

Eternal Dance of Macrocosm



An Encyclopedia of
Matter, Mind and Consciousness

Volume 2, 2011

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**An Encyclopaedia
of
Matter, Mind and Consciousness**

VOLUME 2, 2011

Editor: Michael Towsey

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National Library of Australia – Cataloguing-in-Publication Data:

Michael Towsey, 1948-.

Eternal Dance of Macrocosm, Volume 2, 2011

Second Printed Edition 2011

ISBN 978-0-9591792-5-5 (Volume Two)

ISBN 978-0-9591792-6-2 (Set of Volumes)

1. Sarkar, Prabhat Ranjan, 1921-1990. 2. Philosophy of Science. 3. Natural Sciences. 4. Social Sciences. 5. Spirituality.

Cover design by Michael Towsey.

Front Cover. Shiva (The Lord of Dance) performing *tandava* dance – superimposed on the spiral galaxy, M74. (hubblesite.org, with thanks to NASA and the Space Telescope Science Institute (STScI), USA). Tandava is a vigorous dance that represents the creation, preservation and destruction of the universe.

Rear Cover. Hubble Ultra Deep Field view of space, 2003. The deepest visible-light image of the cosmos ever taken. (Courtesy NASA, ESA and STScI, hubblesite.org/gallery/album/)

Printed chemically free on carbon neutral, FSC, TCF (totally chlorine free) paper.
Maleny Green Printery, www.malenyprint.com.

*To the legacy of
Shrii Prabhat Ranjan Sarkar*

Eternal Dance of Macrocosm

An Encyclopaedia of Matter, Mind and Consciousness

Review articles on:

Philosophy of Science

The Physical Sciences

The Life Sciences

The Psychological Sciences

The Social Sciences

The Aesthetic Sciences

Supra-aesthetic Science

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About the encyclopaedia

History

The title of the encyclopaedia is explained by its genesis. In 1977, Shrii Prabhat Ranjan Sarkar asked a friend of mine, Jake Karllyle, at that time visiting India, to arrange the publication of three books, giving a theme for each one. Over subsequent years (not knowing of Sarkar's request), I happened to be working on a series of essays concerned with Sarkar's cosmology (*Brahma Cakra*, the cycle of creation), and social philosophy (*Prout*, an acronym for the *Progressive Utilization Theory*). Jake and I maintained a correspondence and I kept him informed of my writing. Jake observed that my essays could be arranged in a sequence which more or less corresponded to the outline of one of the books requested by Sarkar, the theme of which was *matter, microcosm and social psychology*. I wrote additional essays to fill the gaps and thereby create a coherent book. The completed manuscript was submitted to Sarkar in mid-1985 with the request for a title, which he subsequently gave as *Eternal Dance of Macrocosm*. The book was printed in early 1986 and a copy presented to him.

It will be difficult for the 21st century reader to appreciate the difficulties of producing a book in this way. There was no internet, no email and no fax. A telephone conversation between Sydney and Kolkata (Jake was living in Kolkata from mid-1984) was next to impossible and a letter could take weeks. Yet it was all managed with a typewriter, two carbon copies and air-mail.

It so happened we were both in Kolkata during the final stages of printing. The print shop, Manasi Press, was at 73 Sisir Bhadhari Sarani, a clamorous street just around the corner from Kolkata University. Entry was by way of a dark passage leading to a warren of darkly lit rooms. We might well have stepped back to the 19th century. The clunk and clash of pre-war letterpress and hot linotype machines hammered the ears. Young boys fed gyrating machines with pieces of paper, one at a time. A small kitchen extractor fan could not possibly cope with fuming inks, paper chemicals, sparking motors, solvents and greases. We picked a careful path between precarious piles of collated paper and wet inks, to meet the manager. He ushered us cheerfully into his office which was stacked floor to ceiling with manuscripts, papers and a sample of every book published over several decades. Despite the Dickensian conditions, this shop turned out numerous editions of Sarkar's books both cheaply and efficiently for many years. *Eternal Dance of Macrocosm* was typeset on a linotype machine, printed on a letterpress and manually collated.

A few days after publication both of us had the opportunity to speak to Sarkar about the book. Actually it was the occasion of a celebration to mark the composition of the 3500th song of *Prabhat Samgiita*. Sarkar had just returned from his daily walk and many friends were waiting with garlands. A jasmine vine over the entrance perfumed a delicate breeze and everyone was in a joyful mood. As Sarkar passed by, we congratulated him on the completion of so many songs and

asked if he had received a copy of the book. Sarkar made an appreciative comment and turned to depart. Suddenly he turned back and said of the book, “It adds something extra. It adds something in the realm of intellect and intellectuality.” Later we learned that Sarkar kept a copy of the book on his desk.

Despite the obvious deficiencies of the first edition, Jake and I believe Sarkar was appreciative of the endeavour to strive for a synthesis of the learning of East and West. Sarkar was a Universalist. He stressed the unity of human culture and encouraged all to cultivate an open hearted, magnanimous and universal outlook. Certainly all his published works are imbued with these characteristics.

It is now 25 years since publication of the first edition. The problem with a book such as *Eternal Dance of Macrocosm* is that it very quickly dates. Within a few months of publication, Sarkar embarked on a series of discourses that introduced an entirely new scientific topic, *microvita*. It was immediately apparent that incorporation of this topic would require a major rewrite. And of course 25 years on, Western science has made much progress and styles of thinking have changed.

It would be a pity if the inspiration and the title which spawned *Eternal Dance of Macrocosm* were left to fade away. After several attempts at a second edition it became clear that a different approach must be taken. In early 1991, I decided to rework *Eternal Dance of Macrocosm* as an *encyclopaedia of the sciences*, but it has taken 20 years to produce Volume 2.

The Encyclopaedia

An encyclopaedia is, by definition, a complete account (encirclement) of the knowledge of the day in some field of learning. Encyclopaedias often organize their content in alphabetical order but this is not a defining characteristic. Rather the requirement of an encyclopaedia is that the contributions be systematically ordered, be encyclopaedic in scope and be updated periodically to keep up with developments in knowledge.

The first edition of *Eternal Dance of Macrocosm* attempted to survey a broad cross section of scientific disciplines, an approach which lends itself to an encyclopaedic format with contributions from different authors.

An encyclopaedia of the sciences is appropriate for another reason. Sarkar’s cosmology, *Brahma Cakra*, is an all-encompassing account of the phenomenal world and employs the metaphor of a circle. Brahma Cakra distinguishes a hierarchy of worlds or levels of existence which relate conveniently to the major disciplines of Western science as shown in the following table.

The distinction between the social, aesthetic and supra-aesthetic sciences deserves clarification. The social sciences would include linguistics, sociology, collective and transpersonal psychology, economics and politics, but would exclude ethics, value systems, and comparative religion. The aesthetic sciences include ethics, comparative religion, literature, music, the fine arts and their respective critical systems. Supra-aesthetic science as defined by Sarkar in *Namami Krsna Sundarum* is the realm of spirituality and spiritual practice.

The editor looks forward to a day when *Eternal Dance of Macrocosm* is published annually in multiple volumes, one volume for each of the sciences. This 2011 edition is a first modest step. Its articles cover a range of topics concerned with matter, mind and consciousness. I wish to acknowledge the help of Jake Karlyle, not only in getting this 2011 edition published, but also for making the original publication possible 25 years ago under difficult conditions.

Correspondence between the major branches of Western science
and the worlds (lokas) of Eastern philosophy.

Major categories of knowledge defined by Western science	Lokas (worlds) described in cosmology of Brahma Cakra
Physical Sciences	Bhu Loka (physical world)
Biological Sciences	Bhuvah Loka (crude mental world)
Psychological Sciences	Svah Loka (subtle mental world)
Social Sciences	Mahah Loka (causal mental world 1)
Aesthetic Sciences	Janah Loka (causal mental world 2)
Supra-aesthetic Science	Tapah Loka (causal mental world 3) Satya Loka (Cosmic Consciousness)

Objectives

The encyclopaedia is dedicated to the mission of Shrii Prabhat Ranjan Sarkar and has four objectives:

- 1) To provide an up-to-date, comprehensive overview of the various fields of human learning, enough to satisfy the curious educated reader but not to the depth required by a specialist.
- 2) To offer a universal, synthetic perspective on the fields of human learning. A particular objective is to bridge the gap between traditional Eastern and Western perspectives and, more generally, to cross all cultural divides as best we understand them at any time, so as to develop a universal knowledge.
- 3) To offer the reader an introduction to the various branches of Sarkar's philosophy.
- 4) To offer a medium whereby persons can publish review articles that advance our understanding of the fields of research to which Sarkar contributed.

Editorial Policy

1. Contributions will be solicited from scientists, academics and any person who, in the opinion of the editors, can make a significant contribution to the objectives of the encyclopaedia.
2. The editor(s) reserve the right to make final decisions concerning inclusion, presentation, etc., in consultation with the contributor. Submissions must be in electronic Microsoft Word format. Contact the editors for a style sheet.
3. Contributions will be in the style of review articles that overview a particular field of science rather than accounts of individual research. They should attempt to synthesise advances in the field.
4. Contributions should be of a scholarly nature yet written in a journalistic essay style. Language will be English because it currently commands the greatest global reach. Contributions should be written at a level of difficulty (both in terms of vocabulary and content) comprehended by a second or third year undergraduate student in the field.
5. Contributions should provide a multicultural or synthetic approach to their field and should attempt to bridge the gap between Eastern and Western knowledge. Contributions should promote a universal outlook and avoid all divisive ideas such as nationalism, classism, castism, sexism etc.

Getting Started

The 2011 edition of *Eternal Dance of Macrocosm* includes five essays and it is suggested that they be read in order. The first essay explores the emergence of a new paradigm for Western science to replace materialism. The subject is explored from three perspectives: Kuhn's theory of scientific revolutions, Sarkar's theory of microvita and Sarkar's theory of cognitive evolution. The essay concludes that there is more here than just philosophy of science – achieving an equitable and sustainable globalization is also at stake.

The second essay is an introduction to Sarkar's cosmology, *Brahma Cakra*, and compares it with the cosmology of Western science. The comparison is interesting because the two cosmologies are very different yet both claim to describe the universe in which we live. Finding a correspondence between them would have been difficult prior to the 20th century because Western cosmology was preoccupied with the world of matter and Eastern cosmology with the world of mind and consciousness. However this situation changed significantly in the second half of the 20th century due to the pioneering synthetic work of Fritjof Capra (*The Tao of Physics*) and Ken Wilber (*Eye to Eye*). This essay follows in their footsteps and attempts a synthesis of *Brahma Cakra* with Western learning.

The third essay, *The Dawn of Enlightenment*, is a brief introduction to the history of yoga and spirituality in India. Ramesh Bjonnes argues for the *two river* theory of Indian culture – that what the world now knows as *yoga* (which actually includes a variety of spiritual and health practices, such as meditation, breathing exercises, eating habits and body postures) has its origins in a fusion of indigenous Indian

Tantra with Aryan introduced Vedanta. Bjornes brings a variety of anthropological, linguistic and genetic evidence to support his theory.

The fourth essay, *The Structure of Matter*, compares two descriptions of the physical universe, that of modern Western physics and that of Tantra, which is the ancient spiritual tradition of the Indian subcontinent. It proposes that Tantra's classification of matter into ether, air, fire, liquid and solid is not as naïve as it might seem to the modern Western mind. The essay proposes a correspondence between the five fundamental elements of the old world and the fundamental particles of modern physics.

The fifth essay describes aspects of Sarkar's theory of *microvita* which is also introduced in the first two essays in this volume. The theory promotes a new way of doing science that requires a synthesis of East and West. The contribution of the West is its rigorous three-part methodology of observation, rational theorizing and validation. The contribution of the East is to expand the domain of legitimate experience to include intuitional and spiritual experience. In this way Western science can move beyond the dogma of materialism.

I hope you enjoy Volume 2 of *Eternal Dance of Macrocosm*. Plans are underway for Volume 3 in 2012. Until then ...

Michael Towsey, Editor.

After Materialism

Paradigm Struggle in Western Science

Michael Towsey

Introduction

Western science rests on the philosophical foundation of *materialist monism*,¹ according to which only physical matter exists and therefore only physical matter can be known. Furthermore, matter is known to us only through the sense organs and indirectly through instruments. Consequently valid knowledge can only be derived from a logical interpretation of sensory experience. Until the 20th century, matter was considered a particulate substance moving in a void and having properties by which it is known.

Materialist monism (henceforth *materialism*) also asserts that mind and consciousness are epiphenomena of matter. Mind is not a thing – mind is what the brain does. The neurobiologist Steven Rose defines mind as:

... equivalent to the sum total of brain activity for discussions within the universe of discourse at a hierarchical level above that of the physiological description of the interaction of cells and below that of social analysis.²

Rapid advances in neuro-science have bolstered support for materialism because each new discovery seems to support the premise that “there can be no change in the mental states of a person without a change in brain states”,³ from which it is but a short step to the conviction that matter is the ultimate reality and all mental experience is purely derivative of matter.

Despite the remarkable achievements of Western science, its materialist foundations are not universally accepted. Furthermore new philosophies are emerging which challenge materialism and prompt one to ask if we are witnessing the early stages of a Kuhnian style revolution in Western science. The evidence for such a shift comes from a surprising number of “apostates”,⁴ practising scientists going public with their loss of faith, not in the scientific enterprise itself but in its materialist foundation. This group of rebels do not necessarily agree on all things. However, their writings suggest that consciousness, mind and subtle energy will be essential categories in a new philosophy of science.

Opposition to materialism has waxed and waned several times over the past one hundred years or so. Surprisingly, despite the measurement problem in quantum physics forcing physicists to grapple with consciousness,⁵ it is biologists who have done the hard work to build an alternative philosophy for the natural sciences, even if they do not speak in a single voice. Some biologists, for example those developing the philosophy of enactivism, stay within the bounds of naturalism. Others postulate a role for subtle non-material factors, even at the risk of their

reputations and careers. Notable names include Jacques Benveniste,⁶ Rupert Sheldrake,⁷ Candace Pert⁸ and Elisabet Sahtouris.⁹

There is a second more personal motivation behind this essay. In 1959 scientist and novelist C. P. Snow argued that modern intellectual life had split into two cultures, one informed by the sciences and the other by the humanities.¹⁰ A breakdown in communication between them was a major impediment to solving the problems of modern society and even represented a threat to Western civilization. A decade later when I was a student at Auckland University, *Two Cultures* still generated much discussion and caught my imagination.

At the time, I did not believe the cultural divide was either fundamental or insurmountable. I was both a scientist and a musician – the divide was just a product of too many people having a too-specialized education. Today I recognize the divide as something more disturbing and dysfunctional. It has hardened into an ideological struggle between crass materialism versus a subtle culture; between neo-liberal economics and community; and between a mechanistic universe and a living one. Paradigm struggle in the sciences is just one part of a larger cultural struggle within Western civilisation. This essay is my attempt to address the issue raised by Snow more than half a century ago. Clearly there is a connection between Snow's cultural divide and paradigm struggle within the sciences, namely the dominant position of materialism and reductionism.

Structure of the essay

This essay explores the emergence of a new paradigm for the natural and social sciences. Its purpose is not to persuade the reader of the imminent demise of materialism but rather to explore the dynamics of the challenge facing materialism and the obstacles that must be overcome if any challenge is to be successful. We explore this question within the framework of the theory of scientific revolutions due to Thomas Kuhn (1922-1996). Kuhn's famous book, *The Structure of Scientific Revolutions*, first published in 1962, offers a model with which to interpret revolutionary paradigm change. We will also situate paradigm change within the larger perspective of a macro-theory of cognitive evolution due to Prabhat Ranjan Sarkar (1921-1990). The cognitive contribution to scientific change has been neglected over the past century due to the dominance of socio-historical accounts. As Andersen et al. observe: "... cognitive factors must play a role in any general account of historical change in science".¹¹

The essay has six parts:

1. A review of some of the anomalies confronting the materialist paradigm.
2. A review of emerging responses to materialism that are likely to be part of a new paradigm. These include *organicism*, *enactivism*, *subtle energies* and *integral philosophy*.
3. A discussion of the factors which influence resistance to paradigm change and, in particular, resistance to a new paradigm that acknowledges mind and consciousness on their own terms.

4. An introduction to the *theory of microvita*, in particular those aspects which contribute to a new science of mind.
5. A discussion of the scientific method and how it might change in a transition from materialism to a more subtle paradigm.
6. The macro-perspective – placing paradigm struggle within a larger context, the evolution of human cognition.

Terminology

In recent years the word *physicalism* has replaced *materialism* when referring to the dominant paradigm of Western science. The word physicalism avoids ambiguity with the cultural and consumerist senses of materialism. Nevertheless, despite their different nuances, the two words are used interchangeably in this essay because it cannot be said that physicalism and materialism are entirely divorced from one another. The dominant position of science in Western society ensures that its physicalist foundations ‘encourage’ a materialistic approach to economic and social theory. Western culture is shaped accordingly.

The term *subtle* will be used frequently in this essay to refer to processes that are difficult to detect using the contemporary methods of Western science, because they involve either exceedingly small energies or non-material factors. *Subtle organicism* for example, would refer to an organicism that admits the possibility of non-material factors. Depending on context, the word ‘subtle’ may also be meant in a spiritual sense to describe a phenomenon whose understanding requires a refined intuitional acuity.

Materialists will of course reject *subtle* used in this sense as “muddle-headed” thinking. Whitehead, who worked with Bertrand Russell for many years in developing symbolic logic, eventually parted philosophical company with his friend. Russell remained an advocate of materialism while Whitehead developed *process philosophy* in which matter is treated as conscious. Whitehead once introduced Russell at a Harvard lecture with the quip: “Bertie says that I am muddle-headed. But I think that he is simple-minded.”¹² Almost 100 years later, this comment succinctly contrasts the attitudes of those grappling with materialism and its successor. Fortunately, muddle-headedness has an impressive pedigree. The emergence of a new paradigm for Western science would be inconceivable without bold pioneers such as Alfred Whitehead, Sewall Wright, Prabhat Sarkar and Rupert Sheldrake. The clarity which we seek will come eventually but only after such pioneers penetrate the fog.

Anomalies in Materialism

According to Kuhn, a scientific revolution begins with the recognition of *anomalies*, observations that are inconsistent with the prevailing paradigm. Recall that according to the influential philosopher of science Karl Popper (1902 - 1994), anomalies represent falsifying instances, and one might expect those which we describe in this section to kindle doubt concerning materialism. But not all

anomalies are the same. To understand why most scientists keep the faith we must distinguish three kinds of anomaly: legitimate, inconsequential and illegitimate.

Legitimate anomalies

Legitimate anomalies are better described as unsolved puzzles. They fall within the legitimate interests of one scientific community or another and there is every expectation that they can be solved without abandoning physicalism. Any competing paradigm will have to provide an adequate account of the same anomalies.

The matter puzzle

In the 19th century view, matter had the properties of mass and extension in space. Energy had neither property and belonged in quite a different category. In the contemporary view, matter and energy are inter-convertible and matter, rather than being an ultimate reality, has somehow diffused into more fundamental abstract concepts such as charge, information, energy and entropy. Only some 5% of the calculated mass-energy of the known universe is matter in the traditional sense while the remaining 95% (comprising 25% dark matter and 70% dark energy) remains a puzzle. Bertrand Russell avoided the problem of what matter really is by defining it as that which “satisfies the equations of physics”.¹³ Indeed some contemporary physicists no longer define matter as substance but as an ever-unfolding process.¹⁴

Despite matter becoming an increasingly abstract concept, most physicists see no reason to abandon physicalism. The definition which opened this essay had two parts. The first was an ontological statement postulating the existence of something called *matter* as the only substance. The second was an epistemological statement concerning what can be known. Ultimately materialism falls back on the epistemological commitment – valid knowledge can only be derived from a logical interpretation of sensory experience. For most physicists this is enough – matter, in whatever guise, can only ever be an abstraction. But for others, the essential role of conscious experience in observing matter and of the role of mind in formulating theories of matter encourage them to think beyond physicalism. As expressed succinctly by a biologist, “I know too much about matter from modern physics to be a materialist.”¹⁵

Wave-particle dualism

Wherever matter manifests it does so with the contradictory attributes of wave and particle. This is one of several puzzles in quantum physics. Waves are energetic oscillations of a field and, mathematically, the wave is a non-local entity that spreads throughout space. By contrast, particles are local point-like concentrations of energy. Light is both wave and particle, both universal and local. How can these contradictory attributes be accommodated within the one theory?

According to the orthodox interpretation, the two sets of attributes are *complementary*, meaning that whatever matter might ‘really be’, only its wave or

particle attribute can be observed at any one time – never simultaneously. It depends on the apparatus the observer chooses to deploy. There is no point speculating about the reality behind observations.¹⁶ An alternative interpretation, proposed by David Bohm,¹⁷ is that wave *and* particle exist as separate elements of reality but there are limits to what we can know about them. More recent, cleverly-designed experiments imply that it *is* possible to observe the wave-particle attributes of photons simultaneously, thereby challenging complementarity.¹⁸

The issue at stake here is *realism*; the belief that all physical objects must have a *pre-existing* value for any possible measurement *prior* to the measurement being made. In everyday life we believe the moon to be out there in the sky even when we are not looking at it, but at the quantum level, realism appears to break down. Complementarity reconciles measurements on waves and particles by avoiding the issue of what matter ‘really is’ prior to measurement. That is, complementarity abandons realism.

Despite the ‘non-realism’ of the world of quantum matter, this is not in itself a reason to abandon physicalism. Indeed it is quite likely that any new paradigm of the natural sciences will also have aspects that defy realism.

Quantum indeterminism

The waves described by quantum theory are unusual. They do not describe real waves in a subatomic ‘fluid’ – rather they describe the probability of finding a particle at each point in space should an experimenter choose to look for one. Mathematically, the probability distributions look and unfold like waves, hence they are called *probability waves*.

Probabilities are used in classical science to describe the behaviour of complex phenomena such as the weather and epidemiology. This is necessary because a large number of factors are at play, many of them unknown. Expressing results as probabilities gets around our ignorance while still producing useful information. Quantum probabilities, however, are puzzlingly different. In subatomic experiments very few entities appear to be involved and so in theory we would expect the same experiment, repeated with the same initial conditions, to produce the same result. In practice, each experiment produces a different result. Quantum uncertainty or indeterminism appears to be intrinsic to the subatomic world rather than a product of ignorance.¹⁹

This puzzle challenges the principle of cause and effect, according to which a unique set of causes determines a unique set of results. Instead measurements on two identical subatomic systems can give different results. Einstein could not accept quantum indeterminism. He famously quipped, “I... am convinced that [God] does not throw dice”. Not so well known is Niels Bohr’s reply: “Einstein, stop telling God what to do!”²⁰

As with the wave-particle puzzle there are various responses to quantum indeterminism. According to one explanation, uncertainty arises because the very act of observation disturbs that being observed. Others believe that uncertainty is an inescapable consequence of the wave nature of physical phenomena. Einstein,

Bohm and others believed quantum theory to be an incomplete account of the subatomic world. They postulated some deeper reality behind quantum mechanics, *hidden variables* which, if they were accessible, would enable a deterministic description of quantum events. Many experiments have been directed to this highly controversial issue but it is fair to say that the question is still open.²¹

In passing we note that quantum indeterminism (whatever the ultimate resolution of it) had an important historical influence on biologists. "... biology could not have developed a respectable organicism until rigid determinism broke down in physics and minds were freed to feel the strains and contradictions of naïve mechanism".²²

The origin of life

The origin of life is a fundamental puzzle. The machinery to replicate and manage the business of staying alive, even within the simplest of bacterial cells, is breath taking in its complexity. There is no satisfactory account for the origin of life which falls entirely within the ambit of known physical processes. Current theories are discussed in Paul Davies book, *The Fifth Miracle*.²³ Ultimately Davies concludes that "Real progress with the mystery of biogenesis will be made, I believe, not through exotic chemistry but from something conceptually new." The secret of life, he says, "lies not in its chemical basis, but in the logical and informational rules it exploits". Davies believes new laws of information are required: "My proposal means accepting that information is a genuine physical quantity that can be traded by 'informational forces' in the same way that matter can be moved around by physical forces." Any new paradigm of the natural sciences must say something about the origin of life and it will be cast in terms of information.

The mind-body problem

If physicalism rests on the belief that valid knowledge can only be derived from a logical interpretation of sensory experience, then we face the anomaly that each of us has a complex internal life somehow known to us other than through the senses. Furthermore each of us knows that everyone else has an internal life. Indeed, a theory of mind, that is, the recognition that all persons have their own internal thoughts, beliefs and intentions which guide their actions, is one of the universals of human psychology and culture.²⁴ The ability to feel, perceive, to have internal thoughts and conscious experience is *sentience*. Traditionally sentience has been attributed to a non-material entity, mind, so giving rise to the mind-body problem – how does a non-material mind co-exist with a material body?

The problem for physicalism is to explain how the human body, a collection of apparently inert (dead) atoms and molecules, becomes sentient. Recent advances in molecular biology, neuro-physiology and cognitive science have given much support to the physicalist paradigm that human mental states have purely physical explanations. Any competing paradigm will also have to account for the

correlations between mental state and neuro-physiology even if they are distinct phenomena.

Inconsequential or irrelevant anomalies

Inconsequential anomalies are those which can be avoided by placing them outside the domain of science, thereby preserving materialism from their destabilizing effects.

The metaphysical anomaly

Human internal experience has many dimensions: sensory-motor, instinctual, intellectual, sentimental, social, aesthetic, moral, spiritual and so on, none of which appear to be adequately described by measuring their physical correlates. Consider the widespread feeling that our lives have a *purpose*. Purpose has no place in a materialist account of the world. According to physics, events at the quantum level are fundamentally and unavoidably probabilistic. At the biological level, evolution depends on variation provided by random mutation. Teleological explanations are forbidden. And yet the human experience of life is that meaning and purpose are everything. A life without them is hardly worth living. Notes the biologist Charles Birch, *purpose* is the “central symbol of ecological thinking.” In the context Birch is promoting organicism in opposition to materialism.²⁵

Western science sidesteps these issues by dividing human concerns into the physical and the metaphysical. Here metaphysics is to be understood in its widest sense as the philosophical investigation of being and knowing that is not contingent on physical experience.²⁶ Purpose is a metaphysical problem and thus not a valid concern for science. Indeed logical empiricists assert that metaphysical statements are not even meaningful.²⁷ Such philosophical sleight of hand, whereby the non-material world becomes invisible and irrelevant, has serious consequences. When all psychological and social problems are required to have a material cause then all effort is directed to material solutions. But contemporary societies are accumulating psychological and social problems faster than can be solved.

An essential attribute for a useful philosophy of life must be *optimism*. Materialism promises survival of the fittest until the thermal death of the universe overtakes us all. It manifestly fails the optimism test. In the wake of Germany's defeat in World War 1 by a machine more powerful than itself, Weber attempted to articulate the angst of the German people but had no recourse to a philosophy other than materialism:

... what he [civilized man] seizes is always something provisional and not definitive, and therefore death for him is a meaningless occurrence. And because death is meaningless, civilized life as such is meaningless; by its very “progressiveness” it gives death the imprint of meaninglessness.²⁸

Weber was not prepared to acknowledge any kind of “intellectual mysticism” and in the end could only preach to a German youth, hungry for meaning in the mid-

war years, that they must accept their purposeless fate with “cosmic resignation”.²⁹ Materialism cannot serve as a philosophy of life.

