separation between observer and observed to an awareness that an observer also represents a living aspect of that which is being observed—both as a product of nature and as the mental possibility in nature of observing, as in the notion of the "participator universe."<sup>35</sup> A synthesis of "product" and "process" are at the heart of the puzzles and paradoxes that we associate with ideas of "indeterminacy" in physics, and with genes in biology. The very concept of "objectivity" maintains that the observed and observer are separate does not hold in the study of "highly complex biological processes such as evolution or the functioning of the central nervous system ... we cannot distance ourselves from the object being considered; indeed, this is so at the very moment we start to think."<sup>36</sup>

It is amazing how close in understanding, and that across six centuries, modern physics and biology are to the Neo-Confucian Philosopher, Wang Yang-Ming's continuum view of "innate knowledge": "The innate knowledge of man is the same as that of plants and trees, tiles and stones...Heaven, Earth, the myriad things, and man form one body. The point at which this unity is manifested in its most refined and excellent form is the clear intelligence of the human mind."<sup>37</sup>

The very process of generalizing implies a belief in the unity of the world: "if the different parts of the universe were not like the members of one body, they would not act on one another ... know nothing of one another, and we ... would know only one of these parts. We do not ask if nature is one, but how it is one."<sup>38</sup> The position on mind and nature of theoretical physicists seems consistent with that of the neo-Confucian philosopher. Another physicist suggest that the heliocentric universe is again becoming geo or human centered in that it is "... *formless potentia ... and becomes manifest only when observed by conscious beings* ... Of course, we are not the geographical center, but that is not the issue. *We are the center of the universe because we are its meaning.*"<sup>39</sup>

In 1960, Edward Lorenz, who was modeling the earth's atmosphere with nonlinear equations at MIT, switched from rounding his equations to the sixth decimal point to doing so to the third. What emerged was a totally different system! He attributed the difference to a combination of the iteration of his equations plus the sensitivity of the system to initial conditions—in this case, the changes in the terminal decimal points. Lorenz named this randomness within his

non-random weather models the “butterfly effect” in a paper he wrote entitled “Can the flap of a butterfly’s wing stir up a tornado in Texas?” The discovery of “sensitive dependency on initial conditions” coupled with the “iteration of patterns or data” which produce random irregularities in deterministic systems is the beginning of the contemporary science of “deterministic chaos.”<sup>40</sup>

The term ‘fractal’ was coined from Latin *fractua* ‘irregular,’ to refer to the results of this combination of iteration and sensitivity. In addition, it was Mandelbrot who provided the pictures of this deterministic chaos in his computer generated fractal images—what is described as “... a way of seeing infinity.”<sup>41</sup> We discover these irregular nonlinear fractal structures and patterns throughout nature, in the iterations of buds in Romanesco broccoli, the arterial and venous systems of kidneys, lungs, brains, coastlines, mountain ranges, root systems, turbulences in fluids. For example, one might ask the length of a head of cauliflower or a coastline. At one level, the answer might be eight inches or 580 miles. However, at the fractal level of iteration of growth patterns and/or ocean forces, both can be seen as infinite.

In most, perhaps all of nature, we encounter a kind of deterministic chaos in a world described by “fractal geometries” which have “... become a way of measuring qualities that otherwise have no clear definition: the degree of roughness or brokenness or irregularity in an object.”<sup>42</sup> This is the heterogeneous and nonlinear world of the branching of buds in the cauliflower head, the spongy tissue of the lungs, the indentation on the beach. “Chaos is more like the rule in nature, while order (= predictability) is more like the exception.”<sup>43</sup>

Where the “butterfly effect” of the 20th century relates to sensitivity to initial conditions and the iterations of patterns and equations in physical space, the “butterfly dream” of the 4th Century BCE Taoist philosopher, Chuang Tzu, reflects sensitivity in a philosophical system to initial presuppositions and their iterations in philosophical space. Chuang Tzu claimed to have fallen asleep and dreamt he was a butterfly. Upon awakening, however, he wondered whether he was a man who had dreamt he was a butterfly, or whether he was a butterfly dreaming, it was a man.<sup>44</sup> We may insist that “dream” is not “reality,” and reality is not dream. However, if one subscribes to the view that the world is ultimately atomic in nature, then do physicists dream of particles or do particles dream of physicists in an *adhyasa—neti neti—tat twam asi* continuum.