The logical paradox

For most scientists engaged in what Kuhn would call *normal science*, materialism is a self-evident truth. However if we ask what evidence justifies materialism as the necessary and sufficient foundation for scientific endeavour, we find that no experience permitted by materialism can justify it. Materialism is not a scientific fact but rather a ‘prejudice’ which precedes experimentation. Even neuro-philosopher Patricia Churchland who is committed to materialism and opposed to Cartesian dualism admits, “We do our research as if materialism is a proven fact, but of course it isn’t.”³⁰

The paradox, more generally expressed, is that one cannot justify a paradigm using the logic of the paradigm – one must step outside its boundaries. However, stepping outside the materialist paradigm yields (by its own logic) meaningless statements. A significant discovery of the 20th century was that all formal languages have such paradoxes buried within them. Yet given the utility of formal languages (and scientific paradigms reside at the edge of formal languages) scientists have easily learned to live with the paradox.

Illegitimate anomalies

Illegitimate anomalies are those which would pose unacceptable threats to physicalism if they were agreed to be legitimate. Consequently the anomaly must be invalidated in some way. Perhaps the evidence has been incorrectly gathered or incorrectly interpreted. It is here that we observe the physicalist paradigm as dogma, an idea beyond which one is not permitted to go. We note just two examples.

Homeopathy

Homeopathy uses highly diluted remedies to achieve medicinal effects. Controversy arises because of their extreme dilution – most often not a single molecule of the active agent remains in the prescribed dose. The point here concerns not the efficacy of homeopathy but the response of orthodox materialism.

The first objection is that homeopathy defies the *law of mass action* which states that the rate of a chemical reaction is proportional to the concentration of the ingredients. Note that this objection is characteristic of *normal science* – it denies all evidence inconsistent with accepted laws. Homeopaths reply on two fronts: first that the water in the final remedy contains a ‘memory’ of the original active agent and second that the remedies are effective and should not be rejected for lack of an acceptable theory.

Sceptics (the gatekeepers of physicalist orthodoxy) respond that ‘water memory’ is not known to science and there is no evidence homeopathic remedies work beyond the placebo effect. The argument then falls back on statistics but is much

complicated by the difficulty of quantifying the placebo effect. There are claims that the placebo effect accounts for 30-50% of the efficacy of many medicines (homeopathic or allopathic) depending on the patient's conviction. It might be thought that this phenomenon is itself an interesting challenge to the physicalism but sceptics attack even the legitimacy of placebo studies.³¹

In a now famous episode, the French immunologist Jacques Benveniste reported the 'water memory' effect in an immunological experiment published in *Nature*, 1988.³² The work was attacked by the world famous sceptic and magician James Randi who found that the experiments were "statistically ill-controlled". Despite repeating the experiment in 1991, Benveniste lost his prestigious position and funding – in other words he was sacked. Again the point here is not the efficacy of homeopathy but the angry opposition to it. *Normal science* protects its paradigms fiercely, making rational investigation very difficult.³³ In a fascinating case of *deja vous*, the 'water memory' effect has been invoked again in 2011, this time by the Nobel Prize winner Luc Montagnier in the context of DNA replication. Once again the result is being met with scorn.³⁴

ESP

Extrasensory perception (ESP) refers to the reception of information not through the recognized physical senses but directly through the mind (whatever that might be). It is a generic term that includes psychic abilities such as telepathy, clairvoyance and precognition. Surprising though it may seem, several papers establishing the validity of ESP have been published, a recent example demonstrating that some people can 'see' the future.³⁵ Objections to ESP fall into the same categories as those to homeopathy. First ESP defies the known laws of physics by invoking faster than light communication and action at a distance.³⁶ Second the evidence itself is disputed because statistics are necessary to evaluate the results.³⁷

Normal Science

This section introduced a number of materialist anomalies debated by philosophers and scientists over the past 100 years or so. Physicalists will offer explanations for each anomaly and in isolation none of them is devastating for the paradigm. But collectively they contribute to a growing sense of unease that physicalism now hinders rather than helps us to arrive at a satisfactory understanding of the world. By satisfactory is meant an understanding that is consistent with observation but *also* captures the richness and subtlety of human life. Physicalism appears to place restrictions not only on how we interpret the world but how we *experience* it. That is surely a legitimate concern.

Of course the existence of puzzles is no reason to overthrow a paradigm. It might well be that a completely physicalist account of the origin of life is just around the corner. But likewise there is no rule in science that says we must not explore alternatives that escape the constraints of physicalism. It is at this point that physicalism becomes a faith or dogma.

Many will consider describing physicalism as a faith to be both nonsense and dangerous. Science, after all, has been a consistent force in defeating religious dogma over many centuries and surely physicalism has proved itself because its explanations of the natural world have had remarkable successes. But defending physicalism by pointing to its successes is rather like defending capitalism by pointing to its billionaires, while ignoring debt and poverty. Such selective attention is due to the blindness of faith. As Kuhn points out, a successful paradigm opens some doors but closes others. In the case of physicalism, success has come at considerable cost – the emasculation of the mental and spiritual worlds. Furthermore I would argue that the success of Western science is not due to materialism but to empiricism. Disentangling materialism from empiricism in order to expand the kinds of experience that inform the latter is one of the important themes of this essay.

Revolution

In its *normal* mode of operation, a scientific community advances knowledge by solving puzzles. Without unsolved puzzles, a science would become just another engineering technology. Puzzles are legitimate anomalies when there is every reason to expect that they can be solved within the constraints of the existing paradigm. Where it is obvious that a supposed anomaly challenges the existing paradigm (as in the case of homeopathy and ESP) then a scientific community's first line of defence is to declare the anomaly illegitimate. Kuhn regards this as an acceptable response. Just as a society cannot maintain itself in a state of permanent revolution (China's Cultural Revolution illustrates the tragedy of permanent upheaval) so too a scientific community cannot remain in a state of permanent scientific revolution. The difficulty with revolutions is that they are necessarily destructive as well as constructive. A scientific community in normal working mode is constructive, that is, it is motivated to resolve puzzles in order to buttress its existing paradigm. A paradigm will not be abandoned, says Kuhn, until all its possibilities have been exhausted.

In these circumstances starting a scientific revolution is difficult. Any new paradigm may offer a fresh account of existing anomalies, but it is also likely to expose new anomalies. It is not obvious beforehand whether launching a scientific revolution will yield a net gain. And this is before we even consider the professional reputations and years of work invested in building the status-quo. Scientists, like everyone else, have egos. Nevertheless, despite all the obstacles, scientific revolutions *do* occur and they are accepted as progressive *after the event* because they offer some net gain either in puzzle solving or technological advantage. A truly important scientific revolution, such as that instigated by Einstein and colleagues, has consequences far beyond the narrow scientific community. It changes the way humanity sees itself. As we shall see, the paradigm emerging in opposition to materialism changes the way humans see themselves in the universe. It is to this collection of ideas that we now turn.

Emerging Paradigms

In this section we introduce the key features of paradigms emerging in response to the inadequacies of physicalism. We begin with *organicism* and its natural successors, *autopoiesis* and *enactivism*. We then introduce *subtle energies* and the *integral philosophy* of Ken Wilber. These schools of thought should be seen as complementary rather than competitors. Nor are the ideas in a ‘final’ form – they continue to evolve.

Organicism

Organicism emerged in the 19th century as biologists grappled with the inability of the *mechanistic* paradigm to explain embryological development. According to traditional mechanism, biological organisms assemble in a predictable clockwork fashion determined by the properties of their parts. The organicist view says that parts can only be understood in the context of the whole and the whole is more than the sum of its parts (Figure 1).³⁸

... complex wholes are inherently greater than the sum of their parts in the sense that the properties of each part are dependent upon the context of the part within the whole in which they operate. Thus when we try to explain how the whole system behaves, we have to talk about the context of the whole and cannot get away with talking only about the parts.³⁹

Organicists reject the belief that accounts of biological systems can be reduced to the laws of physics.⁴⁰ Instead, as argued by the renowned evolutionary biologist Ernst Mayr, living systems have *emergent properties* that cannot be predicted, even in theory, from the most complete knowledge of their physical parts. Consequently biology requires its own philosophical foundation (or paradigm). Indeed organicists believe biology to be more fundamental than physics.⁴¹

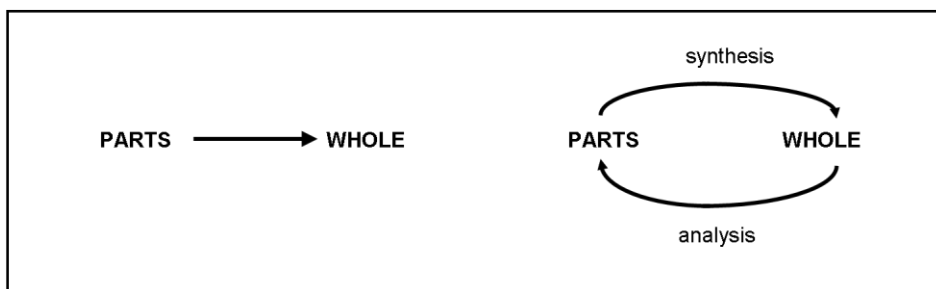


Figure 1: A diagrammatic distinction of mechanism (left) and organicism (right). In mechanism the parts determine the whole. In organicism, the whole is always in a process of becoming because there is a circularity of cause and effect between parts and whole.

Organicism defines itself by making some important distinctions: machine versus organism; mechanism versus gestalt; reductionism versus holism.⁴² The struggle to establish organicism as a respectable biological paradigm was long and hard because it was not clear in what sense ‘the whole could be more than the sum of parts’. What are *emergent properties*? The debates centred on three paradigms,

mechanism, *physical organicism* and *vitalism*. According to mechanism, biological organisms are mechanical devices – set the parts in motion and they turn like the mechanism of a clock. There is nothing emergent. According to vitalism, living organisms have an additional quality, a *vitality* or *soul*, that does not arise from purely physical processes. Biologists were reluctant to accept organicism until vitalism was defeated, which eventually happened because physicalist explanations increasingly answered the questions biologists asked. Organicism was accepted as an appropriate paradigm for embryology and developmental biology⁴³ with the proviso that emergent properties involve nothing more than chemical gradients and electromagnetic fields. Vitalism came to be viewed as a mechanistic view of life with *soul* as the driver of the machine.⁴⁴

It is surprising that 100 years later mechanist and vitalist views of biology have re-emerged, albeit much modified. The most recent mechanist incarnation, *neo-mechanism*, views all natural structures, living and non-living, as products of codes that produce outputs when given inputs, just like computer programs. There is even a neo-mechanist theory of the universe known as *pancomputationalism*, the universe as a computer.⁴⁵

On the other side, a growing number of scientists and philosophers reject physicalism as a complete account of the biological world. Of courses this group do not wish to return to traditional vitalism but they do wish to integrate mind and consciousness *non-reductively* into their understanding of the world and for some (for example, Chalmers⁴⁶) this requires an acceptance of dualism. We will return to this issue subsequently.

Autopoiesis

In 1972 the Chilean biologists Humberto Maturana and Francisco Varela introduced *autopoietic systems* as a definition of life.⁴⁷ Autopoiesis (derived from the Greek meaning *self-constructing*) is a marriage of organicism with systems theory. Consider a robot built from many parts. An autopoietic robot would be one that contained all the internal processes required to create and maintain itself without external intervention by humans. Note that by this definition an autopoietic system is necessarily integrated into an environment which provides the necessary parts for its survival (Figure 2).

Autonomous biological structures, at all levels, (cells, organisms, social systems and ecosystems) are autopoietic systems in which structure, process and information are inseparably coupled to maintain the whole in an unstable equilibrium. Autopoietic systems are *bounded* (they have a cell membrane or skin⁴⁸), they are *precarious* (that is, they maintain an unstable equilibrium), they are *energetically open* (they allow the selective transport of energy and matter in both directions across their boundaries) and they are *operationally closed* (there are sufficient processes *within* the bounds of the whole system to maintain the whole). This coupling of structure and process is considered a rudimentary form of knowledge or cognition.⁴⁹

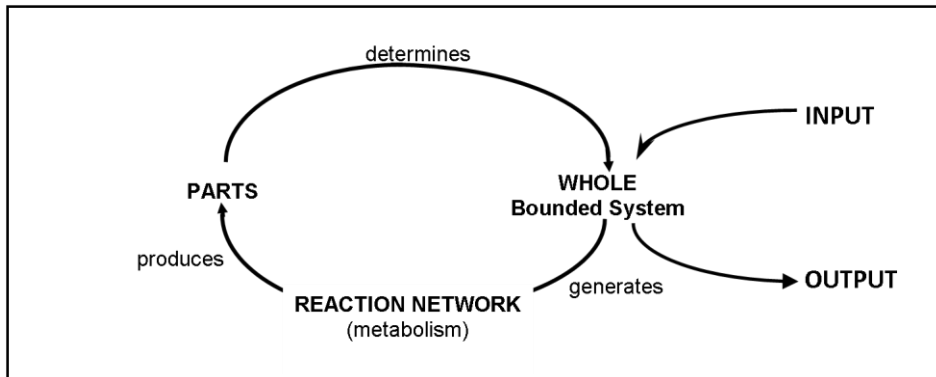


Figure 2: An autopoietic system (diagram adapted from Di Paolo⁵⁰).

According to the evolutionary biologist Elisabet Sahtouris the earth, galaxies and the universe are autopoietic systems and by this definition they are living:

... the Earth meets the biological definition of a living entity as a self-creating autopoietic system, and that only limited aspects of its function – never its essential self-organization – may be usefully modelled by cybernetic systems ... Notice that calling the Earth alive, by definition, is more than proposing a new metaphor to replace mechanism. It is also different from proposing a Gaia hypothesis or a Gaia theory. There is nothing to be proven once we decide that Earth fits the autopoietic definition of life, as it simply revises our conceptualization from mechanism to organism.⁵¹

Note that autopoiesis does not include growth or reproduction in its definition of life, though these are features of biological entities. Once one is persuaded of the ubiquity of autopoietic systems, “the model of a lifeless, mindless mechanical universe outside human experience” must be rejected in favour of a new understanding, “a living, intelligent universe”.⁵²

Enactivism

Enactivism (introduced by Verela, Thompson and Roche in 1991⁵³) is a further synthesis of autopoiesis with connectionism, dynamical systems, cognitive science, phenomenology and Buddhism. Enactivism has gained considerable support as a new paradigm for the cognitive and social sciences (Di Paolo et al., 2010⁵⁴). Given the broad sweep of the enactivist synthesis it is obviously more than a biological paradigm. According to Di Paolo, autopoietic systems that are actively engaged with their environment (sense it, adapt to it and change it) become agents that construct meaning, which in turn becomes the basis for sentience and cognition.

Enactivism is well-placed to become the natural successor to physicalism and is a further demonstration that biologists are doing the hard work to construct a new paradigm of the sciences. Important features are that it integrates a range of Western scientific disciplines with a contemplative tradition from the East, that it accepts conscious experience *a priori* (not as an epiphenomenon) and that it integrates purpose, values and meaning non-reductively into its account of life.

Furthermore enactivism does not limit the concept of a bounded autopoietic system to biological structures enclosed by membranes and skin. Closed autopoietic systems also encompass all kind of corporate institutions that do not have physical bounds. In these, the concept of operational closure refers to a system defined by a closed network of processes. In biological systems these processes are metabolic but in social systems they are cultural, economic and contractual. Thus enactivism allows us to recognize quite abstract forms of institutional and cultural life as ‘alive’. It satisfies the need for a paradigm that encompasses multiple scales of reality *and* bridges the divide between physical, biological and social phenomena.

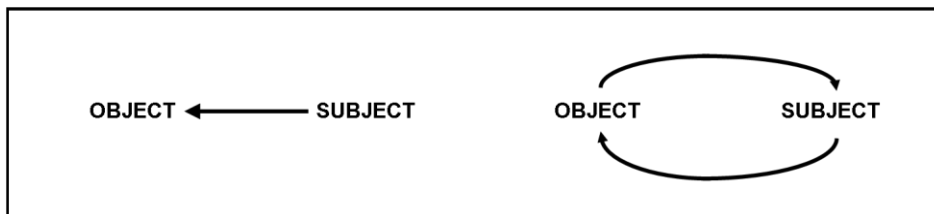


Figure 3: A diagrammatic distinction between the ‘modernist’ (18th-19th C) subject-object relationship (left) and enactivism (right). In ‘modernism’, object exists independently of the subject and subject has an absolute point of view to the object. In the enactivist view, subject and object (mind and body) are co-determining and co-creating. Both are always in a *process of becoming*. The latter view is not new to enactivism. Its origins can be traced through post-modernism, Marxism and before.

Enactivism argues against the dualism of body and mind while at the same time acknowledging the internal phenomenological world. Mind and body are said to be co-determined and co-created – in other words, mind is unavoidably *embodied*. In fact enactivism treads the “middle-path” with all the traditional dualisms (mind-body, subject-object (Figure 3), self-other, idealism-materialism) by arguing that each pair is co-dependent and therefore neither pole offers firm ground on which to found scientific certainty. It draws on the Buddhist concept of *sunya* (the Void) to argue that “groundlessness” is the only defensible paradigm of science. We will have reason to return to this concept at various points as we proceed.

Despite its achievements, I do not believe enactivism takes us far enough in developing an alternative paradigm to physicalism. Di Paulo et al. describe enactivism as a “non-reductive naturalism”. Naturalism is the belief that only physical laws and forces (as opposed to supernatural ones) operate in the world and that nothing exists beyond the natural world. A non-reductive naturalism attempts to embrace consciousness, mind, sentience and purpose within the constraints of naturalism. It is interesting that Chalmers describes his approach to the “hard problem of consciousness” as “naturalistic dualism”. Both Chalmers and enactivism recognize the deficiencies of physicalism but neither (despite their different solutions) steps too far from it. Perhaps it is inevitable that paradigm change can only proceed in small steps, yet if a new paradigm of Western science is to embrace the richness of human life and the cosmos, it will have to make a clean break with materialism in several respects. One of these is the acceptance of

a substantive theory of mind. We next take a step towards such a theory by considering subtle energies.

Subtle energy fields

Fields are an important concept in organicism for they offer the means whereby the parts coordinate their activities with the whole.⁵⁵ Fields convey information between the parts and provide continuity where the parts are discrete. Morphogenetic fields were postulated in embryology around 100 years ago to explain the ability of a divided embryo to develop into two identical forms. The field-embryo relationship is dynamic. Embryonic cells grow according to the shape of the field but they also shape the field.

Morphogenetic fields in physicalist organicism consist of chemical concentration gradients and electrostatic fields.⁵⁶ However in this section we take a step beyond physicalism. Subtle energies can be understood as sources of information that structure matter but are not yet known to science. They may or may not be physically embodied. Theories of this kind might provide clues to the existence of uncontrolled variables which currently confound attempts to investigate subtle phenomena such as homeopathy and ESP.⁵⁷ We consider two theories in this category, Rupert Sheldrake's theory of *morphic fields* and Ervin Laszlo's theory of the *akashic field*.

Morphic fields

Sheldrake's bold leap was to take the concept of morphogenetic fields from developmental biology and extend it to many kinds of non-biological phenomena, natural and social. In his first book of 1981, *A New Science of Life*,⁵⁸ Sheldrake rejects both reductionism (DNA determines biological structure) and *vitalism*. Instead he proposes a new version of organicism in which biological structure accretes to morphic fields but structure also moulds the fields. Thus there is an evolving feed-back loop between the two. Sheldrake's more general proposal can be summarized as follows:

...natural systems, or *morphic units*, at all levels of complexity – atoms, molecules, crystals, cells, tissues, organs, organisms, and societies of organisms – are animated, organized, and coordinated by *morphic fields*, which contain an inherent memory. Natural systems inherit this collective memory from all previous things of their kind by a process called *morphic resonance*, with the result that patterns of development and behaviour become increasingly habitual through repetition. Sheldrake suggests that there is a continuous spectrum of morphic fields, including morphogenetic fields, behavioural fields, mental fields, and social and cultural fields.⁵⁹

A controversial possibility in Sheldrake's theory is that, if the behaviour of a living organism affects its field, newly acquired behaviours can be subject to (Lamarckian-like) inheritance by subsequent generations.

According to Sheldrake, morphic fields act as a kind of memory or database for both organic (living) *and* abstract (mental) forms.⁶⁰ Consequently, biological *and* sociological phenomena become more probable the more often they occur because

their morphic fields become better established. In other words, organic forms (biological and mental) are more like habits which are ever subject to change, albeit slowly. Sheldrake pushes this idea to the point where he proposes that even the laws of nature are mutable habits that have evolved since the Big Bang. Max Planck might have agreed:

We have no right to assume that any physical laws exist, or if they have existed up to now, that they will continue to exist in a similar manner in the future.⁶¹

In recent years Sheldrake has devoted himself to finding indirect evidence for morphic fields in the form of anomalous non-local behaviours that cannot be explained by materialism. Needless to say, his results and their interpretation are always fiercely debated since his entire theory runs counter to materialism.

The akashic field

According to the philosopher of science Ervin Laszlo, the biggest puzzles in contemporary cosmology have a common element: “they exhibit a staggering coherence throughout the reaches of space and time”.⁶² Puzzles such as the observed flatness of the universe and the fine tuning of physical constants are best explained, he says, by an intimate communication between the far-flung reaches of the universe.

The three dozen or more physical parameters of the universe are so finely tuned that together they create the highly improbable conditions under which life can emerge ... These are all puzzles of coherence, and they raise the possibility that this universe did not arise in the context of a random fluctuation of the underlying quantum vacuum. Instead, it may have been born in the womb of a prior ‘meta-universe’ ... a vaster, more fundamental universe that is behind or beyond the universe we observe and inhabit.

How is coherence implemented on the universal scale? Laszlo believes that the quantum vacuum is a fundamental energy and information carrying field that retains an implicit memory of every explicit event. In *Science and the Akashic Field*, he supports this idea with evidence from cosmology, quantum physics, biology and consciousness studies. The akashic field is a subtle non-material communication mechanism that underlies physical reality and connects every point in space with every other point. Its principle observable effect is coherence through time and space, so enabling the universe to function as a single entity.⁶³ Sheldrake has noted the similarity between morphic fields and the akashic field.⁶⁴

A more subtle science

Morphic and akashic fields can be understood as conduits of information to structure matter without any commitment to a formal ontological category such as mind. But the ideas are opposed by materialists because they invoke apparently non-physical processes. The closing thought for this section is that neither autopoiesis nor enactivism are contingent on physicalism, despite Di Paolo’s description of them as non-reductive naturalism. Physicalism is a self-imposed constraint, not a necessary condition. To put it another way, a synthesis of enactivism and subtle energies is possible; the key concepts of enactivism

(bounded, precarious, energetically open, operationally closed systems) are general enough to embrace subtle energies. Indeed subtle-enactivism would go a long way to satisfy Alfred Whitehead's desire for "a more subtle science".⁶⁵ But it is time to consider another paradigm which is not so reluctant to embrace subtle energies.

Integral Philosophy

The *integral philosophy* of Ken Wilber is the most comprehensive attempt to date to forge a new paradigm of science. It integrates not only the sciences but also the philosophies of East and West. Here we confine ourselves to Wilber's All-Quadrants-All-Levels (AQAL) schema⁶⁶ which sets the foundation for a discussion of consciousness (Figure 4).

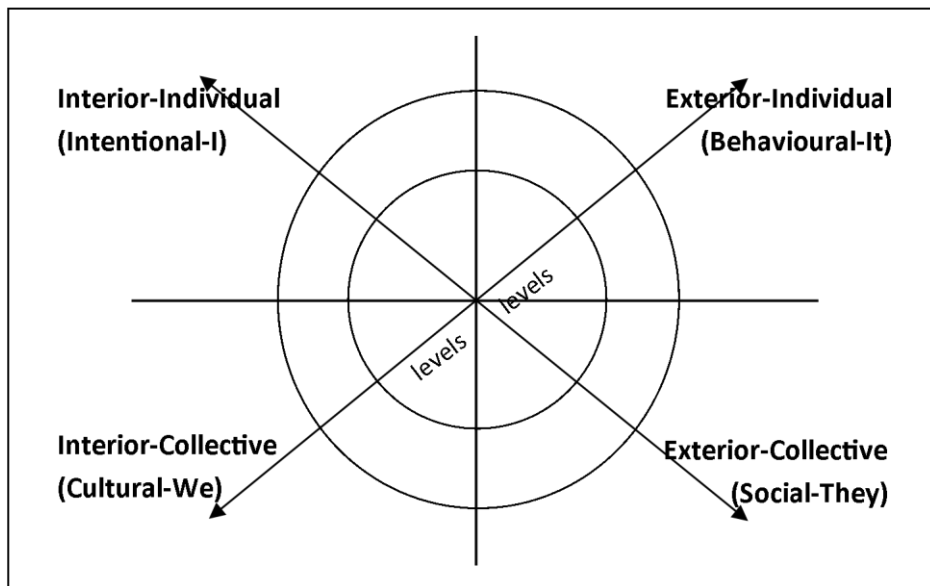


Figure 4: The AQAL schema simplified from Wilber.⁶⁷ The arrows point in the direction from lower (less subtle) levels to higher (more subtle) levels.

The AQAL levels

Wilber's synthesis of East and West begins with the East's hierarchy of levels or worlds that differ in degree of subtlety and in the mode of consciousness by which they come to be known. The crudest level is *matter* (the world that interests physicists) and the subtlest level is *spirit* (the world that interests mystics).⁶⁸ In between are the levels of mind but it is helpful to think of all levels as composing a mind-matter spectrum. Mind is some kind of substance or energy differing from matter only by degree. Physical matter is at the crude, energetically dense, short wavelength end of the spectrum. Mind is at the subtle, energetically sparse, long wavelength end of the spectrum. Likewise human experience of the spectrum ranges from crude to subtle, determined by how accessible the experience is to human consciousness. Sensory experience of the physical world is easily

accessible. Intellectual ideas range in difficulty and certain kinds of spiritual experience at the most subtle end of the spectrum are inaccessible to ordinary consciousness. In other words the spectrum defines a gradation of both *being* and *knowing*. Wilber suggests that the mind-matter spectrum has an echo in Western medieval philosophy as the *great chain of being*.⁶⁹ See *The Cycle of Creation* in this volume for a more complete introduction to the AQAL levels.

The matter-mind spectrum provides a different slant on some materialist anomalies. For example, the sharp dualism which materialism rejects is not a feature of the spectrum. Matter and mind differ only by degree. Consequently the spectrum approach dissolves the apparently sharp boundary between physics and metaphysics and between the natural sciences and the humanities. The categories still exist but can be understood as parts of a spectrum. The natural sciences admit the subjective categories of mind and consciousness. The humanities admit the objective categories of energy and elementary substance.

According to Laszlo,⁷⁰ if a multi-level universe is to be an integral entity, it must incorporate two fundamental organizing principles: *self-similarity* and *coherence*. *Self-similarity* describes systems whose patterns on the smallest size scale (lowest AQAL level) are similar to those at the largest scale. Fractals are an example. *Coherence* is the idea that psychic and physical structures on all scales coordinate their activities because their component waves mutually adjust to facilitate a coincidence of nodes. The AQAL levels may be distinct but they are closely coordinated and therefore behave as an integral entity.⁷¹ Coherence accounts for the close parallelism in neuro-science between mental states and neuro-physiological states.

The AQAL quadrants

The four quadrants are derived from two polarities, interior-exterior and individual-collective. The exterior-individual quadrant is the world of 'things' and substance, the objective world studied by the natural sciences. The interior-individual quadrant is the domain of subjective experience. It is not easily approached by the natural sciences but rather requires a phenomenological or introspective approach. Individuals always exist within communities of similar entities, so there are two 'collective' quadrants. From the human perspective, the external-collective quadrant is objective society, its institutions, law, infrastructure etc., while the internal collective includes culture, social values, norms, etc.

Consciousness

As noted at the beginning of this essay, a major distinction between materialism and any new paradigm will be in their approach to consciousness. Consciousness is a difficult word for two reasons: First, the referent of a word is usually assumed to be a *thing* and it is easy to forget that consciousness, by definition, is not an objective entity. Second, consciousness has several senses, all used in this essay, which we must now distinguish.

Let us define human consciousness as our faculty of being aware, of having internal feelings and perceptions. According to this definition consciousness is

both subjective and experiential. One cannot be conscious without being conscious of something but the experience is accessible only to oneself. Consciousness is indivisible ('I' am not dual) and it has continuity ('I' remember my tenth birthday). The indivisibility and continuity of consciousness lead to the notion of *self*, the 'I' who is aware of its existence and who acts in the world. The notion of self in turn implies the *not-self* or *other*. In other words, human consciousness has a boundary and it has a 'centre of experience' or a 'point of view' from which it engages with the other.

Language allows humans to communicate their internal experiences and thereby we accept one another as conscious. What kind of consciousness do animals and plants have? Even to accept plants and animals as conscious beings (rather than machines) is a recent acknowledgment but it is reasonable to suppose that lower animals have sensory-motor conscious experiences and instinctual feelings. Higher animals are likely to have more subtle emotional experiences (as evidenced by their care for the young) and it is now believed that some animals such as dolphins, elephants and apes have a sense of self. These different modes of consciousness correspond to the multiple levels of the AQAL schema.

The difficulty that consciousness presents to the materialist paradigm is twofold: how does a collection of inert atoms become conscious? And does consciousness imply dualism, the existence of something non-material? The difficulty is well appreciated by physicists who understand that it is only through conscious experience that the very existence of the universe becomes known. How then, can consciousness be reduced to physical principles when those physical principles are known only through conscious experience?

I regard consciousness as fundamental. I regard matter as derivative from consciousness. We cannot get behind consciousness. Everything that we talk about, everything that we regard as existing, postulates consciousness. (Max Planck⁷²)

More recently, the celebrated physicist John Wheeler, who coined the term *black hole*, devised an illustration in which the universe is represented as a large letter U. One arm of the U is endowed with an eye intently observing the other arm which represents the informational aspect of reality. The universe is thus both observer and observed, conscious and introspective.⁷³ No reality can be observed outside of consciousness.

Before we can deal with the origin of consciousness, we must first consider the idea that the universe itself is conscious. If we ascend the levels in Wilber's AQAL schema, we inevitably arrive at a conscious universe because it also has interior and exterior sides. In Tantra and Vedanta, the consciousness of the universe is Cosmic Consciousness. We have already noted that some biologists accept planet earth, galaxies and the universe to be alive in the sense that they are autopoietic systems. But would science allow us to say that they are also conscious?

Chalmers, despite his adherence to naturalism, hints at an intriguing approach to this question. Recall that he advocates "naturalistic dualism" because conscious experience cannot be reduced to physical principles. But having postulated

dualism he is left with the quandary that there is close synchrony between conscious experience and external physical processes. Thus he postulates a third more fundamental category behind subjective experience and objective physicality which he calls *information*. “[Conscious] Experience arises by virtue of its status as one aspect of information, when the other aspect is found embodied in physical processing”.⁷⁴ He then takes a speculative step: if all information processing systems have conscious experience then perhaps conscious experience is widespread through the universe because information is everywhere.

We are thus lead to *panpsychism*, the view that all matter has a mental aspect or consciousness. Not surprisingly there are different views on what kind of consciousness matter has. Alfred Whitehead credited physical (non-living) objects with having conscious experience but not with cognition (information-processing abilities such as learning and remembering). The geneticist Sewell Wright (1889-1988) postulated consciousness to be an inherent property of elementary particles rather than an emergent property of biological complexity.⁷⁵

To summarize the different meanings of the word consciousness:

1. Consciousness is a *relationship* between an experiencer and that which is experienced.
2. Consciousness is the *faculty* of subject/knower/observer/witness. It is the ‘I’ of ‘I exist’ and the ‘I’ of ‘I do’, self and agent respectively.
3. As per Wilber’s AQAL schema, all levels in the hierarchy of being have dual internal-external aspects, which in their unity he describes as *energetic consciousness*.
4. Consciousness can also refer to the *domain of experience* of which a person is aware or conscious. Hence we talk about the conscious and unconscious minds, a person’s social or political consciousness and expansion of consciousness. Conscious experience becomes more subtle and its domain expands as one ascends levels.
5. The AQAL schema admits both individual and *collective consciousness*. The latter refers to the way a large group of people views the world and how that view changes over time.
6. At the highest AQAL level (ultimate collectivity), the universe is a conscious, living entity. Thus a distinction must be made between the unit consciousness of a human being and the *Cosmic Consciousness* of the universe.

Awareness of the different meanings of consciousness allows us to resolve some apparently contradictory ideas. For example, in Tantra and Vedanta, consciousness is primary and non-derivative while in the cognitive sciences it is treated as an emergent property of complex biological structure and function. These views are not necessarily contradictory. Consciousness, in the sense of subject/knower/observer/witness, is primary and non-derivative. However consciousness, as the *domain* over which a subject is aware, is an emergent

property – the more complex the structure of the whole, the more extended and subtle the domain of its consciousness.

Dualism and non-dualism

Dualism versus non-dualism and Sarkar's resolution of the perennial debate between the two *-isms* are discussed in *The Cycle of Creation* (in this volume). Here we simply declare that an alternative paradigm for the sciences must be *non-dualistic* if it is to deal with various materialist anomalies in a satisfactory way. Indeed much of the remainder of this essay will elucidate the many implications of non-dualism. The term 'non-dualism' is derived from Eastern philosophy and implies that the 'ultimate reality' is beyond all boundaries and philosophical distinctions.

We have noted that Chalmers, recognizing the difficulties with materialist monism, advocates dualism, but then immediately postulates a more fundamental third entity, information. One might say he moved from material monism to dualism and then back to a more subtle monism. But his more subtle monism is not what is meant by non-dualism. The difficulty that Chalmers faces is that consciousness from a scientific point of view is a constantly changing relationship between subject and object. Objectivity changes subjectivity and then subjectivity changes objectivity. Objectivity is always *in parenthesis* (to use an enactivist phrase) and subjectivity is always *in a process of becoming*.

This circularity between subject and object (their co-determination) lies at the heart of enactivism. It leads Verela et al. to reject dualism and embrace the Buddhist concept of *sunya* which they translate as *groundlessness* (rather than the *void*). Scientific knowledge is ultimately groundless in the sense that there is no viewpoint from which to gain absolute knowledge. Sarkar agrees that all scientific knowledge is necessarily *relative* and that dualism is not the ultimate reality but he does accept dualism as a practical description of a prevalent state of consciousness. Even Verela et al. admit that dualism is persistent and not easily transcended without some form of mental endeavour, for example, by meditation. Further, we cannot imagine an empirical science without the dualism of observer and observed, even if they are co-determined.

An important issue in both enactivism and in Sarkar's philosophy is how human beings escape the frustrating limitations of dualism. According to Sarkar we escape dualism by expansion of consciousness (that is, by ascending Wilber's levels of mind) which leads ultimately to the union (yoga) of unit consciousness with Cosmic Consciousness.

Human beings can become one with [Cosmic Consciousness] with the help of their unit consciousness. Only when they attain this stage can they realize that there is no difference between the microcosm and the Macrocosm; that is, knowledge, knower and known lose their individual existences. The knower and knowable become practically one, and the connecting link between the two, that is, knowledge, stands nullified.⁷⁶

There is a growing acceptance amongst Western scholars that non-dualism (variously called *advaeta*, One without a second, Spirit – the name varies according to tradition and context) is the ultimate nature of things. There is also much interest in the relationship between *advaeta* and scientific endeavour (see for example physicist John Wheeler⁷⁷ and the international conference *Science and Non-duality*⁷⁸). Although *advaeta* is a very subtle philosophical concept, the English word Spirit more accurately captures the full significance of *advaeta* in human affairs. Wilber uses it, as does Hegel (in translation). The word Spirit makes explicit the link between *advaeta* (a purely philosophical concept) and spirituality (the highest human endeavour). We will return to *advaeta* because it must be one of the fundamental ideas in any new paradigm of science.

Resistance to Paradigm Change

Integral Enactivism

In this section we explore resistance to paradigm change and, in particular, resistance to the transition from materialism to a more subtle paradigm. It proved difficult to write this section without giving a name to the still-incomplete paradigm that we might expect to replace materialism. Enactivism and integral philosophy are candidates but I will argue later in the essay that they are both incomplete – neither gives us everything we need. However in combination they are impressive. Let us therefore refer to the emerging paradigm as *integral enactivism*. By itself enactivism remains too focused on the external quadrants of the AQAL schema. Integral philosophy injects subtlety (mind and consciousness) into enactivism. Integral enactivism is certainly not the end of our search. I ask the reader to accept it as a convenient interim label to facilitate discussion of paradigm change.

The members of a scientific community are bound by a common paradigm, a set of shared theories, values and beliefs about their discipline. The tension between preserving and over-throwing paradigms infuses scientific endeavour with great dynamism. From a cognitive perspective, a paradigm is a shared conceptual structure in the minds of a community of scientists. Consequently the cognitive dimension is essential in any account of science.

It is a paradox that Kuhn's theory of 'normal' and 'revolutionary' science, of paradigm shifts and incommensurability was widely embraced by the intellectual community, yet as noted by Anderson et al.,⁷⁹ he suffered the fate of many prophets:

... he was ignored by the people he most hoped to influence ... At the close of the twentieth century, philosophers [of science] generally rejected paradigm shifts and normal science as useful categories for understanding scientific change.

As we begin the second decade of the 21st century, most practising scientists fall back on *logical empiricism* and Popper's *critical rationalism* to justify their daily practice.⁸⁰

The scientific community generally rejected Kuhn because concepts such as *gestalt shift* and *incommensurability* (the inability to compare a pre-revolutionary with a post-revolutionary paradigm) invoked cognitive processes that, at the time, had little empirical support and furthermore appeared to place scientific debate beyond the reach of logical analysis. Kuhn emphasized the *extralogical*⁸¹ dimension of science and was accused of *irrationality* and *relativism*. However since *The Structure of Scientific Revolutions*, great advances in brain imaging, neural networks and cognitive psychology have provided new support for Kuhn's theory of scientific concepts.

Frame Theory

Andersen et al. provide a significant reinterpretation of Kuhn using the tools of *frame theory*, which itself grew out of the Roschian revolution in psychology in the 1970s and 80s. Here we avoid the details – enough to say that frame theory provides a model of how the human brain stores and works with complexly structured concepts. Andersen et al. use frame theory to illustrate how a paradigm (the world as understood by a scientific community) is represented in the brain as a taxonomic tree or concept hierarchy consisting of branches and nodes.⁸² At the base of the tree is a single node, encapsulating all categories and entities recognized by the paradigm. This parent node branches into child nodes and so on down the tree, each layer representing finer and finer subsidiary categories. Ultimately each of the many branches ends in a leaf or single conceptual entity. (Note: By convention taxonomic trees are drawn upside down with trunk at the top, branching downwards to leaves at the bottom as shown in Figures 5 and 6.) Similarity and dissimilarity between concepts is determined by the path distance between nodes (branch points).⁸³ Furthermore conceptual entities can have graded family resemblances or differences between one another rather than the purely logical distinctions required by Popper.⁸⁴

Frame theory enjoys empirical support and appears to be “robust across modern human cultures”.⁸⁵ The benefit of applying frame theory to paradigms is that it suggests a new way to understand scientific revolutions. An anomaly violates the structure of a conceptual tree. Once accepted as legitimate, an anomaly points to something wrong with the conceptual structure that a community has built as its model of the world.⁸⁶

The severity of an anomaly depends on the locus of the violation – the higher up the tree (closer to the trunk), the more fundamental the anomaly and the more difficult the reconciliation.⁸⁷ Andersen et al. believe that Kuhn's distinction between ‘normal’ science and ‘revolutionary’ science is best interpreted in terms of the severity of tree reconstruction required to achieve reconciliation. If the discrepancy is small (involving only the rearrangement of a few leaf nodes) the community will make the adjustment and ‘normal’ science continues. However a discrepancy high in the tree will be difficult to reconcile and a scientific ‘revolution’ must ensue. Incommensurability is the natural consequence of restructuring a concept tree.⁸⁸ The words for ontological terms may persist but their meanings change due to a change of context in the tree.

Here lies a fascinating tension. If we reject Feyerabend's anarchistic, "anything goes" interpretation of science⁸⁹ and sidestep the vexed issue of scientific realism,⁹⁰ then science claims superiority over religion because *ultimately* it allows experience to overthrow theory and doctrine. Furthermore there is an explicit commitment to public discussion of anomalies and their reconciliation. Yet 'normal' science resists theory change until it cannot be avoided. Indeed says Kuhn, many scientists do not make the change – they simply retire and die. Andersen et al. tell us that such resistance to revolutionary paradigm change is not pure bloody-mindedness. The reconstruction of a concept tree involves a collective neuroplasticity and the expenditure of much cognitive energy⁹¹ – consequently one cannot understand the dynamics of science without acknowledging the neural and social substrate in which its logic is played out.

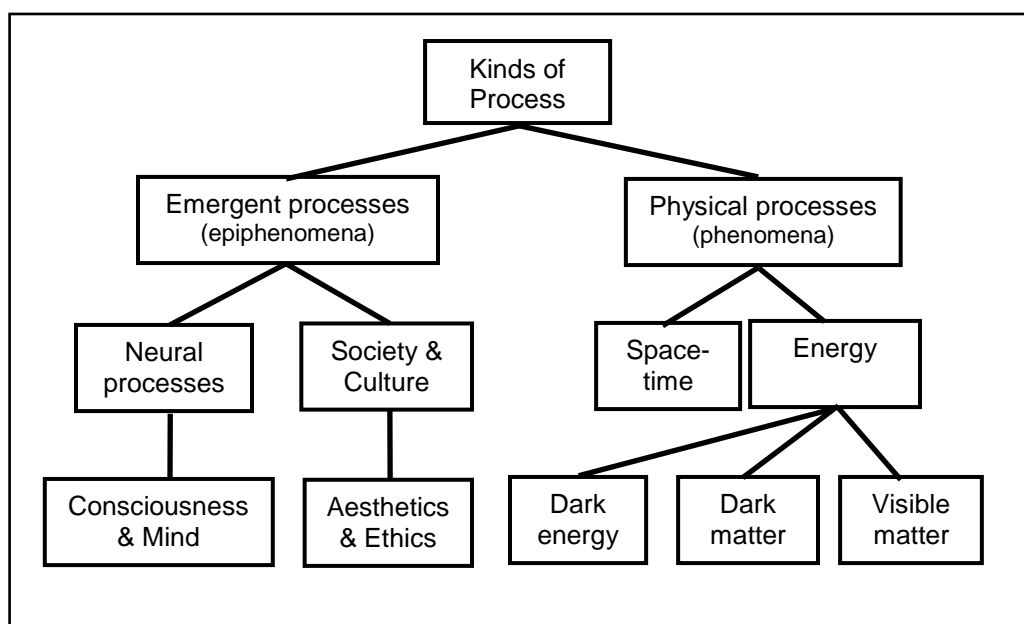


Figure 5: A concept tree representing materialism. Categories such as mind and consciousness, which idealists claim to be primary, are in materialism epiphenomena of physical processes.

The struggle by biologists of the late 19th and early 20th centuries to reject mechanism and develop organicism was a Kuhnian paradigm shift in the biological sciences.⁹² Today we are concerned with a much larger community (that of natural *and* social scientists) and with a much more difficult paradigm shift (materialism to integral enactivism). These two paradigms can be represented as concept trees as in Figures 5 and 6. It must be admitted immediately that the two paradigms might have been represented in many different ways – the trees shown are not necessarily the most defensible and no attempt has been made to represent frames with attribute-value pairs. The trees have been constructed with a view to highlight the difficulties inherent in a paradigm shift from materialism to integral enactivism.

Just three of the important discrepancies will be noted:

1. Consciousness in the materialist tree is a *leaf node* indicating that it is a sub-subcategory, derivative of more fundamental categories. In particular it is an epiphenomenon of neurophysiological processes. In the integral enactivist tree, the word consciousness appears in three nodes but most importantly in the primary node or trunk. The shifting of a concept from leaf node to primary node is as fundamental a change in a concept hierarchy as one can make and gives rise to a severe example of incommensurability further compounded by the various meanings of the word *consciousness* within integral enactivism.

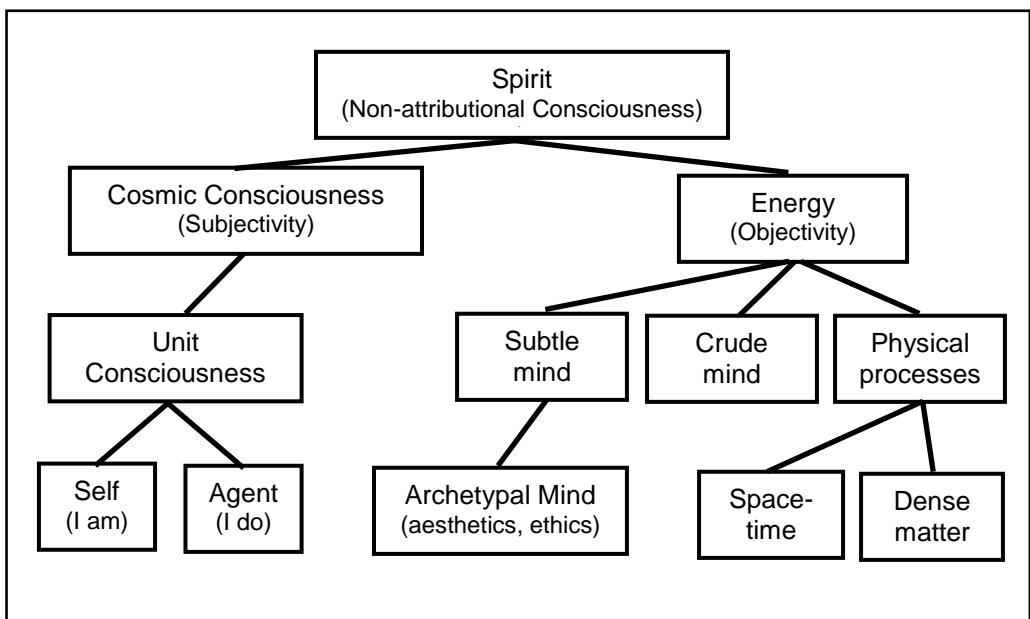


Figure 6: A concept tree representing integral enactivism.

2. Mind in the integral enactivist tree is substantive – some kind of energy. In the materialist tree, mind is a product of neural complexity and linguistic artifice.⁹³ Here is another source of incommensurability.
3. In the materialist tree, ethics and aesthetics are purely socio-cultural constructions. In integral enactivism, they are more deeply embedded in cosmic processes.⁹⁴ Consider, for example, the contribution of *sacred geometry* to aesthetics. This particular difference between the two trees is a source of controversy to which we will return.

In short the concept trees in Figures 5 and 6 illustrate that the transition from materialism to integral enactivism cannot proceed without a fundamental “reconstruction of the field from new fundamentals”.⁹⁵ History tells us that such change does not happen overnight.

The Chemical Reaction Metaphor

The dynamics of paradigm change can be likened to a chemical reaction. The speed of a chemical reaction is determined, in part, by two factors, *temperature* and *activation energy* or *barrier*. The reaction rate can be increased by increasing the temperature of the reactants or by lowering the activation barrier. In this metaphor, the revolutionary transition to a new paradigm is compared to a chemical reaction in which the *reactants* (the components of the old paradigm) are rearranged to become the *products* of a new paradigm. An increase in the number and difficulty of the anomalies faced by the existing paradigm is equivalent to raising the temperature. The greater the conceptual reorganization required to shift from one paradigm to the other is equivalent to raising the activation barrier which will slow the reaction. The activation barrier can be lowered if the alternative paradigm appears to offer credible accounts of existing anomalies. The difference between the number of problems solved by the pre- and post-paradigms is equivalent to the difference in free-energy between reactants and products.

The above metaphor suggests that any expectation of an imminent transition from materialism to integral enactivism is misguided. Using the language of the metaphor, the reaction temperature in 2011 is not sufficient to overcome the activation barrier. On the other hand, change when it comes can be rapid. After an accumulation of anomalies over some decades, Einstein's 1905 papers turned physics on its head within a few years.

No account of science can ignore its cognitive dimension. Socio-economic and social constructivist theories have dominated accounts of science and social change over the past 100 years. However as pointed out by Andersen et al., a complete account of science "requires a mix of social or historical factors with cognitive factors ... [and] renewed attention to its cognitive structure."⁹⁶

Beyond Integral Enactivism

Neither enactivism nor integral philosophy give us everything we would want in a new paradigm of science. Although their synthesis, integral enactivism, is powerful it is nevertheless instructive to be explicit about the short-comings of each in isolation. Perhaps it is inevitable that paradigm change can only proceed in small steps and that we are unlikely to get *a theory of everything* despite Wilber's claim that integral philosophy offers just that. The assertion in this essay is that if a new paradigm of science is to embrace the richness of human life and the cosmos, it will have to include each of the following concepts:

1. Non-dualism
2. A substantive theory of mind
3. Modes of knowing other than the eyes of flesh and reason.
4. A theory of purpose that accepts both self-realization and universal family – in other words, a theory that liberates not just spiritually but also politically and economically.

Enactivism accepts 1 and 4 (depending on the author), rejects 2 and ignores 3. Integral philosophy accepts 1, 2 and 3 but is fatally ambiguous about 4. Non-dualism has already been introduced and is the essential starting point for a theory of purpose. The three remaining sections of this essay will explore in turn: a substantive theory of mind, alternative modes of knowing and a theory of purpose.

The Theory of Microvita

If we are to develop a technology of mind (eventually achieving some kind of power comparable to material technology) then we require a substantive theory of mind. Mind certainly exists in close association with matter, but mind is also its own thing. Sarkar's theory of microvita, introduced in a series of discourses from 1986 to 1990,⁹⁷ extends a set of metaphors already well-established in physics (such as wave, particle, and multi-dimensional space) to formulate a substantive theory of mind. Part of the difficulty in embracing a science of mind is the lack of suitable metaphors to describe the apparently intangible. Sarkar's theory is of interest if only because it emanates from a culture in which mental power is taken seriously.

There are two previous papers in the academic literature concerning the theory of microvita – the first from the perspective of the natural sciences,⁹⁸ the second from the perspective of the social sciences.⁹⁹ While it is clear that the microvita discourses address issues of fundamental science, the ideas are difficult and not presented in a way designed to engage a Western scientific audience. There are four parts to the theory relevant to this essay:

1. In the context of physics, there exist particles more fundamental than electrons and quarks.
2. Matter and mind are arrayed on a spectrum of particle/waves from crude to subtle.
3. Any account of the subatomic realm must include both mind and matter.
4. The scientific method must eventually cultivate a mode of knowing which Sarkar calls a “power of conceiving”, described in this essay as a highly sharpened intuition.

Sarkar postulates that particles which we currently consider to be fundamental, such as quarks and electrons, are in fact composites of numerous smaller particles. He calls these fundamental entities *microvita* (singular *microvita*) derived from the Latin, ‘small life’. A microvita is “the minutest entity”. Far from being massive high energy matter particles (like the much sought after Higgs Boson or ‘God particle’ which is expected to be 100 times more massive than a proton), microvita are subtle in character.

Because it is fundamental, a microvita has no internal structure – it “requires space in theory but not in the realm of physicality”.¹⁰⁰ Although billions of microvita are said to condense to form a physical particle such as a proton, a

microvitum itself is not pure matter nor pure idea but an intermediate form, a “silver lining”, between the two. There is a continual exchange between matter and microvita. “Microvita are the initial stage of matter... microvita are transmuted into matter and matter is transmuted into microvita”.¹⁰¹ Let us express this in the following manner:

microvita ↔ physical particles

In addition microvita are created and they die. We may interpret this metaphorically to mean that microvita are continually emerging from and returning to the vacuum state (which in Sarkar’s terminology is *ethereal space*).¹⁰² Note that in microvita theory Sarkar frequently uses biological language where contemporary scientists would use the language of physics.

In summary, these ideas suggest a two-way flux of microvita:

ethereal space ↔ microvita ↔ physical particles.

Microvita are responsible for the structural integrity of all physical entities and life forms. Carbon atoms, for example, and “all other kinds of atoms are the creation of microvita”; “... when billions of microvita get solidified, a carbon atom is formed”. Differences between atoms are due to differences in number, denomination and arrangement of the constituent microvita.¹⁰³

I believe these ideas to be Sarkar’s account of the quantum vacuum and virtual particles. Virtual particles continually emerge from and return to the vacuum and they interact with real particles. The following equation makes the link to microvita apparent:¹⁰⁴

quantum vacuum ↔ virtual particles ↔ physical particles.

There is accumulating evidence, derived from experiments which confine electrons in novel ways, that they are not fundamental particles. For example electrons confined in a one-dimensional channel appear to split in two, one part having charge the other spin – that is, spin and charge are not inseparable attributes. Electrons trapped in thin layers using powerful magnetic fields, appear to disintegrate into numerous particles each having some fraction of the original unit charge.¹⁰⁵ The conclusion is that an electron is not indivisible but a stable configuration of some more fundamental entities. If this is correct, quarks are also likely to be composite structures.

Mind - as above so below

The relationships which exist between matter, microvita and ethereal space in the physical arena are extended to the psychic arena, the world of mind. In fact, invoking the principle of self-similarity, they apply to the entire spectrum of energy and substance, from the crudest to the most subtle as represented below for each end of the spectrum:

ethereal space ↔ crude microvita ↔ physical structures

psychic space ↔ subtle microvita ↔ psychic structures.