## Implications of the Advaita-Vedanta for modern science

A dualistic view of nature or the cosmos must accommodate the problem and paradox of the *relationship/s* between the two basic elements, and we would emphasize the term “element” as the basic “stuffs” of the view, i.e. matter versus spirit, creator versus creation, ideas versus things. These basic elements are qualitatively different and yet somehow together produce the world of our experiences as well as our knowledge of it.

A monistic or non-dualistic (*advaita*) view must accommodate and explain the paradox of *differences*, whether essential or apparent, that seem to arise between and among the basic aspects of the *one*, and we would emphasize the term

"aspect" (from *aspiceri* to look at). Chuang Tzu calls attention with his talk of "oneness" and the realization that one and the statement "about one" equal "two-ness, ad infinitum to this puzzle. (The Chinese philosophical tradition tends to stress 'aspect' of a totality whereas Indo-European philosophical traditions tend to stress "things" within a totality—an approach, as A. C. Graham noted, which is facilitated by the use in Indo-European languages of the verb "to be.")<sup>45</sup>

Shankara outlines the nature and function of "superimposition" in the introduction to his *Commentary on the Vedanta Sutras of Badarayana*. He also suggests it is a quite normal process (a necessary process?) that the intellect/self follows in the empirical and rational world:

It is a matter not requiring any proof that the object and the subject...which are opposed to each other as much as darkness and light are, cannot be identified. All the less can their attributes be identified. Hence it follows that it is wrong to superimpose upon the subject—whose Self is intelligence, and which has for its sphere the notion of the Ego—the object which has for its sphere the notion of the Ego, and the attributes of the object, and vice versa to superimpose the subject and the attributes of the subject on the object. In spite of this it is on the part of man a natural [beginingless] procedure ... what have we to understand by the term "superimposition?"—The apparent presentation, in the form of remembrance to consciousness of something previously observed, in some other thing.<sup>46</sup>

Shankara's solution to the nature of difference in the non-dualistic totality of *Brahman* can provide a useful approach to modern physical and social science, which have been increasingly forced to reject the absolute reductionism and dualism of classical differences between subject and object in what physicists call a "participant universe." It is a universe in which our knowledge of it is dependent upon "uncertainty principles," "incompleteness theorems," principles of "multiple explanations," "complementarity," "non-linearity," "non-locality," "deterministic chaos," and "butterfly effects." It is a universe in which difference is a matter of focus and choice. Erwin Schroedinger, for example, insisted that "... it depends entirely on the observer what he chooses to regard as essential and what as inessential in a thing. *Per se* everything is equally essential. This would turn 'organic' and 'inorganic' into characteristics, not so much of the object as of our point of view or the direction of our attention."<sup>47</sup> This modern universe is a "self-aware universe."<sup>48</sup>

"Superimposition" provides a very useful model for dealing with what can be considered different/dissimilar aspects in and of a totality consisting of the non-linear and random nature of the brain, turbulence in liquids, the iterating and infinite patterns of the cauliflower head, our kidneys, and our thinking processes, etc. In what might pass as a modern "paraphrase" of Shankara's position, contemporary geneticists and molecular biologists write:

Any theory of psychic development must include not only a specification of how a given biological individual develops psychically in a given sequence of environments, but how the developing individual in turn interpenetrates with the objective and subjective worlds to recreate its own environments.<sup>49</sup>