These particle equations complement the wave description of the matter-mind spectrum. Note that we have now changed the word *particle* to *structure* (on the right hand side) to suggest that microvita are interacting with physical and psychic structures on all size scales. In addition these different structures are coordinated, resulting in a universe that displays *coherence*.¹⁰⁶ However there is an important reversal in the way we must think about these structures. They do not exist independently exchanging microvita (virtual particles) passively with the vacuum state. Rather the exchange of microvita with the vacuum state is the means by which structures maintain their integrity and stability. This is a *synergetic* approach to understanding subatomic particles promoted by biophysicists such as Sitko.¹⁰⁷

The structure of ideas

The logical consequence of a substantive theory of mind is that ideas (the content of mind) are also substantive structures that embody psychic energy and occupy psychic space. Complex ideas can be understood as ‘molecular’ wholes consisting of ‘atomic’ parts. Consequently the dynamic parts-whole relationship that describes the physical and biological worlds also applies to the mental worlds. Indeed it is significant that in order to elucidate the relationship between parts and wholes, organicists use linguistic metaphors.¹⁰⁸ The meaning of a word in a sentence cannot be understood without reference to the whole sentence and yet the sentence itself is more than the sum of the individual word meanings. Language is a suitable metaphor for organicism because the ideas expressed by language literally have an organicist construction.¹⁰⁹

We previously used the metaphor of a chemical reaction to illustrate paradigm change in science. In a theory where ideas are substantive, old and new paradigms are not just symbolic representations on paper, or patterns of neural connections in a community of brains. They are themselves collective substantive structures and so the chemical-reaction metaphor becomes something more than a metaphor. Ideas are bound to one another by conceptual bonds. It requires psychic energy to break those bonds and to rearrange the component atomic ideas. Here is another example of *self-similarity* – the patterns of dynamism and constraint that describe material processes can also be applied (with appropriate caution) to the world of ideas.

A substantive theory of mind is not necessarily inconsistent with the enactivist paradigm. Microvita theory is minimalist in the sense that its abstraction of mind is similar to its abstraction of matter – the fundamental elements of both are described using the metaphors of wave and particle. The participation of mind in a living organism emerges out of the metabolism of its precarious autopoietic physical structure.¹¹⁰ But the ingredients of an emergent mind are already in the parts. In fact the substance of mind is everywhere, just as the substance of space-time is everywhere.

Microvita and the anomalies of materialism

The theory of microvita offers an account of several materialist anomalies. We comment only on those that Sarkar appears to reference.

Atom has mind

According to the interpretation of microvita theory proposed here, particles such as electrons and quarks are composite structures. Exchange of microvita with the vacuum state maintains particle integrity. An atom is a higher level structure whose integrity is also maintained by microvita exchange with the vacuum state. We now come to another significant feature of Sarkar's theory –atomic structure depends not only on physical microvita but also on psychic microvita. That is, the structure of an atom has physical components (whose attributes can be detected by appropriate instruments) and subtle psychic components which constitute the antecedents of human mind. The latter however cannot be detected by physical instruments.

This idea is not new and is a continuing strand in the organicist philosophies of the mathematician Alfred Whitehead¹¹¹ and the evolutionist Sewall Wright:

The only satisfactory solution ... would seem to be that mind is universal, present not only in all organisms and in their cells but in their molecules, atoms and elementary particles.¹¹²

More recently Charles Birch, former professor of biology at the University of New South Wales, summed up the idea:

There is but one theory, known to me, that casts any positive light on the ability of brain cells to furnish us with feelings. It is that brain cells can feel! What gives brain cells feelings? It is by the same logic that we may say – their molecules. And so on down the line to those individuals we call electrons, protons and the like. The theory is that things that feel are made of things that feel.¹¹³

In other words, subatomic particles have psychic propensities which are the antecedents of feelings and sentiments in biological organisms. Just as a quark has electric charge, it also has psychic charges (propensities) that, in aggregate, contribute to mind. If we wish to understand these subtle components we must study those aspects of human psychology to which they contribute.¹¹⁴

If atoms have mind, why do we not recognize it in a rock, for example? Here we invoke the metaphor of a magnetised iron bar. Although each iron crystal produces a small magnetic field, it is not until all crystals orient their fields in the same direction that a macroscopic field becomes apparent. In the case of human beings, mind is an emergent property dependent on the complex structure and coordinated metabolism of our trillions of constituent cells.¹¹⁵

It is important to note that this account of mind is not a vitalist explanation of life where something slips in from the outside. There are two issues here. The first concerns the unity of a biological organism – its sentience arises from a synergy of structure and composition. The second concerns a commitment to empiricism, well expressed by Haraway:

Therefore, although both vitalists and organicists share a devotion to the idea of wholeness and a rejection of mechanistic physics and chemistry as adequate to the solution of biological problems, they diverge on a very critical issue. Organicists declare that it will be possible to state positive,

unambiguous, empirically grounded laws for all aspects of the behaviour or organisms. Form and organization are not mysteries, but challenges.¹¹⁶

In accepting this challenge microvita theory declares that mind can be brought within the domain of empiricism. In other words, empiricism is not bound to materialism. We turn to this issue in the next section.

The above approach to the atomic and sub-atomic worlds allows us to address two more anomalies of materialism: quantum uncertainty and the origin of life.

Uncertainty

In an apparent reference to quantum uncertainty, Sarkar notes: “Most of the atomic research done until now has been done on the basis of the guessing method because different stages of the atom and different constituent parts of the atom do not come under direct perception – they come [only] within the arena of human concept.”¹¹⁷ In Sarkar’s theory, atomic structure is due to billions of participating microvita, only some of which can be detected using a physical apparatus. The rest are too subtle to observe physically but nevertheless influence what is observed. Quantum probabilities in Sarkar’s theory *are* due to ignorance and not intrinsic to quantum processes.¹¹⁸

The origin of life

Recall Paul Davies proposal for new laws of information and informational forces to account for the origin of life. Information is an abstract concept which has many meanings depending on context. In its most general sense, information is a pattern that influences the (trans)formation of other patterns. For example, a sentence is a pattern of words that influences patterns of human behaviour. DNA is a pattern of nucleotide bases that transforms the pattern of biological development. In order to account for the origin of life (prior to RNA and DNA), Davies implies the need for novel sources of substantive or embodied information. Since information is ultimately measured in discrete bits, we would expect its ultimate embodiment to be particles in discrete states.

Microvita are particulate organizing principles (information bits) that constitute the structure of atoms. Their embodied form may be physical (directly detectable by instruments) or non-physical (detectable by other means as we shall consider later), nevertheless both kinds contribute to the building and maintenance of organic structures against the disintegrating influence of entropy.

Something to think about

Astro-psychology

A new paradigm of the natural sciences must not only address the anomalies of materialism. It is also expected to open up new domains of scientific research in the same way that the quantum/relativity revolution opened up entirely new fields of physics. We can only speculate about the new domains

that might be opened up by a science of microvita but, if atoms have mind, then *astro-psychology* is a likely candidate.

The observation that organic molecules known to be the precursors of biological molecules are distributed throughout space has given rise to the new science of *astrobiology*.¹¹⁹ Astro-psychology is a natural extension. It will arise out of the realization that wherever there is matter in space there is mind. The elemental particles of mind cohere with the physical particles that make up stars, gas clouds and cosmic dust. Stars like our sun spew out an endless stream of radiation and cosmic particles and likewise an endless stream of elemental psychic particles. The universe is streaming with the antecedents of ideas. Just as stars can be characterized by the proportions of their constituent chemical elements, so too, they will be characterized by their constituent psychic elements. Furthermore the psychic stuff radiated through space may be harvested by photosynthetic-like mechanisms on planets (Sheldrake's morphic fields) and incorporated into the minds of many life-forms. Of course this is necessarily speculative, but if we postulate a universe incorporating mind, that mind must have structure and must link to the minds of life forms throughout space.

The Objectification of Mind

A significant feature of Sarkar's theory is that it objectifies mind. Just as there are first and third person descriptions of the physical world, there are also first and third person descriptions of the mental world. Third person descriptions (derived from measurements performed on the substance of mind) will yield psychic power but they will also have all the problems of third person descriptions if they alone prevail. Sarkar is explicit about this. The world of mind is a vast domain which humans must inevitably explore. But entering this domain does not, of itself, bring virtue, wisdom or spiritual insight. However just as the exploration of the physical universe has brought humanity to the frontiers of mind, so entering the world of mind will eventually take humanity beyond mind.

Even if they can accept its anti-materialist position, critics will argue that Sarkar's theory lacks scientific evidence. This is partly true and partly misses the point. Concerning the first postulate, we have already cited evidence from experiments with confined electrons that they are not fundamental. Such results invite speculation that the electron may be a stable configuration of more fundamental entities. Theoretical physicists construct many theories that have no immediate prospect of validation or falsification, yet the activity is considered useful because it provides a rich source of possibilities to be sifted by future observations.

Concerning the second postulate, it is noteworthy that in pursuit of an understanding of matter we have been led to increasingly subtle concepts such as the substance of space-time, dark energy, "it from bit", non-locality and a computational universe. The substance of mind is but one step further.

A New Scientific Method?

From philosophy to science

Paradigm shift requires that a community (scientific or otherwise) reconstructs its understanding of some part of the natural or cultural world. There is a collective neuroplastic component to such reconstruction which takes much time and effort. In this essay we are concerned with the combined community of natural and social scientists and obviously any reconstruction undertaken by this largest of scientific communities will be fundamental and fiercely contested.

The early 20th century paradigm shift from an absolute, mechanical universe to a relativistic, probabilistic universe was indeed a revolution. Fundamental assumptions of the day, such as realism and cause-and-effect, had to be abandoned. Even the great Einstein could not make some of the required cognitive adjustments. And yet he remained a scientist. Which begs the question – what must remain unscathed in a fundamental revolution of the sciences? Must the scientific method itself change? As Kuhn recognized, a paradigm is not just a representation of the world as it is believed to be, it is also *a particular way of doing science*.¹²⁰ In this section we ask the question – in what ways might the scientific method change given a change in the paradigm of the sciences?

The practice of Western empirical-analytic science involves disciplined observation to discover patterns of association or cause and effect. A successful outcome reduces uncertainty in our interactions with Nature. Scientists who have embraced the discipline fear that, by admitting the mind and internal worlds as legitimate domains of study, they will be obliged to let go of measurement and rigour, from which it is but a short slide back to superstition and religion. It is a legitimate fear.

The Western scientific discipline rests on three inviolable principles that must survive any paradigm shift we can presently contemplate:

- Experience must take precedence over theory.
- Experience must be measureable or countable.
- Experience must be validated by as many persons as possible.

Note that none of these principles (not even the second) necessarily restricts itself to sensory experience of the physical world. But is it really possible to extend this methodological discipline to embrace the intangible world of mind? The answer, I suggest, is ‘eventually but not yet’. Let us approach this question by a consideration of the above three principles.

Experience must take precedence over theory

Scientists like to claim that they arrive at theories through observation and experimentation. Experience precedes theory. In practice, as we have already noted, the relationship is more complex. Avoiding the issue of scientific realism, let us accept that theory stimulates experimentation which stimulates more

theory. If the cycle is broken for want of a satisfactory theory, or want of sufficient experimental results, science stagnates. Western materialism cannot produce a science of mind because it has neither a satisfactory theory nor the appropriate experimental methods.

Microvita theory implies that humans can extend their exploration of the universe into the currently subjective world of mind. But what kinds of experience are relevant to this exploration and could they be reproducible? Sarkar deals with this issue in the following passages:

“...atoms have two parts – the cruder part and the subtler part... The subtler part of atoms has not been investigated. For research into the subtler part of atoms, psycho-spiritual practice is needed... many great things can be achieved by using the subtler part of atoms. This is yet to be seen. When research into the crude and the subtle parts of atoms proceeds together, then only will there be great benefit for the entire creation”.¹²¹

“Microvita research can be done in physical, chemical, medical and psychological laboratories. For microvita research, you will have to study human psychology thoroughly.”¹²²

“With the help of non-carbonic pabula they [human beings] will sharpen their psychic penetration within inter- and intra-atomic and molecular space.”¹²³ (*Non-carbonic pabula* is a term Sarkar uses to describe intellectual and spiritual sustenance for the mind.)

“I think, by dint of our spiritual sadhana [meditation and other mental disciplines that are part of the tradition of Tantra], rather our physico-psycho-spiritual sadhana, our minds will develop in all strata, and the power of conception, the power of conceiving, will also develop, and with that developed conceiving power, we will know all the secrets of these microvita.”¹²⁴

A consistent theme throughout the microvita discourses is that the scientist must acquire a “power of conceiving”. I suggest that this power can be understood as a highly developed *intuition* because the practices Sarkar prescribes to develop the power of conceiving he describes elsewhere as *intuitional science*.¹²⁵

Intuition is an ability to obtain an immediate insight or understanding that apparently bypasses conscious sensation and reasoning. It has a number of characteristics. First, it appears to play a significant role in many aspects of human life, including artistic creativity, personal relationships and problem solving. It certainly plays a role in the formulation of scientific models and hypotheses.¹²⁶ Second, it appears to emerge from beyond the conscious mind as though it is a power expressed through us but not by us.¹²⁷ Third, intuitional insights emerge best in a still mind. Empathy, being one form of intuition, does not blossom in an agitated mind. Everyone has the capacity for intuition but it is usually frustrated by incessant demands on time and the senses. Meditation is a well known way to focus attention and to strengthen intuition.

Another feature of intuition is its seeming detachment from any immediate underlying physiology. Speed reading provides a pertinent metaphor. Julius Caesar was apparently unable to read unless vocalising out loud. Thus his

generals had to absent themselves when a secret communication arrived. Today we find a spectrum of sub-vocalisation styles including whispering, lip movement, throat movement and, least obvious, saying words in the brain. However, advocates of speed reading argue that all forms of sub-vocalization slow one down – fast reading requires a purely mental process that can be learned.¹²⁸ Likewise intuition requires a disentangling of understanding from immediate sensory-motor processes.

The development of an enhanced intuition as proposed by Sarkar would probably involve a change in the normal state of human consciousness. Strange as this may seem, it would not necessarily be the first time such a change has occurred within the brief span of human history. The American psychologist Julian Jaynes (1920–1997) has argued that people prior to 3,000 years ago did not possess the unified, introspective mind-space that we consider normal today. Rather cognitive function was divided between one part of the mind which appeared to “speak” and a second part which listened and obeyed. Thoughts were interpreted as utterances of the gods. Today we might say their behaviour was directed by auditory hallucinations. Jaynes argued that the change from this mode of consciousness (the *bicameral mind*) to what we consider ‘normal’ consciousness (self-identification with internal thought processes) occurred over a period of centuries about three thousand years ago and was catalysed by the emergence of metaphorical language and writing.¹²⁹ Jaynes believed consciousness to be dependent on language.¹³⁰

Today we find such a state of mind hard to imagine. Yet we possess another kind of bicameral mind, one in which intuition is not integrated into our mind space but rather appears to operate externally and independently. The development of a microvita science will require transcending our contemporary bicameral mind in order to find a new way to engage the world intuitively. If the development of writing catalysed the previous transition in consciousness, what might be the trigger for the next transition?¹³¹

Experience must be measurable

Measurement is the foundation of empirical-analytic science, yet it is a source of both strength and weakness. So much of what is important in human life cannot be measured. “... values, life meanings, purposes and qualities slip through science like sea slips through the nets of fishermen”.¹³² Nevertheless it is difficult to see how one can discover patterns in nature without counting – for without counting, statistics is impossible; and without statistics, induction is impossible; and without induction how can one validly assert the existence of a pattern? The logical interpretation of measurable experience must remain a defining feature of empirical-analytic science. Note that measurement comes *before* interpretation and classification.

Sarkar’s exposition of a new kind of science makes three important claims. The first is a motivating claim – that the world of the atom is not purely physical and therefore a complete account requires ‘observing’ its non-physical components. Second, in order to ‘observe’ the non-physical components scientists will have to

develop a new mode of knowing appropriate to the task. In Ken Wilber's typology of knowing,¹³³ this new mode appears to lie somewhere between the "eye of reason" and the "eye of contemplation" – let us call it the *eye of intuition*. Third, all experience is mediated by microvita which are discrete¹³⁴ and countable. Thus experience mediated by the 'eye of intuition' is amenable to mathematical treatment. For example, mind could be dealt with mathematically as a multi-dimensional space, just as the material universe is so described.¹³⁵

It is clear that a new paradigm of the sciences must allow humans to have multiple modes of knowing. In fact the logic of Wilber's AQAL schema suggests that humans have a mode of knowing for each level. Wilber simplifies his schema to just three modes, the eye of the flesh, the eye of reason and the eye of contemplation.¹³⁶ Western science is founded on the eyes of reason and flesh, Eastern science on the eye of contemplation. The eye of contemplation reveals that which cannot be seen by Western science, in particular the revelation of purpose and meaning. Spirit may be compared to a light, the effect of which is to suffuse the human mind with elevating ideas such as the oneness of the human family, sacrifice for justice, the beauty of truth and even a curiosity to find the source of that light. Any attempt to pursue these ideas with the eyes of flesh and reason will fail. Only the eye of contemplation recognizes the illumination of Spirit.

The theory of microvita adds a fourth eye to Wilber's simple schema, the *eye of intuition*. Intuition is of course an existing mode of knowing but imperfectly developed. Note that with the eye of intuition, a subtle portion of mind (subject) observes elements of cruder mind (object). The subject-object polarity is preserved – subtle will always be *subject* to crude, crude will always be *object* to subtle. Furthermore Sarkar implies that the disciplined observation of the objectified mind by the eye of intuition can be translated into the language of reason (logic and mathematics).

It is not easy to appreciate the scientific possibilities that arise from a collective sharpening of the eye of intuition but I suggest that likening the current condition of the divided human mind to Julian Jaynes' notion of the early bicameral mind is informative. Certainly any future development of the Western scientific method will have to be seen from the perspective of all levels of the AQAL schema.

Experience must be validated

Patterns in the natural world are not self-evident. They hide behind the relativity of time, place and person. Events take on a different guise depending on how, when and where we observe them. Scientists have developed ways to circumvent the relativities of time and place but the relativity of person remains problematic and is the focus of the post-modernist critique of Western science. Science attempts to circumvent the relativity of person using *consensual validation*, that is, multiple persons independently repeat the same experiment. But this is an imperfect solution because every observer is a multiplicity of persons – an individual but also the member of a family, a community, a nation, a class, a culture and a gender. In other words, the person relativity operates on many different scales. So it is that a community of male scientists produced a theory of

human evolution in which men played the dominant role.¹³⁷ Scientific knowledge must always be “in parenthesis” or, in the language of Sarkar, it is always “relative” to time, space and person.

Despite its shortcomings, consensual validation remains the best defence we currently have against dogma and declarations of divine revelation. Its success requires scientists to be well trained – to learn their discipline’s paradigm and to grow the necessary brain maps. To achieve this students pursue two strands of study. They learn theory from books and lectures, and sensory-motor skills in laboratories. Both strands are essential.

However, the implication of Sarkar’s theory is that a two-strand education will not, in the future, be enough. A third strand will be required in order to develop intuition or the power of conceiving. Meditation will be indispensable. Students will likely sit in meditation halls dedicated to the purpose of learning the visualizations and auto-suggestions relevant to their discipline. They will be taught to withdraw their minds from external distractions and to focus their powers of concentration. Using appropriate imagery, their minds will be projected into inter-molecular spaces or into more subtle psychic spaces. One can imagine that just as the previous two centuries were dominated by the discovery of the chemical elements, so the coming centuries will be dominated by the discovery of elemental psychic particles or microvita. Once a new particle is discovered, students will learn how to deploy their own minds to obtain the same experience. Such techniques will be useful not only in physics. Sarkar foresees applications in chemistry, engineering, medicine and agriculture.¹³⁸

In a comment on the education system required to promote a science of microvita, Sarkar suggests that all levels of the curriculum from kindergarten to post-graduate should teach the philosophy of neohumanism¹³⁹ and the eight practices of *astaunga yoga*.¹⁴⁰ These include ethics, regulation of breath, body postures, withdrawal of mind from the senses, concentration and meditation.

To conclude this section, we can interpret Sarkar’s proposal for a science of microvita as a synthesis of East and West. The contribution of the West is clear – it brings a rigorous three-part methodology of observation, theory and validation. In particular it brings the extraordinary development of logic and mathematics by which experience can be formalized. And the East? It brings a dramatic expansion in the domain of legitimate experience and, more importantly, the disciplined methodology by which subtle experience can be obtained. It took centuries to develop today’s scientific method and it may take many more years before the synthesis of East and West settles into an integrated methodology. But there is surely a trend – the cutting edge of science is becoming more psychic than physical. It would be ridiculous to assert that those rational faculties which have emerged to date in the Western world, powerful as they are, represent the pinnacle or the end of psychic evolution. Indeed, the implication of Sarkar’s theory is that psychic evolution has only just begun.

Science and Human Evolution

The emergence of a new paradigm of science is not just a matter of philosophy. The *practice* of science must also change. Sarkar's proposal is that the scientific method must incorporate new modes of knowing. In this section we turn to the larger time-scale in which paradigm struggle in the sciences is just one small step in the evolution of human cognition. Here cognition is defined in a broad sense to mean the mental activity of acquiring knowledge through all kinds of mindful experience; sensory-motor, rational, intuitive and contemplative. We approach this topic from two perspectives, Sarkar's macro-theory of cognitive evolution and second, anthropology, the science which studies the cultural and social diversity of humanity.

There is a tension between these two perspectives because anthropology, at least since the 1950s and 60s, has shunned macro-theories of cognitive and cultural evolution in favour of the ethnographic approach which pursues case studies of individual cultures without trying to situate those studies within grand theorizing. Macro-theories tend to privilege the Western world view because they are the product of Western intellectual endeavour. Nevertheless both perspectives are presented here because both offer insights into the emergence of a new scientific method.

A Macro-theory of Cognitive Evolution

Within Wilber's AQAL schema we discern two kinds of subject-object relationship. The first and most obvious is that between interior and exterior. Each (AQAL) level has its own interior-exterior relationship. As we ascend levels on the exterior side, objective wave-particle attributes become more subtle – wavelength increases and particle energy decreases. On the interior side, the quality of conscious experience also becomes more subtle and the domain of self expands. The effect is that in ascending levels, each level acts as subject to lower levels – in short, there is also a hierarchical sequence of subject-object relationships. The story of human evolution and of individual development (to the extent that development recapitulates evolution) is about the unfolding of these levels and life's journey through them. Wilber has developed these ideas in *Eye to Eye*.¹⁴¹ Here we approach them through Sarkar's philosophy. We will use these ideas to develop a theory of purpose.

Let us consider Wilber's levels as a great spectrum of being and knowing. Objectivity is more apparent at the crude end of the spectrum, subjectivity at the subtle end. We may divide the spectrum at two places, one marking the divide between mind and matter, the other between knower and known. The former is an ontological divide between existential categories. The latter is an epistemological divide which arises because, *from the perspective of contemporary human consciousness*, the subjective attributes of matter and the objective attributes of mind are 'invisible'. Consequently it appears as if one end of the spectrum is knowing-subject and the other known-object, with a divide somewhere in between. Known is that part of the spectrum (on the crude side of the divide) which comes within the domain of a person's consciousness. Knower is that part

of the spectrum (on the subtle side of the divide) whose objective attributes remain invisible (unconscious to humans) but which nevertheless contribute to the structure of self. At the present stage of human evolution the two divides are close, implying that mind knows the world of matter. But the two divides are quite independent. In particular the ontological divide is fixed but the epistemological divide *shifts* over the course of evolution and indeed defines the progress of evolution.

Just as there are two sides (internal-external or subjective-objective) to the great spectrum of being and knowing, so too, there are two sides to the story of evolution, the structural and the cognitive. On the structural side, there is increasing complexity as parts become wholes – billions of atoms become a living cell, billions of cells become an organism (eventually human) and billions of humans become (eventually, through the process of globalization) a planetary society.¹⁴² On the cognitive side, each synthetic or integrative step is accompanied by a *shift in the knower-known divide* – the light of consciousness shines into the ‘near-subject’ portion of the spectrum so that a small part of the proximal subtle mind which was previously *knower* now becomes *known* – the domain of the conscious mind expands; additional and more powerful modes of knowing become available.

The logic of this process is that evolution by synthesis ultimately leads to the subtlest subject through a sequence of subject-object transitions.

If materialism is rejected, what should be the desideratum of human life? The supreme goal should be the subtlest entity. Human beings have to move towards this supreme goal. Your approach should be internal, subjective, but at the same time you have to maintain an adjustment with this world of objectivities. In the process of adjustment there is a subject and an object, and in the next stage the subject becomes the object and a new subject arises. In the following stage the new subject becomes the object.¹⁴³

Sarkar describes the process of expansion of consciousness by synthesis as Supreme Synthetic Subjective Appropriation (SSSA). SSSA exposes a nested hierarchy of subjects which he illustrates using the idea of a school administration.

If you think of your schoolteacher, your schoolteacher is your subjectivity. You think that your schoolteacher is seeing everything. The schoolteacher thinks that the school inspector is seeing everything, so the school inspector becomes the subjectivity. The school inspector thinks that the director of public instruction is seeing everything, so the director becomes the subjectivity and the school inspector becomes the objectivity.

The term *appropriation* in SSSA presumably references Whitehead, in whose philosophy an entity becomes subject by appropriating those entities that come before it. In SSSA those preceding entities are the parts which make the whole. In other words by appropriating parts (*concrecence* in Whitehead’s terminology), the whole gradually becomes subject to the parts – and the parts which were previously subject now become object (Figure 7).

expansion of consciousness by synthesis (SSSA). The effect is that the domain of self expands progressively by embracing other. In that process, one enjoys a lightness of being, comes closer to Spirit and ultimately to advaeta (non-dualism). From advaeta there is nowhere else to go because it is all-inclusive, without boundary. Expansion of consciousness has two sides, *self-realization* and effort to establish *universal family* (that is, caring for collective welfare, environment and planet earth). Both sides are required because, as Wilber's AQAL schema makes explicit, expansion of consciousness has both individual and collective dimensions.

Expansion of consciousness by synthesis and its corresponding system of values is the foundation of Sarkar's social philosophy, *Prout*. Individuals and communities, by gradual steps, move from crude to subtle and from the selfish to the collective welfare. All scientific and intellectual discoveries, all kinds of social and economic achievement are only considered *progress* to the extent that they encourage the synthetic flow of life from crude to subtle.¹⁴⁷

Relative and absolute ethics

It is necessary to comment on the inclusion of aesthetics and ethics in an ontology of mind (Figure 6). Materialists will declare that giving ethics an ontological status is a category mistake.¹⁴⁸ So it is when ones paradigm is objectivist materialism, for, by the logic of the paradigm, mind can only be an attribute of matter and ethics can only be normative. Let go objectivist materialism and other approaches become possible.

A comprehensive account of ethics requires accepting that they are both *constructed* by humanity and *prior* to humanity. In the language of Sarkar, they have both *relative* and *absolute* origins. On the relative side, ethics are socially constructed to help us survive in a contrary universe – they assist the viability of precarious autonomous systems. On the absolute side, ethics are informed by our 'sense' of spiritual potential which first manifests in what Wilber calls the Archetypal mind (the *vijnanamaya kosa* in Vedanta). It is the level of mind where archetypes such as virtue, beauty, truth, justice and love first differentiate from Spirit and thereby give multiple kinds of meaning to our lives. Importantly, as Wilber notes, the Archetypal mind is "above and prior" to the physical and mental worlds which we ordinarily inhabit.¹⁴⁹ Again, this is not to deny the importance of social normative factors in constructing particular ethical and aesthetic systems but these factors are superimposed on the prior dynamics of the Archetypal mind. The impulse to bridge the separation between small-self and Spirit has tremendous consequences throughout all the levels and quadrants of human existence. It is as central to any description of humanity as gravity is to a description of the physical universe. It is the ultimate source of all value.

The role of science in evolution by synthesis

According to the theory outlined above, human biological and cultural evolution is characterised by a succession of synthetic steps both structural and cognitive. We may characterize the transition of 3000 years ago postulated by Jayne as one

such synthetic step. It was most likely catalysed by the invention of writing, an information technology revolution every bit as significant as our modern equivalent.¹⁵⁰ On the structural side, writing enabled much larger groupings of humans to act as a cohesive unit thereby helping humanity to cope with the vicissitudes of nature.¹⁵¹ On the cognitive side, human consciousness took a quantum step. The bicameral mind divided between subject (voices in the head) and object became, from our modern perspective, integral or unicameral. The two transitions, structural and cognitive, were inextricably linked.¹⁵²

3000 years later, due to the tremendous scientific and technological developments of the modern era, we are confronted with another information revolution whose structural consequence is once again the integration of a larger grouping of humanity, *globalization*. But, just as before, there is a cognitive side, a bicameral to unicameral transition. The contemporary mind is bicameral in at least two respects. First, as already noted, the faculty of intuition is not properly integrated into the modern psyche – it is our contemporary equivalent of ‘voices in the head’. Second, the two cultures recognized by Snow, now locked in ideological struggle, are the consequence of a divided social mind – one looking back to the familiar objective world of matter, the other looking forward to the subtle but yet-to-be-explored world of subject. The success of globalization depends as much on this cognitive metamorphosis as on the more obvious political and economic factors.

In Sarkar’s view science plays a crucial role in the synthetic steps of SSSA. First, the means by which humans attempt to “maintain an adjustment with the world of objectivities” is the scientific method itself. Science creates the technology which makes structural synthesis possible (in our case the communication technologies which drive globalization). Second, the technological developments spawned by science bring about biological and psychic changes in humanity thereby exposing the existence of a more subtle subject and arousing interest in psycho-spiritual practices.¹⁵³ Third, the development of a more subtle science (for example in our time, a science of microvita) is required to solve the new social problems created by globalization itself. As Sarkar puts it, without a more subtle science “many of the problems in modern society will not be solved in a nice way”. The knowledge acquired by this more subtle science will not in itself be wisdom, but it “will help us much in attaining the stage of *paravidya* [wisdom or spiritual knowledge]”.¹⁵⁴ “Microvitum is the inner secret of life, the inner secret of vital progress in the three fields of physicality, psyche and spirituality. This theory of microvita must not be neglected or ignored.”¹⁵⁵

Something to think about

Animals have science

In Sarkar’s view even animals have “knowledge of science”.¹⁵⁶ He cites the ability of bats, ants and spiders to build remarkable structures. In this larger sense, each biological species is a community with its own scientific paradigm. The learning mechanism may be either natural selection or cultural selection or some interaction of the two. Knowledge acquired by natural selection is encoded in genes, is expressed as instinct and is

reproduced sexually. Knowledge acquired through cultural selection is encoded in neural networks, is expressed as habit and is reproduced by imitation and formal learning.

Instinct and learning interact. Apes, for example, appear to have a knowledge of herbal medicine for the treatment of their diseases. However, females take medicines more frequently than males in some communities but not in others.¹⁵⁷ In the evolution from apes to humans, nature appears to have given ground to culture and instinct to habit.

One might speculate about future trends in evolution. If humans develop new modes of knowing, a new “power of conceiving”, how will this change learning and culture and their interaction with instinct and genes?

The Contribution of Anthropology

SSSA is a macro-theory. It tells us that on the macro-timescale the evolution of life proceeds by synthesis – parts become wholes in both a structural and a cognitive sense. The theory tells us that globalization is a natural and inevitable consequence of life striving for expansion of consciousness through synthesis. In the last section we proposed that the struggle to find a new paradigm for the sciences must be understood within the larger context of globalization.

But now the detail becomes important and here we turn to anthropology because it is the discipline which informs us of the tremendous diversity of humanity and how that diversity might best achieve a sustainable and equitable globalization. However from anthropology we also learn of the dangers of evolutionary macro-theories. Thus this section is concerned with two issues, the danger of evolutionary macro-theories and the tension between human diversity and synthesis.

The dangers of evolutionary macro-theories

The development of anthropology as a scientific discipline was shaped by colonial expansion in the 19th century and subsequently by the anti-colonial movement of the 20th century. Colonial expansion brought Europeans into contact with many new peoples and the first anthropologists set to documenting all that they discovered.¹⁵⁸ Very quickly, the diversity of cultures demanded theory and Darwin’s newly formulated theory of evolution was ready made for the task. Nature has produced a great diversity of cultures and belief systems but competition, natural selection and survival of the fittest ensure that the best and most powerful come to dominate. Thus one can distil from the diversity of culture a progression:

primitive → magical → religious → scientific.¹⁵⁹

According to this application of social Darwinism, the colonial order was ordained by nature. European powers were the sovereigns of the material world, the masters of matter, because they had embraced science.

On closer acquaintance however it became obvious that non-European cultures frequently had a sophistication and wisdom that eluded their imperial masters. A culture might be materially poor but spiritually rich – the yogi sitting in the Himalayan Mountains and the Aboriginal Australian doctor sitting in the Central Desert being archetypal examples. With the demise of colonialism following World War II, the theorizing focus shifted from evolution to issues of cultural hegemony (Antonio Gramsci) and power (Michel Foucault). In addition feminist discourse was influential in bringing a reflexivity to anthropological inquiry. An author's own culture, gender and racial background became part of his or her ethnographic investigation.

Contemporary anthropologists bring these sensitivities not only to the discourse of globalization but also to debates about scientific paradigms which are the concern of this essay. For example, Shiv Visvanathan and Boaventura de Sousa Santos (both are philosophers of science and de Sousa Santos is a founder of the World Social Forum) argue that economic and social justice in a globalized world depend upon *cognitive justice*, the recognition that there are multiple ways of knowing the world, each having a deserving place.¹⁶⁰ In turn, cognitive justice demands the preservation of indigenous languages because each provides a unique window onto the world. No one language provides all views.

Integral philosophy revisited

With these thoughts in mind we return to integral philosophy because it claims to be *a theory of everything* (actually the title of one of Wilber's books). It is a macro-theory that attempts to incorporate all levels of human consciousness (physical, mental, spiritual) and all quadrants (the internal, external, individual and social dimensions of life). Wilber understands human evolution to progress through a series of stages or levels as summarized in two diagrams in *Eye to Eye*.¹⁶¹

(1) archaic → (2) magic → (3) mythic → (4) rational →
(5) psychic → (6) subtle (archetypal) → (7) causal (spirit).

It is immediately apparent that the first four stages are similar to the sequence:

primitive → magical → religious → scientific.

The final three stages explicitly acknowledge humanity's psychic and spiritual potential and therefore make it an attractive evolutionary schema.

Wilber is insistent that cognitive evolution (and human development to the extent that it recapitulates evolution) passes through the above seven stages and he is critical of many Western philosophers for conflating the magical (level 2) with the spiritual (level 7).¹⁶² In other words, spirit is at the opposite end of the spectrum from the archaic and magical.

The difficulties with integral philosophy only become apparent when Wilber applies it to the real world of politics and globalization. Hope for the future, he says, depends on people becoming "integrally informed". As an example he cited Tony Blair as the most integral leader of the day – this declaration was made just prior to the invasion of Iraq.¹⁶³ He also sees hope that powerful US politicians such as Bill Clinton, Hillary Clinton, Al Gore, Jeb Bush and Karl Rove have read

integral philosophy.¹⁶⁴ Don Beck who has done much to proselytise Wilber's work regarded the then President George Bush as "a good leader" who "has been chosen by the spiral".¹⁶⁵ As noted by Michel Bauwens in a highly insightful piece on the Integral movement, a theory claiming to be a theory of everything but going in this political direction "seems to have lost any emancipatory power".¹⁶⁶

Integral philosophy, for all that it is an elegant synthesis of Eastern and Western philosophy, is deficient in at least two respects: first, it lacks a satisfactory theory of class and political economy and second, it privileges a very particular Western elite, those who are WEIRD (Western, educated, industrialised, rich and democratic), less than one-tenth part of the human race.¹⁶⁷ Integral philosophy fails the cognitive justice test – its globalized world would be a colony of graduates from elite universities and business schools. The indigenous world has no future. The lesson is surely that macro-theories, no matter how apparently elegant, cannot be used to promote futures that are inherently unjust.

Neohumanism and theories with heart

It is interesting to compare integral philosophy with Marxist *historical materialism*. Both are macro-theories that claim to offer a complete account of human affairs but both have an element of naivety. Historical materialism asserts the inevitability of a communist utopia, this naivety arising from the lack of an adequate theory of human psychology and spirituality. The naivety of integral philosophy, by contrast, arises from the lack of an adequate theory of class and political economy. This of course is why US politicians such as Karl Rove might find it attractive.

A synthesis of integral philosophy and historical materialism would seem to be a way forward. The one compliments the other. Yet something would still be missing – the recognition that humans are fundamentally sentimental and that their sentiment needs to find expression. In short, a synthesis of integral philosophy with historical materialism would be lacking a heart.

Sarkar's cosmology (*Brahma Chakra* or Cycle of Creation¹⁶⁸) is a macro-theory like Wilber's integral philosophy. Unlike integral philosophy, *Brahmacakra* is complemented by the socio-economic philosophy *Prout* which includes a theory of class and economic exploitation. A third component of Sarkar's philosophy is *neohumanism*. It is the glue which binds Prout to Brahmacakra and, more importantly, it provides the *human heart*.

Neohumanism recognizes that human beings are innately sentimental – that they can be motivated more by sentiment than by material existence or intellectual ideas. Of course humans become sentimentally attached to all sorts of things, good and bad, important and superficial. Fascist regimes feed on a sentimental appeal to purity of nation. Politicians exploit superficial sentiments. The key idea in neohumanism is *not* to suppress sentimentality in favour of rationality but *to turn* human sentiment toward the collective well-being of humanity, plants, animals and planet and then use that magnanimous sentiment to support rationality. Expanding sentimental concerns from self to family, to community, to

nation, to planet, to all life is the means by which humanity can promote expansion of consciousness and manage evolution by synthesis.

Thus the core human struggle is to cultivate an all-inclusive neohumanistic sentimentality and to maintain vigilance against divisive sentiments.¹⁶⁹ Spiritual practice is essential for the former, and education for the latter. It is interesting to note that the spiritual practice which Sarkar has in mind is *astaunga yoga*, the same system of practice that he advises for students wanting to promote a science of *microvita*. In other words, Sarkar does not view scientific endeavour as separate from society. His science has heart.

Diversity and synthesis

A new paradigm which encompasses the natural and social sciences will have consequences far beyond the rarefied world of practicing scientists. It will certainly have political consequences that colour policymaking and the way influential people view the world. The above digression into Wilber's integral philosophy was a necessary reminder that macro-theories can have fatal blind spots. Marcus Bussey argues that 'theories of everything' are inherently hegemonic, precisely because their blind spots are invisible to those who promote them.¹⁷⁰ On the other hand Michel Bauwens asks what, if anything, can be salvaged from integral philosophy? He is critical of integral philosophy but still accepts "the integrative impulse as a worthy enterprise".

In a world of such diversity, to look at structure and developmental processes (which are a feature of the natural, social and personal worlds) is necessary. But the integrative, integral impulse does not belong in any way to Mr Ken Wilber; it is a general feature of contemporary consciousness (one trend battling the fragmentation of postmodernity), with many different pioneers and alternatives to Wilber.¹⁷¹

Emboldened by a belief that the integrative impulse is a worthy enterprise, this essay pursues the possibility of a new philosophy of the sciences arrived at by a synthesis not just of East and West but one additionally revitalized by indigenous cultures. Here the term 'indigenous' does not do justice to the diversity that it is meant to represent. Humanity is not just represented by East and West (a false dichotomy) and therefore paradigm struggle in the sciences is unlikely to be resolved until it accommodates the spectrum of humanity. Just as a new paradigm must accommodate physics, biology and anthropology as valid but different 'modes of knowing', so it must also accommodate other 'modes of knowing' found in the spectrum of human cultures.

To focus the discussion we consider what Western science might learn from Aboriginal Australia whose cultures, being some 50-60,000 years old, are considered the oldest on the planet. Two features immediately stand out to the Western eye, the Aboriginal relationship with land and 'shamanist' practices. We consider these in turn.

Enchantment

As expressed by Silas Roberts, first chairman of the Northern Land Council:

Aboriginals have a special connection with everything that is natural. Aboriginals see themselves as part of nature. We see all things natural as part of us. All things on Earth we see as part human. This is told through the idea of dreaming. By dreaming we mean the belief that long ago, these creatures started human society.

These creatures, these great creatures are just as much alive today as they were in the beginning. They are everlasting and will never die. They are always part of the land and nature as we are. Our connection to all things natural is spiritual.^{172 173}

And as expressed by Bobby Randall, an elder of the Pitjantjatjara people:

Being alive connects you to every other living thing that is around you. Your spirit, your psyche, your physical, your mental – you are all connected with other living forms – you are one with everything else that there is – the *oneness* – the completeness of the *oneness*.¹⁷⁴

There is a similarity here with the belief (previously described) of biologist Elisabet Sahtouris that the earth, galaxies and indeed the universe are living entities. Compare this with Weber's insistence that the discoveries of modern science had rendered civilized life "meaningless" and yet his refusal to admit any kind of "intellectual mysticism". The organicist movement began in the late 19th Century as an attempt to *re-enchant* science (hence the title of Harrington's book, *Reenchanting Science*¹⁷⁵) and more than 100 years later traditional Australian cultures can contribute to that endeavour.

Australian Aborigines ... present the most thorough instance of 'world enchantment', where the world of living people is strongly imbued with spiritual significance. Landscapes bear the all-pervasive marks of Ancestral Beings and totemic spirits, whose songlines cross the country.¹⁷⁶

Seeing with many eyes

Turning to *shamanism*, the word itself actually comes from Siberia but is now used generically to describe practices in which a person enters a trance-like altered state of consciousness to gain spiritual insight or to effect cures.¹⁷⁷ The anthropologist Matthias Guenther regards "Australian medicine men as shamans and Australia as sharing in two key shamanic concepts: a multi-layered universe and two periods of existence, the Dreamtime and the present day".¹⁷⁸ Mowaljarlai and Malnic describe the medicine men of the Kimberley region (North West Australia) as seeing with "many eyes":

The Law is guarded and enforced by the *banman*, the medicine man in the community. He has spirit powers and special sight (many eyes); he travels astrally and knows how to channel the healing energies of Snake Power. Now the number of banman men has shrunk to a handful, and no-one knows much about their activities. They are said to leave neither trace nor shadow.¹⁷⁹

The idea of seeing with "many eyes" is reminiscent of Wilber's modes of knowing: the eyes of flesh, reason and contemplation. Anthropologists Ronald

and Catherine Berndt are cautious in their approach to the subject of Aboriginal Australian psychic practices. The issue is of interest, they say, because Aboriginal Australians themselves believe in such abilities.¹⁸⁰ However an earlier anthropologist Adolphus Elkin (1891 - 1979) was quite explicit in reporting observations (albeit in language that now seems antiquated) of hypnotism, clairvoyance, telepathy:

... in most tribes, everybody can practice some forms of black magic and, through dreams and traditionally formalized systems of presentiments, know or learn what is happening at a distance that is of significance to themselves and their friends.¹⁸¹

While we must keep in mind the tremendous variety of Australian cosmology and psychic practice, there are reasonable grounds to believe that some Aboriginal Australians ("men of high degree" to use Elkin's phrase) possessed, at least in their traditional culture, cognitive abilities that are exceptional from a Western perspective. Furthermore these abilities were consciously acquired through a system of training and discipline which was passed on from one generation to the next. Surely these are the characteristics of a science whereby the people who practice it acquire some kind of power.

Over the last two decades, Aboriginal authors have lamented that knowledge of traditional Law and culture is dying. Indeed in order to ensure the preservation of some small part of the oldest culture on earth, Big Bill Neidjie,¹⁸² Bobby Randall, Dulumunmun Harrison,¹⁸³ David Mowaljarlai and others have begun to put in writing what were previously closely guarded secrets. What Western science might learn from these disclosures concerns the 'enchantment of the natural world' and the 'seeing with many eyes'.

Something to think about

Cognitive Diversity

Nature produces great diversity of life, not only the obvious biological diversity but also the not so obvious cognitive diversity. On the timescale of millions of years, the path to modern humans seems somewhat linear - cognitive ability probably increased proportionately with brain size and neural connectivity. However, on the timescale of the last 60,000 years (that is, since the emergence of modern humans from Africa), the branches and tendrils of human evolution have explored various cognitive possibilities due to differing environmental and social pressures. In Europe and West Asia, the discovery of farming and the aggregation of people into cities were dominant influences to shape collective psychology. In this circumstance, the struggle to survive led to a culture that desired (and achieved) increasing mastery over the physical world.

However, in Australia the flora and fauna did not lend themselves to farming and the population remained decentralized. Consequently collective psychology in this part of the world evolved in other directions. The sociologist Randall Collins argues, for example, that mysticism is more likely to flourish in decentralised societies.¹⁸⁴ The anthropologist Elkin believed on

the other hand that Aboriginal Australia's openness to subtle experience was encouraged by the stillness of the continent's large open spaces, lack of attention to time and simplicity of material life.

In another part of the world, the earliest Vedic hymns indicate that even at the dawn of the historic era, the peoples of the Indian sub-continent were exploring different states of consciousness and developing a language to describe them.¹⁸⁵

How a synthesis of Aboriginal Australia and Western science might proceed practically cannot be spelled out in a recipe. It is a matter of the two cultures 'rubbing shoulders', of learning from one another, of *inter-civilizational dialogues*. Many Aboriginal elders have expressed a willingness to participate in a synthesis – Dulumunmun Harrison has made it his life's work. Says elder Bobby Randall from Uluru, "What I would like to see is a mixing of the two ways [traditional and Western]".

White people need to understand our system by coming and learning from us, so that we can get a two way learning and living together in action. Thousands of years of teaching you can learn and we can share it. For us mob, we need to apply discipline ... to learn your English language and your numbers so that we can understand the system and use it for our benefit.¹⁸⁶

As with globalization, conditions must be attached to a synthesis of scientific paradigms. It should be voluntary, of equals and with mutual respect. In addition the synthesis cannot be one of politically correct clichés. It must empower those who embrace it and it must serve the interests of larger humanity. Science is after all not just about power – it is also about service to humanity.

Authors Note

Among the colleagues I asked to review this essay before publication, two expressed concerns about the previous sections (*Enchantment* and *Seeing with many Eyes*) but for very different reasons. From the perspective of a social scientist, one commented that Western cherry picking of 'indigenous' cultures is not a synthesis;¹⁸⁷ that it is easy to represent indigenous people "romantically and exotically" but what is actually required is to engage *their* perspectives in *their* context; that it is necessary to allow others' perspectives to challenge one's own, rather than use them as "mere adornments for one's own paradigmatic perspective".

The second reviewer, a physical scientist, said that the two sections were not "relevant to the topic". The emphasis to this point had been on the need for modern science to move beyond materialism but advocating primitivism will alienate otherwise sympathetic scientists.

In the end I decided to include the two sections because the concept of *cognitive justice* deserves to be heard. But achieving it will not be easy given the broad spectrum of attitudes and life experience that demands to be heard. Indeed there is

a deep tension here because science cannot (must not) be subsumed by politics, yet justice is achieved by politics.

Something to think about

Beyond biological metaphors

Organicism emerged as a paradigm for developmental biology when biologists struggled with the inadequacies of physicalism, mechanism and reductionism. Over subsequent decades organicism evolved into autopoiesis and enactivism. Autopoiesis is now accepted as a useful model for many kinds of system, biological, neural and social. Even some physical systems such as galaxies have been interpreted from the autopoietic perspective.

This essay has attempted to free enactivism from its naturalistic constraints by incorporating a substantive theory of mind and more subtle modes of knowing, but its biological roots remain dominant. Even Sarkar uses biological metaphors to introduce his theory of microvita. Revolutionary paradigm change cannot leap beyond the bounds of contemporary rational imagination. But eventually a biologically dominated paradigm of the sciences will become inadequate. What happens then?

Anthropology points the way. In an anthropological paradigm, the natural world would be populated, not with inert entities, nor with biological entities, but with conscious entities. And the relationships between them would not be described using the language of physical forces or ecology but using the language of culture.

Methodology in an anthropological paradigm would be characterized by dialogue (a conversation between observer and observed, whether the observed be mineral, plant, animal, human or social) and by reflexivity (that is, in dialogue with an atom, the scientist might be obliged to record his/her own mental state).

Physicists will of course reject a dialogue with atoms as ridiculous and for the moment it is. The point of this conjecture is to question the currently accepted hierarchy of sciences in which physics is fundamental and disciplined whereas biology, psychology and anthropology are considered derivative and inexact. It might be more accurately said that anthropology is the most complete science, the default science. Biology and physics are increasing simplifications of anthropology because the questions that can be asked of the worlds they explore and the answers that can be expected of them are increasingly constrained.

Concluding thoughts

This essay concludes by returning to its two motivations: the first, to highlight the social and cultural importance of an emerging revolution in the sciences; and the second, to respond to C. P. Snow's lecture of a half-century ago concerning the

threat posed by a breakdown in communication between the ‘hard’ sciences and the ‘soft’ humanities.

Paradigm Change and Globalization

We began with the premise that materialism is accumulating anomalies which make it vulnerable to a challenge from a new paradigm of science. The character of those anomalies invites a challenge from a philosophy such as integral enactivism. We explored the main conceptual features of the emerging paradigm and the contribution of microvita theory. To replace materialism, a new paradigm will need to overcome both theoretical and practical obstacles. The former demands a major reconstruction of our model of the world. The latter demands a honing of new cognitive faculties. These difficulties are interwoven because a more subtle paradigm requires more subtle cognitive faculties to sustain it.

Contemporary debates about the adequacy of materialism go back to the 19th century. Three waves of dissatisfaction can be discerned, each one following an apparent triumph of materialism and machine.¹⁸⁸ The first wave appeared after the terrible destruction of World War One. It was a global movement (the English spokesperson being Alfred North Whitehead) but German biologists in particular developed a theory of organicism that gradually distinguished itself from vitalism. The second wave (the New Age generation of the 1960s) appeared in the shadow of the atomic bomb and embraced the larger ecological perspective. The third wave followed the conclusion of the Cold War which symbolized the defeat of the communist machine by the capitalist machine. Its contemporary spokespersons are biologists such as James Lovelock, Rupert Sheldrake and Elisabet Sahtouris.

In each wave, the metaphors changed somewhat but the fundamental issue remained the same – materialism and the mechanist world view are antithetical not just to humans but to life itself. As long as materialism dominates the sciences, the challenge posed by a more subtle alternative in whatever guise will not go away. Whether the third wave has enough dynamism to replace materialism or whether a fourth wave will be required only the future will tell. But there is much more at stake here than philosophy of science – achieving an equitable and sustainable globalization also depends on the outcome.

Two Cultures

We may assume that the outcome of contemporary paradigm struggle will be a single philosophical framework which spans the material, psychological, social, ethical and psycho-spiritual lives of human beings. Which raises a question – can an all-inclusive philosophy dissolve Snow’s divide and bring about a holistic culture?

In attempting to answer this question, the theory of evolution by synthesis (SSSA) presents us with an interesting dilemma – the human race necessarily strives for meaning by pursuing a philosophy which integrates the entirety of its experience, but any such philosophy succeeds only temporarily. For, with each synthetic step,

the subject-object divide *dissolves* only to *reappear* subsequently in a more subtle location.

Humans are attracted to the subtle but uncertain world of subject, drawn irresistibly by intellectual, aesthetic, ethical, egalitarian and neohumanist impulses.¹⁸⁹ The mystery and the spiritual promise of the subtle unknown has always attracted the attention of artists, poets, musicians and novelists and they will continue to articulate ever more subtle experiences – experiences which elude the eye of analytical science and which step beyond the embrace of contemporary philosophy. By this means the human race is presented with one evolutionary challenge after another and collective consciousness expands.

The inevitable consequence of evolution by synthesis is ultimately to arrive at a final synthesis, the “subtlest entity”, the Supreme Subjective State¹⁹⁰ in which human consciousness merges with Cosmic Consciousness and then steps beyond to advaeta. It would be naïve to suppose that such a journey could be completed without personal and collective struggle or that it will be completed in the near future. Collectively, humanity has hardly opened the door into the vast world of mind and it is still struggling with the challenges of globalization on a small planet in a vast universe. But fortunately the goal is such that it fills humanity with much hope and enthusiasm for the journey ahead.

Acknowledgements

The author wishes to thank Zazie Bowen, Marcus Bussey, Firdaus Ghista, Sohail Inayatullah, Jake Karlyle, Toby Kirk and Steven Richheimer for reviewing earlier manuscripts and for stimulating comments.

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Endnotes

- ¹ Monism is the philosophical view that various apparently distinct categories can be reduced to one category. It usually stands in contrast to dualism, the view that they can or should only be reduced to two.
- ² Rose, Steven. *The Conscious Brain*, London: Penguin Books/Pelican, 1976.
- ³ Pinker, S. *How the Mind Works*, 1997. ISBN 88-04-49908-7.
- ⁴ The label *apostate* is used by Gilbert, S.F. and Sarkar, S. "Embracing Complexity: Organicism for the 21st Century". *Developmental Dynamics*, 219, pp. 1-9, 2000.
- ⁵ The measurement problem arises in quantum physics and is regarded by some as a fundamental anomaly in Western science. A measurement on a physical system is not complete until it is registered in the mind of a conscious observer. Consequently the state of the system cannot be known until the moment of conscious observation. That is, the observer is not just a passive witness but has a contributory role in determining what is observed. See Brian Greene, (FC) pp. 91-95 and pp. 201 for a discussion of these and associated questions.
- ⁶ Jacques Benveniste (1935–2004), en.wikipedia.org/wiki/Jacques_Benveniste.
- ⁷ www.sheldrake.org/homepage.html
- ⁸ www.candacepert.com/. Candace B. Pert, *Molecules of Emotion: The Science behind Mind-Body Medicine*, New York: Simon & Schuster, 1999.
- ⁹ Sahtouris understands life as an essential expression of the universe not, as materialists would have us believe, an accident. Matter/energy arranges itself into living forms on multiple scales from the super-galactic and galactic down to bacterial life-forms on planets such as earth. See www.ratical.org/LifeWeb/Erthdnce/chapter21.html. For links to her other work see en.wikipedia.org/wiki/Elisabet_Sahtouris
- ¹⁰ Snow, C. P., *Two Cultures*, The 1959 Rede Lecture, University of Cambridge. *Two Cultures* was subsequently published as a book, *The Two Cultures and the Scientific Revolution*. Snow wrote a follow-up in 1964, *The Two Cultures: And a Second Look: An Expanded Version of The Two Cultures and the Scientific Revolution*.