There is a mental world, the world of perception, to which the mind reacts, which at the same time is a world created by the mind. It is obvious to all of us that our behavior is in reaction to our own interpretations of reality, whatever that reality may be.<sup>50</sup> Shankara's idea of "superimposition" also provides a methodology for inter-relating the five aspects of a knowing/understanding continuum, (i.e. interpreter/observer, interpreted/observed, interpreting/observing, interpretation/observation) and perspectives upon the inter-relationships in what is a continuum of superimpositions of each upon the other. The *observer* superimposes possible mental and sensual contexts upon the *observed*; the *observed* superimposes possible experiential and sensual contexts upon the *observer*; the possibility of *observing* superimposes a processing context upon both *observer* and *observed*; the observation, especially as symbolized superimposes possible linguistic contexts upon *observer*, *observed*, and *observing*. In addition, an awareness of the syntheses of superimposition and superimposing in these four aspects superimposes *perspectives* upon the knowing and understanding continuum in whole and in parts.

Three central ideas emerge in Shankara's analysis central to understanding the non-linear, orderly, yet chaotic world:

1. "Subjectification" and "objectification" reflect different aspect and perspectives within a continuum—inseparable and essential to one another. Awareness of this relationship is not the relationship, but a perspective upon it (this is the fifth aspect of the knowing process) in reflexive self-awareness.
2. The inter-dependence of subject and object is the both the source and the value of the superimpositions that occur when we superimpose the attributes of the one upon the other—but again it is in reflexive self awareness that we can realize that these attributions are superimpositions, for in reflexive self awareness we become aware of the minding process of "superimposing."
3. The superimpositions—but not the superimposing process—have their origins in memory and past experience—that is the empirical possibilities for consciousness. The recognition of these possibilities as "possibilities *for*" is an aspect of the possibility *of* consciousness.

The paradox of the superimposition of subject/object is a paradox that figures centrally in modern science. In an illustration taken from biology it is pointed out that:

Organisms do not simply adapt to previously existing, autonomous environments; they create, destroy, modify, and internally transform aspects of the external world by their own life activities to make this environment. Just as there is no organism without an environment, so there is no environment without an organism. Neither organism nor environment is a closed system, each is open to the other.<sup>51</sup>  
[Superimposes upon the other.]

The process of superimposing is reflected both in the world as imitation and imitating processes and in human mental events as imagination and imagining processes. It is a world in which DNA as recipe is super-imposed upon species,



genotype upon phenotype and phenotype upon genotype, signs upon concepts, concepts upon signs, values upon cultures and cultures upon values, brain upon mind and mind upon brain. Ultimately, ours is a world in which the possibility of consciousness finds its expression in the possibilities *for* consciousness; and as Shankara proposed, the possibilities *for* superimpositions lead back in reflexive self-awareness to the possibility *of* superimposing.