- ¹¹ Andersen et al. (CSSR) p. 18. It should be noted that Andersen et al. interpret cognitive factors in terms of neural processes whereas Sarkar would take a broader non-material perspective.
- ¹² As quoted by Birch (OP) p. xi.
- ¹³ Russell, Bertrand. *History of Western Philosophy*, Unwin University Books, New Edition, 1961, p. 633.
- ¹⁴ For example Basil Hiley (1935-), en.wikipedia.org/wiki/Basil_Hiley.
- ¹⁵ Birch (OP) p. xv.
- ¹⁶ This is the so-called Copenhagen Interpretation of wave-particle dualism. The Copenhagen Interpretation side-steps the wave-particle puzzle but thereby introduces another puzzle already mentioned – the *measurement problem*.
- ¹⁷ See, en.wikipedia.org/wiki/David_Bohm. In Bohm's theory, the wave is a 'guide' that determines particle motion. The guiding waves constitute an *implicate order* or hidden level of reality.
- ¹⁸ These experiments were performed by Shahriar Afshar. See, Marcus Chown (2004). "Quantum rebel", *New Scientist* **183** (2457): pp. 30–35. For more on the controversy about this experiment see, en.wikipedia.org/wiki/Afshar_experiment
- ¹⁹ It should be emphasized that uncertainty or unpredictability is not the same as *randomness*. If experimental results were random there would be no observable pattern. However there is a pattern which takes the mathematical form of a standing wave. What can be predicted with great accuracy is the probability of finding a particle at a particular location if one chooses to do so.
- ²⁰ Isaacson, (E) p. 326.
- ²¹ See Brian Greene, (FC) Chapter 4, "Entangling Space" for further discussion. The assertion that quantum events are inherently probabilistic requires a caveat – they appear so given today's apparatus and theories. But it is a mistake to assume that today's science has reached the limits of reality. Quantum uncertainty is better understood as a way of describing our current state of knowledge and not as some fundamental truth about the universe. See Greene, pp. 99 and pp. 206 for discussion of these issues.
- ²² Haraway, (CFF) p. 24-25.
- ²³ Davies, (5thM).
- ²⁴ Although a theory of mind is universal, the age at which this recognition emerges varies between cultures. See Laura Spinney, "Who's the oddball?" *New Scientist*, 13 November 2010.
- ²⁵ Birch (OP) p. xvii.
- ²⁶ The boundary between physics and metaphysics is not always well defined. Any law of physics (e.g. that entropy spontaneously increases) whose truth is dependent on experimental observation would be excluded from metaphysics. But situating those laws in a larger cosmological context (e.g. linking entropy increase to the nature of time) might be metaphysics. Metaphysics is generally concerned with issues of being

(ontology) and knowing (epistemology). Metaphysics would include a consideration of human spirituality from an intellectual perspective.

- ²⁷ Logical empiricists promote a view that the scientific method is the rational analysis (using mathematics and logic) of observational evidence (empiricism) and more specifically that a statement is meaningful only if its truth or falsity can be verified by the means of logical empiricism.
- ²⁸ As quoted in Harrington, (RS) p. 118.
- ²⁹ The phrase used by Harrington, (RS) p. 118.
- ³⁰ As quoted by Roger Lewin, *Complexity: Life at the Edge of Chaos*, Simon and Schuster. ISBN:0020147953 / 9780020147954 / 0-02-014795-3. Churchland goes on to acknowledge that although she does not believe in Cartesian dualism, “we cannot claim to have ruled it out”.
- ³¹ www.skepdic.com/placebo.html
- ³² Benveniste, Jacques, *Nature* **333** p. 816, 1988.
- ³³ See www.naturalnews.com/025627.html, link valid 17 March 2010.
- ³⁴ Coghlan, Andy. “Scorn over claim of teleported DNA”, *New Scientist*, 15th January 2011, p. 8-9.
- ³⁵ See for example a report by Peter Aldous, “Seeing the future”, *New Scientist*, 20th November 2010, p. 10, describing a paper that will appear in the *Journal of Personality and Social Psychology*.
- ³⁶ The legitimate quantum puzzles concerning wave-function collapse and quantum entanglement also postulate processes requiring faster-than-light correlation. However these effects, unlike ESP, are not believed to involve transmission of information. See Brian Greene, *The Fabric of the Cosmos*, 1st Edition, 2004; Penguin, 2005.
- ³⁷ Radin, Dean I. *The Conscious Universe: The Scientific Truth of Psychic Phenomena*, New York: HarpersEdge, 1997. Radin discusses a statistical meta-analysis of numerous ESP studies that demonstrates the validity of ESP.
- ³⁸ See, www.answers.com/topic/organicism. The slogan “the whole is greater than the sum of the parts” is attributed to the Austrian philosopher Ehrenfels in 1890. (Harrington (RS) p. 28.)
- ³⁹ Gilbert, S.F. and Sarkar, S. “Embracing Complexity: Organicism for the 21st Century”. *Developmental Dynamics* **219**: pp. 1-9, 2000.
- ⁴⁰ This view is promoted by *logical empiricists*. See, www.iep.utm.edu/carnap/
- ⁴¹ Mayr, Ernst. “What is the Meaning of Life?”, In *This is Biology: the science of the living world*. Harvard: Belknap Press of Harvard University Press, 1997. Chapter 1. Here Mayr is speaking for all twentieth century organicists who believe that there are “unique biological laws of integration and organization” essential to understanding organisms. (Haraway, (CFF) p. 194.) Organicists believe that the central problem of biology is the dynamic unfolding of form from zygote to adult (Haraway, (CFF), p. 25). But the unfolding of form also applies to celestial structures such as galaxies and solar systems and thus the principles of organicism are relevant to these structures.
- ⁴² Harrington, (RS) p. 143.

- ⁴³ Haraway. (CFF)
- ⁴⁴ Haraway (CFF).
- ⁴⁵ See, en.wikipedia.org/wiki/Digital_physics.
- ⁴⁶ Chalmers, (JCS).
- ⁴⁷ Maturana, Humberto R. and Varela, Francisco J. *Autopoiesis and Cognition. The Realization of the Living*. Dordrecht: Reidel, [1st edition 1973] 1980. p. 13.
- ⁴⁸ In the case of some systems (e.g. social systems) the boundary may be abstract.
- ⁴⁹ Maturana, H. "Everything is said by an observer". In *Gaia, a Way of Knowing*, edited by W. Thompson, Great Barrington, MA: Lindisfarne Press, 1987, p. 71.
- ⁵⁰ Di Paolo, E. *Shallow and Deep Embodiment*. An on-line lecture, accessible via link at www.eucognition.org/index.php?page=embodied-dynamicism-and-enactivism.
- ⁵¹ Elisabet Sahtouris, www.ratical.com/LifeWeb/Erthdnce/chapter5.html
- ⁵² Elisabet Sahtouris, www.thevisionproject.org/Essays/sahtouris_elisabet.html
- ⁵³ Verela et al, (EM).
- ⁵⁴ Di Paolo et al, (HEM).
- ⁵⁵ Harrington, (RS) p. 117.
- ⁵⁶ Haraway, D.J. (CFF), p. 58-59.
- ⁵⁷ Tiller, William. *What are subtle energies?* Journal of Scientific Exploration, Vol. 7(3), 1993.
- ⁵⁸ Sheldrake, (NSL).
- ⁵⁹ Pratt, David. *Rupert Sheldrake: A Theosophical Appraisal*, www.theosophy-nw.org/theosnw/science/prat-shl.htm.
- ⁶⁰ Morphogenetic fields require action across space and time unlike any known type of physical action. This definition is consistent with the term *subtle energies*. See Sheldrake, (NSL) 1995, p. 93. See also James Arraj, *The Mystery of Matter: Nonlocality, Morphic Resonance, Synchronicity and the Philosophy of Nature of St. Thomas Aquinas*, Complete Book Online, 1996. epages.wordpress.com/2007/10/25/the-mystery-of-matter-chapter-2-rupert-sheldrakes-formative-causation/
- ⁶¹ Planck, Max. *The Universe in the Light of Modern Physics*, London: Allen and Unwin, 1931.
- ⁶² Laszlo, (SAF).
- ⁶³ Laszlo, *CosMos*, pp61-65. See also, en.wikipedia.org/wiki/Ervin_Laszlo and MacTaggart, (TF), p. 121.
- ⁶⁴ Sheldrake, Rupert. *The Presence of the Past*, 1988. Chapter 17
- ⁶⁵ As quoted by Birch (OP) p. 144.
- ⁶⁶ Wilber, Ken. "An Integral Theory of Consciousness", *Journal of Consciousness Studies*, 4 (1), February, (1997) pp. 71-92.
- ⁶⁷ Wilber, (JCS).

⁶⁸ Wilber, (E2E), pp. 253-255.

⁶⁹ See for example Wilber, *Eye to Eye* (E2E).

⁷⁰ Laszlo, (*CosMos*) pp. 22-23.

⁷¹ MacTaggart, (TF) p. 121

⁷² As quoted in *The Observer*, 25 January 1931.

⁷³ Wheeler, John. *Beyond the Black Hole*, Centennial symposium to celebrate the achievements of Albert Einstein. 1980. For more on the role of information in physical phenomena see, en.wikipedia.org/wiki/Digital_physics. See also McTaggart, (TF) p. 35. Another physicist to explore the connection between modern physics, mind and consciousness is Fred Alan Wolf (en.wikipedia.org/wiki/Fred_Alan_Wolf).

⁷⁴ Chalmers, (JCS).

⁷⁵ Wright, Sewell. "Gene and Organism", in *American Naturalist* **87**, pp5-18, 1953. See also, www.harvardsquarelibrary.org/unitarians/wright-sewall.html.

⁷⁶ Sarkar, P. R. "To Know Him is to be Free from All Fetters". In *Subhasita Samgraha Part 9*, Kolkata: AM Publications, 1971.

⁷⁷ Wheeler, (ANS).

⁷⁸ <<http://www.scienceandnonduality.com/>>

⁷⁹ Andersen et al. (CSSR) p. 1.

⁸⁰ See <http://www.iep.utm.edu/cr-ratio/>

⁸¹ Haraway (CFF) p. 205.

⁸² Andersen et al., (CSSR) p. 13.

⁸³ Andersen et al., (CSSR) p. 106-107.

⁸⁴ Andersen et al., (CSSR) p. 15.

⁸⁵ Andersen et al., (CSSR) p.14.

⁸⁶ Andersen et al., (CSSR) p. 165 and 172.

⁸⁷ Andersen et al., (CSSR) p. 167.

⁸⁸ Andersen et al., (CSSR) p. 165-166.

⁸⁹ Feyerabend, Paul. *Against Method*, Atlantic Highlands, N.J.: Humanities Press, 1975, and a summary of same at, www.marxists.org/reference/subject/philosophy/works/ge/feyerabe.htm.

⁹⁰ Concerning the debates on scientific realism, this author agrees with the views expressed by Andersen et al. (CSSR, p. 172) that "real-world factors function as constraints [in building conceptual models of the world] in the sense that they offer resistance against giving arbitrary structures to the world". This view also appears to be supported by Harrington: "Certainly, I share the conviction of most of my profession that the statements of science do not "mirror" the realities of nature in some simple, detached way. At the same time, I believe ...science ...apparently does ...engage phenomenal realities that "talk back" and whose logic is not wholly human..." (Harrington (RS), Introduction, p. xxiii.)

- ⁹¹ Doidge (BCI).
- ⁹² Haraway (CFF) p. 204.
- ⁹³ For example, the philosopher Gilbert Ryle dismissed the existence of a non-physical mind as a category error resulting from the misuse of language. See Ryle, (CM).
- ⁹⁴ To be more accurate, enactivism does not treat ethics this way but the approach is implicit in Wilber's philosophy. See for example Wilber on aesthetics in (E2E), Chapter 7, "In the Eye of the Artist".
- ⁹⁵ Preston, (KSSR), p. 52.
- ⁹⁶ Andersen et al., (CSSR) p. 168.
- ⁹⁷ Much of Sarkar's work was originally presented in discourses. The existing book on microvita (MVINS) is actually a compilation of transcriptions of talks, both formal and informal. Audio recordings exist for the former and therefore the transcriptions are reliable. For the latter, there now exist only notes taken by persons present and thus the record of these talks must be considered less reliable.
- ⁹⁸ Towsey, Michael and Ghista, Dhanjoo N. *Towards a Science of Consciousness*. In: Ghista D.N., editor. *Proceedings of the Second Gauss Symposium: Biomedical and Life Physics*. Munich, Germany: Verlag Viewveg; 1995. p. 417-28.
- ⁹⁹ Bussey, Marcus. "Microvita and Transformative Information", *The Open Information Science Journal*, 3, pp. 28-39, Bentham Science Publishers, 2010. www.bentham.org/open/toiscij/openaccess2.htm
- ¹⁰⁰ Sarkar, (MVINS), p. 58. In *string theory*, particles are minute strings that vibrate in an abstract multi-dimensional space. The advantage of allowing particles to occupy a theoretical space is that their properties can then be explained by what happens in that space, thereby reducing the explanatory burden on physical space. In string theory, particle properties are derived from the mode of string vibrations.
- ¹⁰¹ Sarkar, (MVINS), p. 67.
- ¹⁰² In relativity theory space-time is a field but it is not a substance with mechanical properties. However in quantum theory the vacuum state is both energetic and particulate in order to account for phenomena such as virtual particles and zero-point energy. In this sense space-time is a plenum or ether-like substance.
- ¹⁰³ Sarkar, (MVINS), pp. 44-45.
- ¹⁰⁴ Collectively, virtual particle processes are described as *vacuum fluctuations* (Greene, (FC), p. 330) and they contribute to a vacuum energy known as the *zero-point energy field*. See McTaggart, (TF), chapter 2, for a non-mathematical account of the zero-point energy field. However, Greene (FC) pointedly avoids the term. The interaction of virtual particles with real particles gives rise to *quantum jitters* which produce observable effects, such as the Casimir effect and van der Waals forces.
- ¹⁰⁵ Webb, Richard. "To the nth dimension", *New Scientist*, 29 August, 2009, p. 31.
- ¹⁰⁶ MacTaggart, (TF), p. 121
- ¹⁰⁷ See Michael Towsey, *The Cycle of Creation*, in this volume, for an account of Sitko's belief that *synergetics* and *quantum mechanics* are complementary descriptions of structure at the atomic, molecular and cellular levels.

- ¹⁰⁸ For example Gilbert, S.F. and Sarkar, S. “Embracing Complexity: Organicism for the 21st Century”. *Developmental Dynamics* **219**: pp. 1-9, 2000.
- ¹⁰⁹ Noam Chomsky’s proposal for a universal grammar as a body of linguistic knowledge possessed innately by all language users can also be reinterpreted from a subtle organicist perspective. The locus of innate linguistic knowledge resides not in the developing cortex but is imposed by the substantive structure of ideas in psychic space.
- ¹¹⁰ See *The Cycle of Creation* in this volume for an elaboration of this idea.
- ¹¹¹ Whitehead, Alfred. *Modes of Thought*, NY Free Press, 1966.
- ¹¹² Sewell Wright as quoted by Birch (OP), p. 24. See also: Wright, Sewell. “Gene and Organism”, in *American Naturalist* **87**, pp. 5-18, 1953. See, www.harvardsquarelibrary.org/unitarians/wright-sewall.html.
- ¹¹³ Birch, (OP), p. 32.
- ¹¹⁴ Sarkar, (MVINS), p. 133
- ¹¹⁵ See *The Cycle of Creation* in this volume.
- ¹¹⁶ Haraway, (CFF), p. 197.
- ¹¹⁷ Sarkar, (MVINS), p. 133. The strange terminology, “guessing method”, may be due to a mistranslation or mis-transcription but the reference to quantum uncertainty appears clear.
- ¹¹⁸ For more see *An Introduction to Microvita* in this volume.
- ¹¹⁹ See for example the Cardiff Centre for Astrobiology, www.astrobiology.cf.ac.uk/
- ¹²⁰ Preston, (KSSR), p. 24.
- ¹²¹ Sarkar, (MVINS), p. 132.
- ¹²² Sarkar, (MVINS), p. 133.
- ¹²³ Sarkar, (MVINS), p. 23.
- ¹²⁴ Sarkar, (MVINS), p. 5.
- ¹²⁵ Sarkar, P. R. “The Intuitional Science of the Vedas”, in *Subashita Samgraha*, Part 2, Kolkata, India: AM Publications.
- ¹²⁶ For an example of the importance of intuition in science, see Gerald Holton’s account of Fermi’s discovery of the controlled nuclear chain reaction. Gerald Holton, “The Birth and Early Days of the Fermi Group in Rome”, in *Proceedings of the International Conference, “Enrico Fermi and the Universe of Physics”*, Rome, September 29 – October 2, 2001. p. 66. Accademia Nazionale dei Lincei and the Istituto Nazionale di Fisica Nucleare, www.enea.it/com/ingl/New_ingl/publications/editions/pdf/8_Proceedings_FERMI_2001.pdf
- ¹²⁷ Here is Mozart’s description of the intuitional process during composition: “When I feel well and in good humour, or when I am taking a drive or walk ...thoughts crowd into my mind as easily as you could wish. Whence do they come? I do not know and have nothing to do with it ...Once I have a theme, another melody comes, linking itself with the first one, in accordance with the needs of the composition as a whole. It does not come to me successively, with its various parts worked out in detail, as they will

later on, but it is in its entirety that my imagination lets me hear it.” As quoted by Brian O’Neill; *Mozart, Creativity and Gestalt Therapy*, www.behavior.net/forums/gestalt/1998/16_5.htm.

¹²⁸ www.wikihow.com/Learn-Speed-Reading

¹²⁹ Jayne based these insights on an analysis of changes in the language of the Old Testament and early Greek literature. The bicameral or two-chambered mind was from the perspective of our modern mind a divided mind. See Jayne, (OC). See also, en.wikipedia.org/wiki/Julian_Jaynes.

¹³⁰ Doidge (BCI) describes how the emergence of language, writing and reading must have made important changes to cortical brain maps, presumably with accompanying changes to human consciousness.

¹³¹ See Michael Towsey, *The Cycle of Creation*, in this volume, for more discussion. Doidge (BCI) notes that the explosion of human interaction with electronic devices in the current era is changing the human brain and therefore human consciousness.

¹³² Smith, H. *Forgotten Truth*, Harper and Row, 1976, as quoted by Wilber (E2E), p. 27.

¹³³ Ken Wilber is the founder of *integral philosophy*. He is the most successful pioneer of building bridges between Eastern and Western philosophy. For more on his work see *The Cycle of Creation* in this volume.

¹³⁴ Discreetness is another attribute required for scientific realism in addition to locality and cause and effect.

¹³⁵ In this regard Sarkar makes a curious statement: “The day is sure to come when the omega of mathematics will coincide with the omega of biochemistry.” (MVINS, p19.) It is surely significant that he places that *omega* in the chemistry of life and not, as we might have expected, in fundamental physics.

¹³⁶ Wilber, (E2E) see the diagrams on p. 174 and p. 175.

¹³⁷ Prehistoric communities are believed to have been matriarchal. According to biologist and evolutionist Professor Nancy Tanner (Nancy M. Tanner, *On Becoming Human*, New York:Cambridge University Press, 1981) the circumstances bringing this about were inherent in the evolutionary forces moulding early humans. The mother-child relationship placed females under strong selection pressure to find food for their young. So women were the first to develop tools for plant gathering etc.

¹³⁸ Sarkar, (MVINS), pp. 135-136.

¹³⁹ Sarkar, (LIN).

¹⁴⁰ Sarkar, (MVINS), p. 51. Concerning the incorporation of Astaunga Yoga into the education curriculum see, Bussey, Marcus. “Education for Liberation” in *Understanding Prout, Volume 1*, 2010.

¹⁴¹ Wilber, (E2E), chapter 4.

¹⁴² For a more complete account, see Michael Towsey, *The Cycle of Creation*, in this volume.

¹⁴³ Sarkar, *The Existential Value of Ideology*, in *Prout in a Nutshell Part 15*, 1988.

- ¹⁴⁴ See books by Richard Dawkins, for example *The Selfish Gene*, NY: Oxford University Press, 1976. ISBN 0-19-286092-5.
- ¹⁴⁵ This is the language of enactivism. See Di Paolo (HEM) and *The Cycle of Creation* in this volume.
- ¹⁴⁶ Verela et al., (EM), Chapters 10 and 11.
- ¹⁴⁷ For more on Prout see Karlyle and Towsey (eds) (UP1).
- ¹⁴⁸ The term *category mistake* is due to Gilbert Ryle. A category mistake is a logical error involving types and their attributes. According to Ryle, mind could not be a substance (an ontological type) because it is an attribute.
- ¹⁴⁹ Wilber, (E2E), p. 92. See also pp. 254-256 for a discussion of the Archetypal mind in the context of the *pre-trans-fallacy*.
- ¹⁵⁰ According to Gil Stein, director of the Oriental Institute, "It [writing] was the first true information revolution. By putting spoken language into material form, people could for the first time store and transmit it across time and space." See, library.bridgew.edu/mt/max/2010/10/hunting_for_the_dawn_of_writin.html. The development of writing appears to coincide with the development of agriculture and the transition from a nomadic life style to large settled populations.
- ¹⁵¹ See for example Brian Fagan (TLS) who argues that bigger communities (up to some optimum size) can withstand bigger shocks to the food-chain.
- ¹⁵² Ken Wilber describes these transitions in terms of the dilemma confronting the *self*. See for example (E2E), chapter 10, 'Structure, Stage and Self'.
- ¹⁵³ Sarkar, "The Psycho-Spiritual Evolution of Humans", in *Ananda Vacanamrtam Part 5*, 26 November 1978. Sarkar's optimism contrasts with Lord Martin Rees, President of the Royal Society, who suggests that humans may never understand physical reality because we have reached the limits of our cognitive ability. "Some aspects of reality – a unified theory of physics or a full understanding of consciousness – might elude us simply because they're beyond human brains, just as surely as Einstein's ideas would baffle a chimpanzee." (www.timesonline.co.uk/tol/news/science/article7149095.ece)
- ¹⁵⁴ Sarkar, (MVINS), p. 52.
- ¹⁵⁵ Sarkar, (MVINS), p. 42.
- ¹⁵⁶ "Had there been no physical clash and cohesion, subtle human intellect would have remained totally unknown to us. Such conflict and evolution occurs in every unit or organism. Thus all organisms develop scientific thought processes according to their respective mental proclivities and capabilities. For instance, the building of nests by bats, the constructing of pathways by white ants and the weaving of webs by spiders proves that these undeveloped creatures have a knowledge of science." Sarkar, P. R. "Synthesis and Analysis", Original discourse date unknown. Published in *A Few Problems Solved Part 2*. A.M. Publications, 1987.
- ¹⁵⁷ "African Chimps Found to Practice Herbal Medicine". *Los Angeles Times*, 27 December 1985, articles.latimes.com/1985-12-27/news/mn-25409_1_herbal-medicine
- ¹⁵⁸ The first person to describe himself as an anthropologist was the French zoologist François Péron, official scientist for the French exploratory expedition to Australia in 1802. He collected 100,000 zoological specimens in Australia and wrote extensively about the indigenous inhabitants of Tasmania.

- ¹⁵⁹ Flood (TOA), p. 135. Flood cites *The Golden Bough* by the then influential anthropologist Sir James Frazer (1854-1941), whose book is a treatise on the “evolution of the thoughts of man through successive stages of magic, religion and science”.
- ¹⁶⁰ Boaventura de Sousa Santos. *Cognitive Justice in a Global World*, Lexington Books, 2007. www.ces.uc.pt/publicacoes/outras/200321/01.php
- ¹⁶¹ Wilber, (E2E), see figure 7, p. 255 and the figure on p. 265.
- ¹⁶² In order to clarify this issue, Wilbur reduces the seven levels or stages to just three: the pre-personal/rational (stages 1 to 3), the personal/rational (stage 4, the contemporary state of human consciousness) and the trans-personal/rational (stages 5 to 7, a more expanded or integral consciousness that transcends the normal). Wilbur believes most New Age thought succumbs to the pre/trans fallacy, in which the pre-rational is confused with the trans-rational simply because both of them are different from the rational, leading to a misunderstanding of both. He refers to this as the *pre/trans fallacy*. See (E2E).
- ¹⁶³ Bauwens, Michael. *The cult of Ken Wilber: what has gone wrong with Ken Wilber?* www.kheper.net/topics/Wilber/Cult_of_Ken_Wilber.html.
- ¹⁶⁴ See, wilberwatch.blogspot.com/, Wednesday, May 28, 2008.
- ¹⁶⁵ In Wilber’s philosophy society advances through its many stages not in a straight line but spirally and the ‘spiral’ takes on a life of its own.
- ¹⁶⁶ Ibid.
- ¹⁶⁷ See Laura Spinney, “Who’s the oddball?” *New Scientist*, 13 November 2010, for recent studies which reveal how much of a minority is the psychology of WEIRDs.
- ¹⁶⁸ Sarkar, (I&I) and see also Towsey, *The Cycle of Creation* in this volume.
- ¹⁶⁹ For a development of these ideas see Michael Towsey, “The Biopsychology of Cooperation” in (UP1).
- ¹⁷⁰ Bussey, Marcus. “Resistance is not futile: Escaping the integral trap”. *Futures* 42(1), Special Issue: Epistemological Pluralism in Futures Studies, Guest Editor: Sohail Inayatullah, March 2010, pp. 110-114.
- ¹⁷¹ Bauwens, Michael, Op. Cit.
- ¹⁷² As quoted in (YY), p13.
- ¹⁷³ Knudtson and Suzuki (WE) argue that indigenous societies around the world are characterized, at least traditionally, by a “deeply rooted sense of place and relationship with the entirety of the natural world”.
- ¹⁷⁴ As stated by Bobby Randall, traditional owner of Uluru, Central Australia, in a documentary film, *Kanyini*, directed by Melanie Hogan, Australia: Hopscotch Entertainment, 2006.
- ¹⁷⁵ Harrington (RS) p. 118.
- ¹⁷⁶ Flood (TOA), p. 145.
- ¹⁷⁷ See Flood (TOA) p. 145.

- ¹⁷⁸ Flood (TOA), p. 145.
- ¹⁷⁹ Mowaljarlai and Malnic (YY), p. 154.
- ¹⁸⁰ Berndt, Ronald M. and Berndt, Catherine H. *The World of the First Australians: Aboriginal life, past and present*. Canberra: Aboriginal Studies Press, 1999, p305.
- ¹⁸¹ Elkin, A. P. *Aboriginal Men of High Degree*. First published 1944; Inner Traditions, 1993.
- ¹⁸² Neidjie, (KM).
- ¹⁸³ “Listening to the Land – an interview with Max Dulumunmun Harrison”, *Nova Magazine*, May 2010, novamagazine.com.au. Harrison is an elder of the Yuin tribe.
- ¹⁸⁴ Collins, Randall. *Sociology of Philosophies: A Global Theory of Intellectual Change*, Harvard University Press, 1998.
- ¹⁸⁵ Contemporary scholarship traces the Rgveda *texts* to around 4000 years ago. B. G. Siddharth (*The Celestial Key To The Vedas*, Inner Traditions, Vermont, USA, 1999) traces the *oral* tradition to 12,000 years ago and Sarkar pushes it to 15,000 years ago.
- ¹⁸⁶ Randall, *Kanyini*, Op. Cit.
- ¹⁸⁷ See also Mitchell Rolls who argues that the appropriation of Aboriginal non-material cultural property is exploitative. In “New Age, New Orthodoxy – The institutional authorising of balderdash”, in *Journal of Aboriginal Studies*, 2002:1 p. 22, Aboriginal Studies Assoc.
- ¹⁸⁸ Harrington, (RS) Conclusion, p. 207.
- ¹⁸⁹ Towsey, Michael. “The Biopsychology of Cooperation” in (UP1), 2010.
- ¹⁹⁰ This term can be treated as synonymous with Cosmic Consciousness.

The Cycle of Creation

Michael Towsey

Ya eko jalavan iishata iishaniibhih

Sarvanloka iishata iishaniibhih

Ya evaeka udbhave sambhave ca

Ya etad vidur amrtaste bhavanti
(from the Rig Veda)

$E = m.c^2$
(Albert Einstein)

Behind all the manifestations in the universe,

There is One, a Cosmic Magician, who controls all.

Whatever has been or will be created is that One alone.

Those who realise this One Entity become immortal.

Matter is condensed energy.

Human beings are fascinated with magnitude. Whether expressed by building pyramids, manipulating mathematical infinities or gazing at distant galaxies, magnitude excites feelings of admiration, mystery and awe. Little wonder then that cosmology has excited the human imagination since earliest times – it grapples with the biggest entity, our universe, and with the biggest question, where did the universe come from? Indeed the earliest known oral tradition, the Rig Veda having its origins in pre-history, was already concerned with cosmological questions.

In this essay we explore four big cosmological questions:

1. What is the essential nature of things – the ultimate reality behind superficial appearances?
2. What are the fundamental constituents of the universe?
3. What is the origin of the universe?
4. How did life begin?

Not surprisingly, cultures differ in their answers to these questions and, more importantly, in the process by which they formulate answers. The purpose of this essay is to compare two very different cosmologies, those of South Asia and Europe (henceforth East and West). The two produce very different statements (compare those of Einstein and the Rig Veda above) yet both claim to describe the universe in which we live. By illustrating points of correspondence between them, this essay will demonstrate that the two cosmologies offer complementary rather than contradictory accounts of the universe. Finding a correspondence would have been difficult prior to the 20th century because Western cosmology was preoccupied with the world of matter and Eastern cosmology with the world of

mind. However this situation changed significantly in the 20th century due to paradoxical discoveries in physics which invited comparison with Eastern philosophies. Indeed so paradoxical was the new physics that it remains unsettling even in the 21st century. We will continue to refer to the ‘new’ physics although it is now more than 100 years old.

Structure of the Essay

The essay is divided into three parts:

Cosmology East and West: We begin by comparing essential differences between the old and new physics. Next we introduce two of the most influential writers to popularize links between the cosmologies of East and West, Fritjof Capra (author of *The Tao of Physics*) and Ken Wilber (who developed *integral philosophy*). Both authors refer to Eastern cosmology generically believing that the common themes are more significant than the diversity of schools. In this essay we introduce the East through the philosophy of Prabhat Ranjan Sarkar, who accepts only the authority of those schools that combine a practical approach with philosophy.

Four Cosmological Questions: This part compares the approach of East and West to the big four cosmological questions. More attention is devoted to the East because it is likely to be less familiar to the reader. Just as it is necessary for Western cosmology to give an account of mind and consciousness, so too, it is necessary for Eastern cosmology to accommodate fundamental Western ideas such as the big bang and entropy.

The Evolution of Life: The evolution of life in Eastern cosmology is understood in the context of a two phase cycle. In the first phase, the multifarious raw materials of the universe are created. In the second phase, those raw materials evolve into the complex structures of life. This part of the essay concerns the second phase, the sequence of steps by which life evolves. It leads naturally to speculation about the future evolution of life.

Cosmology East and West

The ‘new’ physics includes Relativity and Quantum Mechanics. The former describes our universe on the largest scale while the latter is concerned with the subatomic level. In combination they encompass everything we currently know about the physical universe. The early pioneers of the ‘new’ physics were quick to perceive connections with eastern cosmology. Here are just two examples:

Niels Bohr: For a parallel to the lessons of atomic theory ... [we must turn] to those kinds of epistemological problems with which thinkers like the Buddha and Lao Tzu were confronted when trying to harmonize our position as spectators and actors in the great drama of existence.¹

Julius Robert Oppenheimer: The general notions about human understanding ... which are illustrated by discoveries in atomic physics are not in the nature of things wholly unfamiliar, wholly unheard of, or new. Even in our own culture they have a history, and in Buddhist and Hindu thought a more considerable and central place.

What we shall find is an exemplification, an encouragement and a refinement of old wisdom.²

Why should physicists trained in the hard-headed tradition of Western science turn sympathetically to writings of the East? To answer this we must compare the new physics with the old.

The old and the new physics

The word *physics* is derived from the Greek *physis* – to see the essential nature of things.³ There were five principles in the old physics considered essential to any description of the universe.

1. *Reductionism*: *Physis* is pursued by breaking objects into simpler parts. Understanding the whole is achieved by reducing all explanation to the physical laws which describe the simplest parts.

2. *Discreteness*: The fundamental substance of creation (matter) is composed of particles (such as atoms, protons, electrons, etc.) which are ultimately discrete, inert (passive) and indivisible.

3. *Realism*: Objects behave the same way whether we observe them or not. Reality is independent of the observer.⁴

4. *Causality*: Objects interact with one another according to the principles of cause and effect. The cause must precede the effect and for a given set of causes there is a definite effect. A universe of inert particles therefore behaves like a mechanical device according to fixed, predictable laws.

5. *Locality*: Objects have definite locations in space and time and can only be influenced by their immediate surroundings. Force fields such as gravity and electromagnetism propagate locally.

Between them, Relativity and Quantum mechanics undermine each of these principles. For example, the General Theory of Relativity considers matter to be a condensed form of energy. It is no longer fundamental and indestructible but has more of an abstract quality. Furthermore matter and space are no longer separate entities but different densities of energy within the same energy field. The entire universe is a vast energy field in which every part is linked to every other part just like the knots in a net. In short, the General Theory of Relativity undermines our traditional concept of matter and it undermines the justification for reductionism.

For its part, quantum mechanics undermines realism, causality and locality. First it states that the very act of conscious observation (measurement) changes that which is observed. This undermines the principle of realism. Second, quantum mechanics implies that events at the sub-atomic level are governed by pure chance – thus the law of cause and effect appears to fail at this level. Third, quantum mechanics implies that under certain conditions two particles remain ‘entangled’ or connected even though they are apparently beyond the reach of one another. In other words the principle of locality does not hold.

Today the physics community has come to terms with paradox but, in the first half of the 20th century, the collapse of the old cosmological order was a shock and demanded philosophy. Here is the assessment of C. E. M. Joad,⁵ a popular philosopher of the day:

During the last thirty years our conception of the physical world has been revolutionised. The theories of relativity, special and general, have altered our views of the nature of space and time, while the quantum theory has necessitated a new conception of the nature of matter and energy... Philosophy being demanded, a number of physicists ... are doing their philosophising for themselves and surmise that behind the world which physics studies there is another world. This other world is conceived as a mental or spiritual unity. Matter, it is said, is only an appearance, whence it is but a step to the announcement that mind alone is real and matter is its creature. The more we enlarge the sphere of the known, the more it is obvious we enlarge its area of contact with the unknown, and in so doing we realise our ignorance.

The Tao of Physics

It was not until the publication of two widely read books, *The Tao of Physics* by Fritjof Capra⁶ (1975) and *The Dancing Wu-Li Masters* by Gary Zukav⁷ (1979) that the parallels between eastern cosmology and the 'new' physics began to permeate popular consciousness. Capra wants to demonstrate that:

the two foundations of twentieth-century physics – quantum theory and relativity theory – both force us to see the world very much in the way a Hindu, Buddhist or Taoist sees it ...⁸

He begins with a bold assertion, that the various schools of Eastern philosophy are sufficiently similar to permit generic comparisons with modern physics.⁹ The most important 'generic' feature concerns *oneness*:

The most important characteristic of the Eastern world view – one could almost say, the essence of it – is the awareness of the unity and mutual interrelation of all things and events, the experience of all phenomena in the world as manifestations of a basic oneness.¹⁰

Clearly this view of the cosmos is more consistent with the new physics than with reductionism. Capra recognizes three other parallels between the 'new' physics and Eastern philosophy. First, their truths cannot be understood in logical language – both must resort to metaphor; for example in 'visualizing' a multi-dimensional universe and in 'visualizing' matter as both wave and particle. Second, their realities require a unity of opposites – most famously the yin and yang of the East; emptiness and matter in the West.¹¹ Third, their ultimate substances are not inert and passive (responding only to imposed forces) but inherently dynamic and creative.¹²

Capra's most radical assertion, however, is that the 'mystical' methodology of the East is a science.¹³ Human beings, says Capra, have two modes of knowing, the rational and the intuitive. The West gives primacy to the former and uses the scientific method to obtain *relative knowledge*, knowledge that is dependent on time, place and person. Mystics give primacy to intuition and use a scientific method to obtain *absolute knowledge*, that is, to experience the essential nature of

things beyond dependence on time, place and person. The path of the mystic satisfies three criteria for a science: it gives priority to experience over theory; it requires practice and discipline; and its practices are repeatable and passed on to students. The nature of the knowledge sought may differ between East and West, and the language in which that knowledge is described may differ, (mathematical versus metaphorical) but nevertheless the empirical nature of both paths remains.

The firm basis of knowledge on experience in Eastern mysticism suggests a parallel to the firm basis of scientific knowledge on experiment. This parallel is further enforced by the nature of the mystical experience. It is described in the Eastern traditions as a direct insight which lies outside the realm of intellect and is obtained by watching rather than thinking; by looking inside oneself; by observation.¹⁴

The mystical experience of the universe is entirely dependent on attempting to approach it as a whole. Likewise for the modern physicist, the universe is also:

...experienced as a dynamic inseparable whole which always includes the observer in an essential way. In this experience, the traditional concepts of space and time, of isolated objects, and of cause and effect, lose their meaning.¹⁵

Ken Wilber – Eye to Eye

Ken Wilber is arguably the most influential philosopher to work on a synthesis of Eastern and Western cosmologies. His seminal work is *Eye to Eye*.¹⁶ Despite reservations expressed in another essay in this volume concerning the lack of an adequate theory of class and political economy in *integral philosophy*,¹⁷ the scope of Wilber's synthesis is impressive. Wilber believes that Capra has overstated his case. He is uncomfortable with claims (like the following) in which Capra appears to identify the path of physics with spirituality:

This book [*Tao of Physics*] aims at improving the image of science by showing that there is an essential harmony between the spirit of Eastern wisdom and Western science. It attempts to suggest that modern physics goes far beyond technology; that the way – the Tao – of physics can be a path with a heart, a way to spiritual knowledge and self-realization.¹⁸

Wilber does not believe that physics and spirituality are twin paths to self-realization. Modern physics and eastern mysticism are *not* two approaches to the same reality – they are different approaches to *different* realities.¹⁹ Physics may have discovered the interconnectedness of the physical world, but this is not same as the mystical world. The confusion has led to a “pop-mysticism”.²⁰

Wilber's approach to a synthesis of East and West accepts the East's *hierarchy of realities* or worlds that differ in degree of subtlety and in how they come to be known. The crudest level is *matter* (the world that interests physicists) and the subtlest level is *spirit* (the world that interests mystics).²¹ Confusion arises because categories that were distinct in the old physics, for example matter versus space, observer versus observed and mass versus energy, become unexpectedly interdependent in the new physics. The new physics requires one to abandon traditional categories, logical models and realism. Eastern philosophy has long described the natural world in non-logical terms and thus offers a rich source of

metaphor for the ‘new’ physics. But, says Wilber, just because modern physics and Eastern philosophy are both obliged to deal in metaphor does not mean they are both talking about the same world. Even more important, we do not actually want the truths of Eastern philosophy to depend on Western science, even if there is a connection:

...it is the very nature of empirico-scientific discoveries that they ceaselessly change and alter, that last decade’s scientific proof is this decade’s fallacy, and that no major scientific fact can escape being profoundly altered by time and further experimentation. What if we said that Buddha’s enlightenment just received corroboration from physics? What then happens when, a decade from now, new scientific facts replace the current ones (as they must)? Does Buddha then lose his enlightenment?²²

Table 1

The Six Major Schools of Indian Theist (Vedic) Philosophy

Samkhya: The first ever philosophical system described some 4000 years ago by the world’s first recognised philosopher, Kapila Rishi. Also called <i>Kapilasia Tantra</i> . His cosmology is dualist and includes 24 categories.
Nyaya: A system of logic founded by Gaotama Rishi in 2 nd century. It influenced the development of Indian philosophy in the same way that Aristotelian logic influenced Western philosophy.
Vaiseshika: A related system of logic founded by Kanada Rishi. Its ontology consists of nine <i>tattvas</i> (categories): soul, mind, space, time, ether, air, light, water and earth.
Astaunga yoga: The most practical of the six Vedic schools. It outlines the traditional techniques to achieve self-realisation including meditation, morality, breath and yoga exercises.
Purva-mimamsa: Founded by Jaimini Rishi. Accepts the existence of heaven and hell. Concerned with the correct performance of Vedic rituals.
Vedanta or Uttara-mimamsa: Founded by Vadrdayana Vyasa and elaborated by Shankar Acarya. A monist philosophy whose main teaching is that Brahma alone is real and the manifest world is <i>maya</i> (illusion).

Tantra and Veda

In pursuing a synthesis of cosmologies East and West, we will adopt the same strategy as Capra and Wilber by asserting that the various schools of Eastern philosophy have sufficient similarities to be treated generically. However the reader may object that Eastern philosophy is no more homogenous than Western philosophy. Before proceeding, therefore, it is necessary to acknowledge the diversity of Eastern philosophy and to justify generic references to it.

The major schools of Eastern philosophy are well known, Vedic Theism, Tantra, Zen, Taoism and Buddhism, but within these there are further schools each with their nuances.²³ For the purposes of this essay, Veda and Tantra will concern us most. Vedic beliefs were introduced to India by the Aryans when they invaded from Persia and Afghanistan. There are said to be six schools of Indian theist philosophy which trace their authority to the ancient Vedas (Table 1). Collectively they represent orthodox Hindu belief. Buddhism, Jainism and Cárváka²⁴ although of Indian origin, are not included because they do not recognise the authority of the Vedas.

Table 2

Five Indian sub-branches of Tantra

Shaeva Tantra: places more emphasis on philosophy. Its cosmology includes 36 categories or <i>tattvas</i> , the last 24 of which are similar to Samkhya. The objective of Shaeva Tantra is self-realisation through a determined intellectual contemplation of the Absolute.
Shakti Tantra: stresses the attainment and judicious use of psychic powers. More popular in the western parts of India.
Vaesnava Tantra: stresses the realisation of God through devotional approach and Bliss. Finds little need for philosophy and has no social consciousness. Originated in the south of India but subsequently much influenced by Sufism.
Saora Tantra: concerned with the science of medical treatment and astronomy. Has most support in Maharastra.
Ganapatya Tantra: characterised by a strong commitment to social unity and social awareness. Now merged with Saora Tantra and likewise most practised in Maharastra.

Tantra is not so well known in the West although it has been given a new lease of life due to the extensive writings of Prabhat Ranjan Sarkar. Unlike the Vedic tradition, Tantra developed from the shamanist practices of indigenous India. According to Sarkar, Tantra was first systematized by Shiva some 7000 years ago. Over subsequent millennia, there were various offshoots from Shaeva Tantra, two major branches being Kashmiri Tantra^{25,26} in the West of India and Gaodhya Tantra in Bengal (the East). The latter was more practical and less philosophical due to the lesser influence of Veda. Five extant schools of Tantra are listed in Table 2. In general, Tantra encourages all-round physical, mental and spiritual development. A particular characteristic is its emphasis on developing vigour, both through the regular practice of meditation and confronting difficult situations in life, to overcome fear and weakness. Sarkar promotes a reinvigorated form of Tantra that combines the strengths of each of the schools in Table 2. He also

promotes *astaunga yoga* because of its balanced and practical approach to self-realization.

Tantra and Veda are the two dominant strands of Indian thought and culture. They have greatly influenced one another over the millennia so that they now share many of the same ideas. Early Samkhya, for example was also called *Kapilasia Tantra* and the practices of *astaunga yoga* have their origins in Tantra.²⁷ The question is how to approach this sometimes bewildering array of belief and practice?

Sarkar insists we give more credence to disciplined practice and less to doctrine. Every deliberate human endeavour requires a combination of theory and practice. Where theory takes precedence over practice we may call it philosophy and where practical experience takes precedence over theory, we may call it science. In the remainder of this essay therefore, generic references to Eastern philosophy refer to those traditions whose philosophy has grown out of the practice of meditation and engagement with the world, that is, where a balance of internal and external disciplines has been preserved.

Perennial Philosophy

Wilber begins his synthesis of Eastern and Western cosmologies by invoking *perennial philosophy*, an idea popularised by Thomas Huxley in a book of that name.²⁸ Huxley argues that despite differences, the world's major religions and lesser tribal wisdoms have a core of similarity, an essence, which is more important than their differences. This essence is 'perennial' because it appears in the earliest texts (the Vedas) and has persisted ever since. Even the Judeo-Christian tradition displays elements of it.²⁹

Wilber highlights four important ideas in perennial philosophy. First and foremost is the idea of *advaita*, a word whose literal meaning is 'not two' but which is more usefully defined as 'One without a second'. (*Advaita* is a Sanskrit word, Sanskrit being the language in which these ideas were first formalized. It remains the pre-eminent language of Eastern philosophy.) Thus concerning the first big cosmological question, perennial philosophy states that the essential nature of things is 'One without a second'. In Tantra and Vedanta, this One without a second is *Brahma*, which we may translate as *non-attributional Consciousness* or *Spirit*.

The second important idea, in seeming contradiction to the first, says that within the oneness of creation there is a hierarchy of forms or levels. Here we have perennial philosophy's response to the second cosmological question. The simplest classification has three levels: Consciousness, mind and matter. More usually seven levels are distinguished, the higher levels are more rarefied, subtle and all encompassing, while the lower levels are more dense, crudified and fragmented. In all Eastern philosophies, the material universe or matter constitutes the crudest level.

Third, says Wilber, all traditional philosophies view matter as a "precipitate" or condensation from something more subtle. "Mind creates prana; prana creates

matter”.³⁰ Clearly, mind here cannot refer to human mind since matter was around long before humans. Thus perennial philosophy accommodates the idea of a Cosmic Mind that is the causal matrix of the physical universe.

Fourth, there is the idea of a cyclical flow within creation. In the first phase of the cycle, Consciousness devolves into mind and mind devolves into matter. In the second phase of the cycle, matter evolves back to mind and mind back to Consciousness. This second phase concerns the evolution of life and therefore responds to the fourth of our cosmological questions.

We now consider the big four cosmological questions in more detail, using the perspective of perennial philosophy to bridge the divide between East and West.

Four Cosmological Questions

What is the Essential Nature of Things?

Nature never presents herself to us unambiguously. A person's appearance changes with age. The height of a mountain appears to change depending on one's angle of view. Two drivers involved in a traffic accident will provide different accounts to a police officer. In other words nature hides behind the relativities of time, place and person. It is the common goal of all science (whether of East or West) to peer behind, past or through the veils of relativity, by one subterfuge or another, to arrive at some more fundamental truth. A question: if we could get past all relativities, that is, see our universe from all possible angles, at all times from the indefinite past to the indefinite future and with all possible 'eyes', what would we see? East and West adopt different approaches to this question.

The West

Western physics approaches this question by searching for ever more general laws of cause and effect to describe nature's behaviour. James Maxwell (1831 - 1879) found an essential unity behind the apparently different phenomena of electricity and magnetism, thus deriving a theory of electromagnetism. Steven Weinberg (1933-) found a unity behind electromagnetism and the weak nuclear force.³¹ The holy grail of modern physics is *grand unification*, to discover an essential unity behind the four forces of nature; gravity, electromagnetism and the weak and strong nuclear forces. One candidate for grand unification also postulates a fundamental unity behind matter particles and the four forces.

One might expect that a continuation of this trend will lead to a grand theory of nature having the essential attributes of time, extension (space) and a primordial matter attribute or *charge*. Curiously, these five dimensions (three of space, one each of time and primordial charge) would not be distinct but intermingled and interdependent, thus resulting in five similar dimensions, each being a composite of time, space and charge.

This description of the essential nature of things still misses a key component, the observer. All scientific investigation involves observer and observed. So although it is possible to imagine that Western physics might arrive at some description of the world with just one primordial, fundamental component, this synthesis does not encompass the observer. Furthermore, as Wilber reminds us, the singular primordial entity postulated by physics would still be of the physical world. It tells us little about all the other levels of existence.

The East

On the ultimate nature of things, Eastern philosophy adopts the *synthetic* approach. It begins by recognizing the universe as an integrated, unitary entity and then interprets the parts in terms of the whole. But the East is still faced with the same problem as the West – how to get around the distraction of what is ‘up front’ – how to get to the essential nature of things.

The East’s solution was not to search the external world using the sense organs to find ever smaller physical particles but to search the internal world (the mind) using meditation techniques to obtain ever more subtle experiences. Ultimately this approach led to the understanding of *advaeta* or *non-dualism*, that the essential nature of things is *One without a second*. A moment’s thought will reveal this idea to be very subtle. Advaeta must be beyond time because time demands a *before* and an *after* which is more than one entity. Advaeta must be beyond space because space demands a *here* and a *there*, and it must be beyond the duality of observer and observed.

According to Wilber the major religious traditions acknowledge advaeta one way or another. Christianity has the concept of Eternity (beyond time) and Buddhism the Void (beyond space). In Tantra this ultimate category, where subject-object or observer-observed are fused into one, is Brahma. Other schools of philosophy may use different names but by whatever name, the One without a second is Absolute (ever-unchanging), Infinite (without boundary), omnipresent (beyond space and time) and omnipotent (without any conceivable limitation). All the myriad ‘things’ in our universe, inanimate and animate, concrete and abstract, are different manifestations of Brahma.

Dualism or Monism?

The assertion that all variety is derived from one fundamental category (such as Brahma) is non-dualism or *monism*. It is to be contrasted with *dualism*, the view that all variety can only be reduced to two categories. There are many dualist distinctions, mind-body, spirit-matter, subject-object, creator-created, observer-observed, knower-known. To be a subject-observer-knower is to be *conscious*. Thus in the West where monism is equated with materialism or physicalism,³² debates between dualists and monists focus on the legitimacy of adding consciousness as a fundamental category. Dualists invoke consciousness for many reasons – to account for *qualia* (our first person conscious experience of the world), our sense of self (the witness of experience and the ‘I’ of I exist), intention (the ‘I’ of I do) and our sense of intrinsic purpose, virtue and so on. Materialism fails to provide

convincing explanations for these dimensions of life. From the historical perspective, dualist philosophies emerged prior to monist.³³

Monist philosophies typically declare one side of the above dualisms to be fundamental and derive the other side from it. *Materialism* and *idealism* serve as examples. Materialism asserts that only matter exists and therefore mind and consciousness are epiphenomena of matter. That they appear real is an illusion of language. By contrast, idealism asserts that mental experience alone is real. Whatever the external world might be, it is known to us only indirectly through mind. Strong versions of idealism have been promoted in Western philosophy by Hegel (who reduced all existence to thought/spirit) and in the East by Shankaracarya (who rejected even the reality of thought and propounded the *doctrine of illusion*).³⁴ In fact both materialism and idealism are obliged to invoke a doctrine of illusion in one guise or another because subject and object are natural categories to the human mind and one or other must be explained away to achieve monism. Idealists assert the illusion of objectivity while materialists assert the illusion of subjectivity. It is important to note that perennial philosophy embraces *advaeta without* falling prey to a doctrine of illusion. How this is achieved will become apparent as we proceed.

What are the Fundamental Elements of the Cosmos?

According to perennial philosophy the Cosmos manifests as a hierarchy of forms. Hierarchies in the natural world are self-evident. Atoms aggregate into stars which aggregate into galaxies which aggregate into our universe. According to some speculations, our universe is itself just one of many.³⁵ In the living world, sub-cellular organelles aggregate as cells, cells as plants and animals, living organisms as ecosystems and ecosystems as the biosphere. A hierarchy of parts becoming wholes, where the wholes at one level are the parts of the next level, is called a *holoarchy*.³⁶ The holoarchy of the living world is described by some ecological theorists as a *panarchy*.³⁷

Table 3

Consciousness	Consciousness	Consciousness	7
Mind	Causal, transpersonal mind	Universal mind	6
		Archetypal mind	5
		Intuitive mind	4
	Subtle, personal mind	Symbolic, rational mind	3
	Crude, pre-personal mind	Sensory/motor, instinctual mind	2
Matter	Matter	Matter	1

The above hierarchies are located within the physical world. A fundamental difference between East and West in answering this second cosmological question is that the East recognizes several worlds other than the material which also exist in hierarchical relationship to one another. In simplest terms, Eastern ontology distinguishes three categories, matter, mind and consciousness (Table 3, left column). Mind can be subdivided into three categories, the crude, subtle and causal minds or, to use Wilber's more revealing terminology, the pre-personal, personal and transpersonal minds.³⁸ The personal mind corresponds to the ordinary state of human consciousness, the pre-personal to plant and animal consciousness, while the transpersonal mind is responsible for coordinating plant, animal and human life on the larger ecological and social scale. Finally, the transpersonal mind can be further divided into three levels which have Sanskrit but not English names. We may describe them as the *intuitive*, *archetypal* and *universal* minds (Table 3, right column). These terms are not universally used but they are descriptive.³⁹ Sanskrit was the original language to express these ideas and English still has no words for some of them. Sanskrit can be confusing, so we will often refer to the levels using numbers (as in Table 3). The above subdivisions yield seven levels in the cosmic hierarchy.⁴⁰ Mind constitutes levels 2 to 6.

The AQAL Schema

The first reference to the Cosmos being composed of seven levels appears in the Upanishads⁴¹ and the ontology has persisted. Readers familiar with Wilber's *integral philosophy* will recognize these levels, which he arrived at from a wide reading of Eastern and Western philosophies. It will be helpful for our purposes to introduce Wilber's All-Quadrants-All-Levels (AQAL) schema (see Figure 4 in *After Materialism*, this volume) because it is the framework for his entire philosophy.⁴²

The AQAL levels are those shown in Table 3. The four quadrants are derived from two dualisms, interior-exterior and individual-collective. The exterior-individual quadrant is the world of 'things' and substance, the objective world studied by the natural sciences. The interior-individual quadrant is the domain of personal and subjective experience. It is not easily approached by the natural sciences but rather requires a phenomenological or introspective approach. Individuals always exist within communities of similar entities, so there are two 'collective' quadrants. From the human perspective, the external-collective quadrant is objective society, its institutions, law, infrastructure etc., while the internal collective includes culture, social values, norms, myths etc.

Substance








Despite the differences, there is one surprising similarity between the cosmologies of East and West. Both recognize that the fundamental constituents of nature have a dual wave-particle character. Note that here we are in the external-individual quadrant of the AQAL schema and concerned with an objective description of the fundamental 'substances' of the Cosmos. In Eastern cosmology the seven levels of creation are a spectrum of waves, whose energy increases and wave-length decreases from subtler to cruder levels (Table 4, right column). Of

note is that Absolute Consciousness (Brahma) has no vibratory character. Waves do not change the nature of Brahma any more than ocean waves alter the chemical composition of water.