## Endnotes

- 1 The Rig -Veda is the oldest of the four Vedas and consists of thousands of hymns describing the sky gods. The Sama veda, Yajur veda and the Atharva veda are the remaining three vedas primarily based on the Rig-veda. Indian scholars consider the Rig-Veda to be the oldest Sanskrit book and date it before 4000 BCE. Western Scholars consider it much "younger" and date it around 1500 BCE.
- 2 Max Müller, *The Upanishads, Vols. 1–15. The Sacred Books of the East* (Oxford: Clarendon Press, 1879).
- 3 The Principal Upanishads are also called Vedanta, meaning the end of the Vedas. We prefer to use the term Upanishads not to confuse it with the Indian philosophical School of Vedanta.
- 4 Greeks that settled parts of Northwestern India after the invasion of Alexander the Great (326 BCE) viewed Indra as the analog of their god Dionysus.
- 5 W. Benesch, *An Introduction to Comparative Philosophy* (Macmillan Press, 1997).
- 6 A. Seidenberg, "The Ritual Origin of Geometry," in *Archive for History of Exact Sciences*, 1 (1962): 488–527. A. Seidenberg, "The Geometry of the Vedic Rituals," in Staal, F., and MacFarland, P. (eds), *Agni: The Vedic Ritual of the Fire Altar. Vol. II* (Asian Humanities Press, Berkeley, 1983).
- 7 It must be pointed out that there are many present day scholars of ancient Indian history who disagree with the "Aryan-invasion" theory. See David Frawley, *The Myth of Aryan Invasion of India*. Klaus Klostermaier, *Questioning the Aryan Invasion Theory and Revising Ancient Indian History*
- 8 F. Staal, "Greek and Vedic Geometry," *Journal of Indian Philosophy*, 27 (1999): 123.
- 9 T. Burrow, "The Proto-Indoaryans," *Journal of the Royal Asiatic Society*, (1973): 123–140.
- 10 Asoka (c. 299–237 BCE) is credited with the establishment of the so-called "first" Indian empire, accomplished through decades of bloody conquests. His deep remorse over the carnage at Kalinga led him to embrace the peaceful doctrines of Buddhism. Under his protection, Buddhism flourished and numerous Buddhist texts were written. Asoka also sent numerous emissaries of Buddhism to places like South East Asia, Egypt, Libya, and Macedonia, which resulted in the "golden" age for Buddhism.
- 11 Sarvepalli Radhakrishnan, "The Dignity of Man and the Brotherhood of Peoples," in *Foreign Affairs Record of the Government of India*, (January 1964).
- 12 Staal, *Ibid.*, 105.
- 13 One could argue that Aristotle drew a distinction in the natural world between the animate and inanimate, whereas Descartes was more focused on the human. Descartes' dualism dominated physics for a substantial period of time. Newtonian physics was one of the consequences of the Cartesian view point. H.M. Robinson, "Aristotelian Dualism," in J. Annas, ed., *Oxford studies in ancient philosophy* (Oxford: Clarendon Press, 1983), vol 1, 123–144.
- 14 *The Cambridge History of Seventeenth-Century Philosophy*. Edited by Daniel Garber and Michael Ayers. Vols. 1 and 2, (Cambridge: Cambridge University Press, 1998): 1616.
- 15 A. Perez-Ramos, "Bacon's Legacy," In M. Petonen, ed., *The Cambridge Companion to Bacon* (Cambridge University Press, 1996): 319.

- 16 Polkinghorne comments that Aristotle's view of the soul as the underlying "form" or pattern of the body was "taken up by Thomas Aquinas who rejected Platonic dualism that had dominated Western Christian thinking since Augustine." John Polkinghorne, *Science & Theology* (Fortess Press, 1998): 63.
- 17 W. C. Salmon comments "it is illuminating to recognize that Cartesian dualism offered a way of resolving the conflict between science and religion-which had brought such great troubles to Galileo-by providing each with its own separate domain. Physical science could deal with matter, while religion could handle whatever pertains to the soul." See: "Philosophy and the Rise of Modern Science" in *Teaching Philosophy* (1990): 236.
- 18 Polkinghorne, *Ibid.*, 54.
- 19 Benesch, *Ibid.*
- 20 The Sanskrit words *Advaita-Vedanta* mean "non-dualistic" and "end of Vedas" respectively. Gaudapada (7th century CE) is credited with the founding of this philosophical school, and Shankara was its earliest proponent. The philosophical school of *Advaita-Vedanta* is still very much alive and thriving in present day India.
- 21 *The Vedanta Sutas of Badarayana, with Commentary by Sankara* 2 vols., George Thibaut trans. (New York, NY: Dover Press, 1962).
- 22 *The Vedanta Sutas of Badarayana, with Commentary by Sankara* 2 vols., George Thibaut trans. (New York, NY: Dover Press, 1962): Vedanta Sutas I, i, vol.1, 6.
- 23 Polkinghorne, 57.
- 24 We use the term "possible" because it would seem to reflect human awareness and judgment based upon experience. The term comes from "potis, pote" = "able to"; and the term "esse" = "to be." The term "consciousness" is a combination of "com" = "with," and "scire" = "to know." These two terms combined in the way they are used here mean the "the possibility of knowing with knowledge of one's knowing." An excellent example of this meaning is implied in the term "conscience," which means in moral and ethical matters not only knowing what one is doing, but also knowing the ethical implications of ones actions, and, coupled with potis and esse, implying both the possibility of choosing and the possibility of responsibility. Such knowing or awareness suggests the ability to pose questions on one level about one's views and actions on another level—to remain aware of attending/intending beyond specific attentions and intentions.
- 25 *The Vedanta Sutas of Badarayana, Ibid.*
- 26 The Chinese for "world" or "nature" is *ziran*, which means "thus-so," or "self-arising."
- 27 Sarvepalli Radhakrishnan and Charles Moore, eds., *A Source Book in Indian Philosophy*, (Princeton, NJ: Princeton University, 1957): 42.
- 28 *The Complete Works of Chuang Tzu*, Burton Watson, trans., (New York , NY: Columbia University, 1968): 43.
- 29 Philip Wheelwright, *The Presocraics, "Sextus Empiricus 'Against the Logicians' "* (New York, NY: Macmillan, 1966): 256.
- 30 Fung Yu-lan: *A Short History of Chinese Philosophy*, (New York, NY: Free Press, 1966): 117.
- 31 Benesch, *Ibid.*
- 32 One can think of the Buddhist analysis of "self" into the five *skandhas*: rupa, vedana, sanna, samskara, vijnana (body, feelings, sensations, predispositions, and consciousness) as the essence of intending/attending in a world-view of anicca and anatta. Any discussion as to who does or owns these five *skandhas* would fall under one or more of them.
- 33 Comment made by the physicist John Wheeler in Paul Buckley and F. David Peat, *Conversations in physics and Biology* (University of Toronto Press, 1979): 53–54.
- 34 Cramer, 214.
- 35 John Wheeler's participatory universe as quoted in footnote 33.
- 36 Friedrich Cramer, *Chaos and Order*, (New York, VCH Publishers, 1993): 212.
- 37 Wing-tsit Chan, *Wang Yang-Ming*, 221.

- 38 Henri Poincaré, *The Foundations of Science*, George Bruce Halsted trans. (Lancaster, PA: The Science Press, 1946): 130.
- 39 Amit Goswami, *The Self-Aware Universe*, (New York: G. P. Putnam Sons, 1993), 141.
- 40 Heinz-Otto Peitgen, Harmut Juergens, and Dietmar Saupe, *Chaos and Fractals, New Frontiers of Science*, (New York: Springer Verlag, 1992): 48.
- 41 James Gleick, *Chaos, Making a New Science* (New York: Penguin Books, 1987): 98.
- 42 Gleick, *Ibid.*
- 43 Heinz-Otto Peitgen, Harmut Juergens, and Dietmar Saupe, 48.
- 44 Burton Watson, *The Complete Works of Chuang Tzu* (New York: Columbia University, 1968): 49.
- 45 A. C. Graham, *Chinese Philosophy and Philosophical Literature* (Institute of East Asian Philosophies, National University of Singapore, 1986): 323.
- 46 *The Vedanta Sutras of Badarayana*, *Ibid.*, vol I, 5–6.
- 47 Erwin Schroedinger, *My View of the World*, Cecily Hastings trans. (Woodbridgde CT: Ox-Bow Press, 1983): 42–43.
- 48 Amit Goswami, *The Self-Aware Universe* (New York: G.P. Putnam Sons, 1993).
- 49 R. C. Lewontin, Steven Rose, and Leon J. Kamin, *Not in Our Genes* (New York: Pantheon Books, 1984): 276.
- 50 R. C. Lewontin, Steven Rose, and Leon J. Kamin, *Ibid.*
- 51 R.C. Lewontin, Steven Rose, and Leon Kamin, 273.

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