An object or objectivity is nothing but a wave motion within the body of the Cosmos.⁴³

Particle attributes multiply, particle density increases and inter-particle distance decreases as one steps from subtler to cruder levels. Thus in descending the spectrum, attributes become more numerous, crude, dense, fragmented and constrained. In ascending the spectrum, attributes become fewer, increasingly subtle, rarefied, synthetic and unconstrained.

Table 4

	<i>World</i>	<i>Lokas</i> (Worlds)	<i>Kosas</i> (Structures)	<i>Waveform</i>
7	Absolute Consciousness	Satya ⁴⁴	----	
6	Universal mind	Tapah	Hiranmaya	
5	Archetypal mind	Janah	Vijinanamaya	
4	Intuitive mind	Mahah	Atimanas	
3	Symbolic, rational mind	Svah	Manomaya	
2	Sensory/motor, instinctual mind	Bhuvah	Kamamaya	
1	Matter Physical Universe	Bhuh	Annamaya	

Two important concepts emerge from this spectral ontology. First, matter and mind are both *substantive* categories located on the same spectrum. Matter is at the dense end of the spectrum, which happens to be known to us through our sense organs. Matter can be understood as the densest level of mind. In other words, the gap between mind and matter is not as great as is suggested by the simplistic trinity of matter, mind and consciousness. Matter and mind display similar dynamics because they are both wave phenomena. Ironically, Eastern philosophy accommodates the recent trend in Western post-modernism to dissolve the sharp boundary between matter and mind.

Second, the spectrum of wave forms is continuous, but the boundaries between the different levels are distinct. This phenomenon is similar to the physicist's

concept of a phase change, as for example, the temperature scale is continuous but the transitions from gas to liquid to solid occur at distinct temperatures.

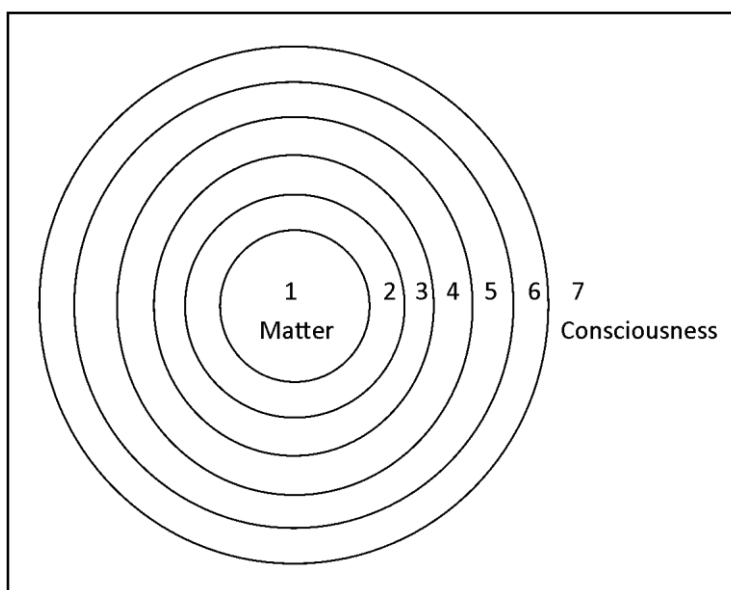
The Individual and the Collective

We can also understand the individual-collective dichotomy in the AQAL schema as referring to the distinction between the Cosmos and its individual constituents at any one level. The individuals are complex wave structures and in this context Eastern philosophy refers to the wave components as *kosas* (the Sanskrit *kosa* literally means *shell*). The collective of structures at any one level resides in a space or world for which the Sanskrit is *loka* (see Table 4). The levels, worlds, lokas and their constituent kosas (shell-like structures) represent qualitatively different kinds of objective reality.

Sarkar describes the hierarchy in terms of constraints experienced by waves. Cruder waves are constrained by subtler waves.

A [cruder] wave can move freely only when it is in harmony with previous [subtler] waves and their curvatures. A wave can pass through an object where there is no physical obstruction or hindrance from a subtler wave, that is, subtler waves can pass through cruder waves; and under such circumstances there is always an adjustment of wavelengths resulting in the creation of physical diversities.⁴⁵

Figure 1: The hierarchy of interpenetration of the seven worlds or *lokas*. The more subtle worlds encompass and interpenetrate the cruder worlds.



Consciousness

We now turn to the interior quadrants of the AQAL schema, those concerning subjectivity and consciousness. The word 'Consciousness' in Tables 3 and 4 and in Figure 1 clearly means something very different from human consciousness. In Western science, consciousness refers to four kinds of internal phenomena common to all human beings and, in some degree, to animals and plants; *qualia*, *subjectivity*, *identity* and *intentionality*. Qualia are first-person conscious experiences

that cannot be reduced to third-person accounts. For example, the pleasure of a rose is not adequately described in terms of light incident on the retina and molecules in the olfactory bulb. Subjectivity is the ‘I’ that has conscious experience. Identity is the feeling that my ‘I’ is indivisible – I am not two persons. Subjectivity and identity constitute the *self*. *Intentionality* refers to subjectivity existing only in relation to objectivity. That is, *self* has bounds and exists only in relation to *other*. These internal phenomena are said to be *irreducible*, that is, they cannot be adequately explained in terms of objective physicalist principles because we only come to formulate physical principles through conscious experience.

A logical conclusion of Wilber’s AQAL schema is that, in ascending levels, we eventually arrive at a conscious universe. Likewise, Sarkar’s philosophy begins with the proposition that the cosmos is conscious. But there is a significant distinction with human consciousness. Whereas the latter appears to depend on a physical base (the human body), Cosmic Consciousness is prior to, independent of and the original cause of the physical world. It is not easy to map all the Eastern concepts of consciousness to the Western because in both schools there are numerous words and ideas that come under the general umbrella of consciousness. There are different words to describe the same concept and the same word to describe different concepts. However Wilber’s AQAL schema is a good framework to anchor ideas.

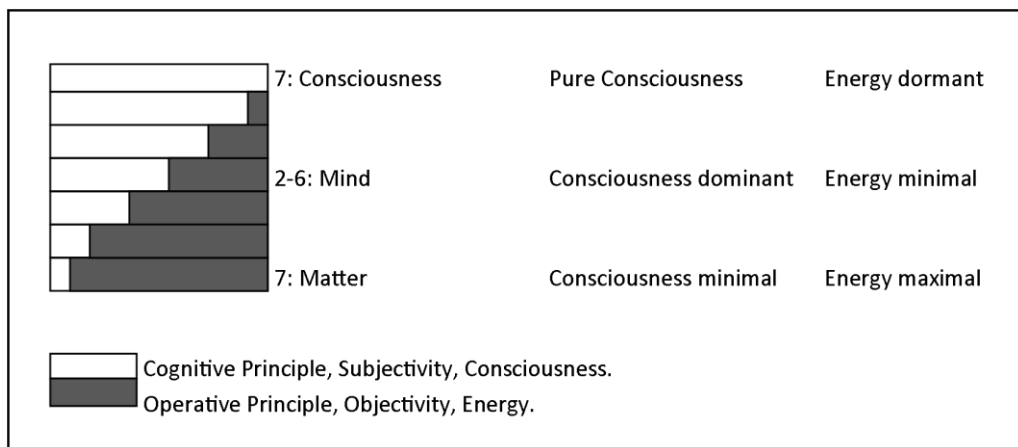


Figure 2: The relative expression of consciousness (subjectivity) compared to energy (objectivity) increases from level 1 conscious state to level 7 conscious state.

In ascending levels, conscious experience becomes more subtle. Matter (level 1) does not behave as if it is conscious. The world of an electron, for example, appears to be highly constrained by physical laws. At level 2 (the biological world) primitive animals presumably have simple sensory-motor awareness. More advanced animals behave as if they have more subtle kinds of emotional experience. Herding animals can form strong attachments to one another. And at level 3, (the psychological world of humans) awareness of ‘self’ arises. But there is now good evidence to suppose that some animals such as elephants and dolphins also have a sense of self.

The AQAL schema allows us to distinguish three kinds of subject-object relationship. The first and most obvious is the relationship between the *interior* and *exterior* quadrants which changes in ascending levels. This is best understood in terms of *self* and *other*. Ascending levels, *other* becomes less tangible (less energetic) and the ‘distance’ separating self from other decreases. This progression (see Figure 2) culminates in level 7 where the separation of self from other no longer exists or, to express it in another way, self completely embraces other.

The second kind of subject-object relationship is that between AQAL levels. As we ascend the interior levels the domain of self expands, the effect being that each level acts as subject to its lower levels. In short, there is a hierarchical sequence of subject-object relationships. For a lower level, the higher levels appear to be the locus of intention and purpose. For the higher levels, the lower levels appear to be objects of manipulation.

Finally there is a third subject-object relationship that arises from the individual-collective dualism in the AQAL schema which we reinterpret here to refer to the dualism of individual-Cosmos or microcosm-Macrocosm. In Sarkar’s philosophy this relationship is of great spiritual significance yet it is somewhat mysterious because in it the human being exists as object in relation to Cosmic Consciousness. It is the relationship that eventually brings one to declare, “Thy will be done”.

Dualism and Monism

It appears from the above that perennial philosophy accepts both dualism and non-dualism – dualism in levels 1 to 6 and non-dualism in level 7. Sarkar approaches this conundrum by stating that the non-dual entity Brahma is a “composite” of two principles, *cognitive* and *operative*. He outlines this approach in a collection of aphorisms or *sutras* using the Sanskrit words *Shiva* and *Purusha* for the Cognitive Principle and *Shakti* and *Prakriti* for the Operative Principle. The first sutra states:

Sutra 1-1: *Shivashaktyātmakam’ Brahma.*

Translation: Brahma is the composite of Shiva and Shakti.

Purport: Brahma [the Cosmic Entity] is the composite of Shiva [Consciousness or Cognitive Principle] and Shakti [Operative Principle]. A piece of paper has two sides. Although they are two for the sake of argument, they cannot be separated from the one paper entity. Removal of one side of the paper jeopardizes the existence of the other. So is the relation of Purusha and Prakriti in the Cosmic Entity. Neither of them can stand without the other. That is why it is said that they are an inalienable concomitance.⁴⁶

It should be noted that the word ‘composite’ refers not to an alloy of two previously separate entities but rather a single entity having dual aspects. This is much the same philosophical device adopted by Chalmers⁴⁷ who accepts that conscious experience cannot be accounted for in terms of objective physical principles, but, having arrived at dualism, finds it necessary to postulate another more fundamental category which he calls *information*. Information has dual

aspects (conscious experience and objective physicality) in order to account for the deep “coherence” between them.

Verela et al.⁴⁸ (concerned with the problems that dualism poses for scientific knowledge) emphasize that the two sides of any subject-object dualism can only exist in relationship to one another. The one has no meaning without reference to the other. They are co-dependent and codetermined. This is the sense in which we can understand Sarkar’s phrase an “inalienable concomitance”.

The dualism of levels 1 to 6 arises from the self’s sense of separation from other. However in the ultimate state of consciousness (level 7) there is no separation and indeed no objective experience as such. It is a non-attributional state best described as *One without a second* and thus there is no ambiguity about its non-dualism. Wilber describes it as “Consciousness as Such”,⁴⁹ Hegel as “the self-contained existence of Spirit”. He adds:

Two things must be distinguished in consciousness; first the fact *that I know*; secondly *what I know*. In *self-consciousness* these are merged in one; for Spirit knows Itself.⁵⁰

An obvious question arises – how do we know that level 7 is a legitimate category to include in a cosmology when by definition we can have no experience of it? There are two responses to this question. First, the spectrum of subject-object relationships points, by extrapolation, to some unexpressed state beyond the most subtle experienced state. Second, just as one knows on awakening that one has been in deep sleep, so too, the lingering bliss following the state of *objectlessness* (known in Sanskrit as *nirvikalpa samádhi*) is proof of that state. Sarkar summarizes these ideas in two *sutras* (aphorisms):

Sutra 1-23: *Tasyasthitih amānasikeśu.*

Translation: This state (of *nirvikalpa samádhi*) is beyond the mind.

Purport: This state of objectlessness being beyond the orbit of the mind, it is not mentally apprehensible.

Sutra 1-24: *Abhāvottaránandapratyayálabhaniirvrttih tasya pramánam.*

Translation: The lingering bliss which follows this state of vacuity is the proof of that state, the means of firm belief in that state.

Purport: ...The real state of vacuity is verily the state of utter destruction of the mind, and so even *savikalpa samádhi* [the *experience* of ultimate Bliss] is not a state of vacuity. Only the state of *nirvikalpa* is the state of vacuity. In this state of absolute vacuity, the spiritual waves of exhilaration that fill the unit entity still continue to flow and trail on for some time even after that state of vacuity, that is, after the mind returns due to unserved *saṁskáras* [the consequential reactive momenta of one’s past deeds]. These very trailing waves of exhilaration and joyous exuberance keep reminding the “mindful” *sádhaka* [one who practices meditation] that his or her “mindless” state had been one of absolute bliss.⁵¹

Logicians will argue that Brahma must be dual if one admits to dual cognitive and operative principles. Taking a more subtle approach, they will also argue that the word *objectlessness* to describe a non-dual state of consciousness implies another

state, *objectfullness*. In other words we are attempting to disguise dualism. As frequently emphasized by Wilber, attempts to capture advaeta using the tools of language necessarily become trapped in contradiction.⁵² It is language that creates paradox. Spirit, he says, is not intrinsically paradoxical.

...[Spirit] is not characterizable at all in mental terms – but when put into mental terms, the result is paradoxical.⁵³

We had better face up front, says Wilber, to the fact that Spirit or advaeta is beyond all symbols, logic and language. Therefore the language used to describe advaeta will always become trapped in contradiction.

The Sciences

Western philosophy and science do not accept substantive levels other than the physical. However the fundamental categories of knowledge accepted in the West reflect the Eastern categories (Table 5) because the dynamic processes of mind act as constraints on the physical level and leave traces or patterns that become the objects of scientific investigation. The sciences, like the levels of mind, are hierarchic. That is, each higher science encompasses the lower sciences but not vice versa. For example, the biology encompasses physics but physics does not encompass biology.⁵⁴

Table 5

The relationship between the sciences of the West and the levels of mind as understood by the East.

	<i>Mind</i>	<i>Kosa</i>	<i>Sciences</i>
6	Universal	Hiranmaya	Supra-aesthetic
5	Archetypal	Vijinanmaya	Aesthetic
4	Intuitive	Atimanasa	Social
3	Symbolic, Rational	Manomaya	Psychological
2	Instinctual	Kamamaya	Biological
1	Matter	Annamaya	Physical

The justification for linking the social sciences to the intuitive mind will be discussed subsequently. The sciences associated with levels 4 and 5 are collectively the *humanities*. The terms *aesthetic* and *supra-aesthetic* science are Sarkar's.⁵⁵ Aesthetic science concerns the humanist archetypes (e.g. virtue, truth, justice beauty) which, in the West, were first articulated by the Greeks. Supra-aesthetic science concerns spirituality and mysticism and is arguably beyond the scope of the humanities. It is highly significant that the hierarchy of mind places

the aesthetic and supra-aesthetic sciences prior to the social sciences. Spiritual and archetypal phenomena transcend cultural and social phenomena.

Mysticism

Note that there is no science for level 7 because it is beyond the dualism of observer and observed. Yet by extrapolation supra-aesthetic science hints at something mysterious beyond itself.

When Fritjof Capra and Ken Wilber refer to *mystics* and the *path of mysticism*, they are referring to a mystery that has fascinated human beings from time immemorial – to penetrate the essential nature of things. Mystery is the right word because the sought state of consciousness is elusive – it appears to lie beyond the mind and to be vast without limit. How can an insignificant human being embrace that which is apparently infinite? This mystery lies at the heart of human spirituality and gives meaning to life.

This search for the Great by the little is called *mysticism*. The fundamental point of spirituality depends on this mysticism. And when this mysticism, this outward existence of mysticism, coincides with the inner spirit of mysticism, the goal is reached: the unit becomes Cosmic.

And for the attainment of this status we have come here. We have come to this world, so our lives are not meaningless. Our everything is meaningful; and by our knowledge, by our action and by our sincerity, we will be increasing our meaningfulness from unit to Infinite.⁵⁶

What is the Origin of the Universe?

Something from nothing

All objective entities manifest as waves and therefore the East's cosmology of origins focuses on the creation of waves. According to Tantra, the Operative Principle is a composite of three antagonistic *binding principles*, the *sentient*, *mutative* and *static*. Thus all variety is a product of the interaction of these three principles. Sarkar describes them using the language of *vectors*, although he does not use the word. That is, the three principles are 'forces' that act in particular directions. The resultant of two equal and opposite forces is nothing. And likewise the resultant of billions of vector forces acting in random directions is also nothing. But even if just a few vectors begin to coordinate their activities then in the language of physics a *phase change* takes place and something happens on the macroscopic scale.

A commonly used example is magnetism. In the unmagnetised state, the individual crystal domains of an iron bar act as magnets pointing in random directions so that, at the macroscopic level, no field is discernible. When the bar is magnetised, all magnetic domains orient in the same direction so that a sum of fields becomes recognizable. Of course we cannot take this illustration literally. The language of vectors and phase changes is used by Sarkar to describe processes that would otherwise be beyond conceptual reach. Perhaps, invoking the principle

of self-similarity, this ‘transcendent physics’ repeats itself throughout all the levels of creation.

In the non-attributional state of Brahma, the three binding principles remain uncoordinated and therefore collectively “dormant”. The attributional state of Brahma arises due to the coordinated but belligerent interaction of the three principles. The effect is the creation of waves having objective attributes.

Making Waves

Consider a guitar string. What is required to produce a sound? First we need a string stretched between two fixed points. Second, the string must be plucked. And finally, the string must offer elastic resistance, so that when the plucking action is exhausted the string will vibrate.

From this metaphor, we deduce three conditions for the production of vibration: a taut string or medium; a displacing force; and resistance or elasticity. Applying the metaphor to the creation of the Cosmos, we require Brahma to metamorphose into a medium of some kind having extension; second the medium is ‘struck’; and third it is elastic so setting up a vibration.

In the non-attributional state (when the binding principles are in equilibrium) there can be no talk of ‘medium’, ‘deformation’ or ‘elasticity’ since these are attributes. Creation begins at the moment of imbalance. The first expressed binding principle is the sentient, due to which Consciousness becomes some kind of abstract medium extended in some kind of space. We must qualify our terms because in the absence of a vibrating entity it is not legitimate to speak of time or space. As a metaphor, we can imagine that the sentient principle, streaming in all directions from the point of creation, generates a three dimensional gossamer. It does not exist objectively, yet something has happened. According to Sarkar, the sentient principle generates the feeling of ‘I exist’. Hence at this stage only the subjective ‘I exist’ feeling gives a clue that something has changed within the vast ocean of Cosmic Consciousness.

The mutative principle expresses next, due to which the gossamer-like medium becomes displaced, just as the finger displaces a guitar string. Yet nothing exists objectively because nothing yet vibrates. Only the advent of a second feeling, the *ego* or ‘I do’ feeling, gives a clue that something additional has happened within the ocean of Consciousness.

In the third creation step, the static principle within the ‘mutated medium’ overcomes the mutative principle. The characteristic action of the static principle is inertia, to resist change, to stifle movement. Yet until the action of this third principle, no vibration can be initiated. In a psychological sense, it is only by meeting opposition or resistance that an action is substantiated and one can say, ‘I have done’ (Table 6).

The subjective components of creation include Cosmic Consciousness, the sentient generated ‘medium’ and the mutative generated ‘plucking’. The resultant vibration is the objective component of creation. The objective component is easily apprehended but the subjective components can only be inferred. Suppose I

enter a dark room not knowing a guitarist is present. Only when a string is plucked can I deduce the existence of subjective entities behind the sound.

Table 6

<i>Binding Principle</i>	<i>Cognitive Status</i>	<i>Psychic Impulse</i>	<i>Feeling</i>	<i>Wave Attribute</i>
Sentient	I exist (1 st subjectivity)	to expand	release, liberation	wavelength
Mutative	I do (2 nd subjectivity)	to activate	empowerment, energy	amplitude
Static	I have done (objectivity)	to suppress	inertness, dullness	frequency

The First and Second Subjectivities

Despite nothing objective being created with the expression of the sentient and mutative principles, nevertheless much is achieved in a philosophical sense. Indeed we can link the theoretical and subjective foundations of the sciences to the action of these principles.⁵⁷ The ‘I exist’ feeling (the first subjectivity) and the ‘I do’ feeling (second subjectivity) are the subjective foundations for the psychological sciences. Indeed a whole branch of psychology is devoted to exploring notions of self (I-exist) and agent/ego/will (I-do).

In the physical sciences, the first and second subjectivities are not obvious but present nevertheless. I suggest that the sentient generated ‘medium’ (first subjectivity) is equivalent to the abstract notion of a *field*. A field is a portion of time and space, every point of which is assigned a specific attribute or potential. In an electric field for example every point is assigned an electric potential; in a gravitational field every point has a gravitational potential. Thus a field is defined by time, space and its ‘entitative’ attribute.

A field is an abstract concept – only the waves which pass as disturbances through it are observable by instruments. Yet in order to describe the behaviour of these waves it is first necessary to set up a coordinate system having one axis for time, three for space and another axis for the ‘entitative’ attribute, e.g. gravitational potential. This mathematical (and therefore mental) ‘setting up’ of the field in readiness to describe a wave is, metaphorically, the expression of sentient principle.

Having set up a field with a coordinate system, it is then necessary to assume the field to be mutable. Mutability enters the physicist’s mental preparation in two ways. First, the axes of the coordinate system are ticked off to allow for changes in value. Second, the mathematical formalism to describe a wave includes operators (for example, addition, subtraction, multiplication and division) that will mutate the values taken by the time, space and ‘entitative’ attributes.

Finally it is interesting to note that the mathematical formulation of waves incorporates field *elasticity*, the field's tendency to resist deformation. General Relativity, for example, treats space-time as an elastic field that propagates gravity waves. These three principles, extension, dynamicity and elasticity, are sufficient to create a universe of waves.

The guitar metaphor is inadequate in two respects: first the musician whose skill is necessary to produce a sound is separate from his/her instrument and second, the striking action is external to the vibrating entity. In philosophy it would be said that the musician (Consciousness) *is* the taut string (first subjectivity) which *is* intrinsically dynamic (second subjectivity). To borrow a term from psychology, the creation is *self-actualising*.

The Three Relativities

The first vibration to emerge from the Cosmic nucleus is *aum*, the most subtle of all 'sounds'. Imagine you are standing in the heart of a large city. You will hear the sounds of individual cars, voices, music, jack-hammers and so on. But standing in a park some distance from the city, all sounds merge to become the hum of a metropolis. Likewise, *aum* is the sound one hears at the edge of the universe – the sum total of all vibration. It is also the seed sound of the universe, the sound from which all others are derived.

Aum, although a very subtle vibration, is still bound by the three relativities. However Swami Shri Yukteswar (guru of the famous Yogananda) introduces the three relativities not as time, place and person but as time, space and *particle*. This different terminology provides us with an interesting insight.

In its different aspects *Aum* presents the idea of change, which is Time (*kala*) in the Ever-Unchangeable; and the idea of division, which is Space (*desa*) in the Ever-indivisible. The ensuing effect is the idea of particles – the innumerable atoms (*anu*). These four, the Word [*aum* vibration], Time, Space and the Atom, are therefore one and the same, and substantially nothing but mere ideas.⁵⁸

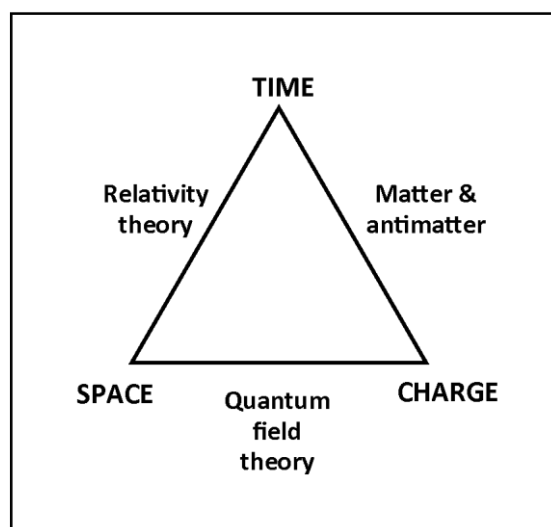
The ideas of time, space, particle (unit entity) and wave appear at the moment of creation. From a psychological point of view, they give rise to *feelings of separation*. In physics we attempt to 'measure' those feelings objectively.

Likewise, the notion of a particle (*anu*) implies separation from other particles or in psychological language, the separation of *self* from *other*. Where only one entity exists there is nothing outside it with which to establish a sense of separation. In the physical realm, a particle is substantiated by its attributes such as electric charge. In the psychological realm, individuality is established by personality (psychic charges). Hence Sarkar's relativity of *person* is Shri Yukteswar's relativity of *anu* or particle.

The connection between *particle* and *person* becomes clearer if we imagine that particle charges (such as electric charge) are an expression of particle personality. An electron flying through Earth's atmosphere is buffeted on all sides by countless other charged particles. However a neutrino (which doesn't have electric charge) can pass straight through Earth as if nothing had happened. The universe for an

electron is a very different place than for a neutrino. In this sense, particle and person are the same kind of relativity.

Figure 3: The relativities of time space and person/charge are interconnected. Time and space are not entirely distinct categories. Likewise space and matter are interwoven as are time and matter. Matter is known to us through its charges.



The three relativities are not separate, independent entities. They are linked like the three vertices of a triangle (Figure 3). Einstein linked space and time into one relativity, space-time. Quantum Field theory links space and particle while time and particle are linked in the notion of anti-particles. A charged particle travelling forward in time is the same as its anti-particle (having opposite charges) travelling back in time. The mutual relativity of time, space and particle is well appreciated in Eastern philosophy. We have already quoted Shri Yukteshwar that space, time and particle are “substantially nothing but mere ideas”. As Sarkar puts it, “This evolutionary panorama revolves around the relative interdependence of the three relativities of time, place and person.”⁵⁹ Sarkar says of time:

[it is] the mental measurement of the motivity of action. Where there is no action or where there is no mind to measure, there cannot be any time either.... Hence the existence of time depends on two factors: the motivity of action and the instrument to measure this motivity of action. The concept of these fragments of time arises in the human brain.⁶⁰

More than 2000 years ago, Buddha observed that time and space are nothing but “names and forms of thought, words of common usage, merely superficial realities.” Ashvaghosha, a first Century Buddhist, maintained:

...space is nothing but a mode of particularisation and has no real existence of its own. Space exists only in relation to our particularising consciousness.⁶¹

A Hierarchy of Space and Time

Our understanding of the three relativities is further complicated by the hierarchical structure of creation because each level has its own kind of time, space and particle charge. Physical time is typified by the atomic clock whose ‘tick’ is constant to within three millionths of a second per year. In biological time

animals live for approximately one billion heartbeats – the faster the heartbeat, the shorter the lifespan. Psychological time depends on how contented one feels or on the number of items in one's list of things to do. Sociological time depends on the rate of cultural and technological change. Concerning the hierarchy of time and space, the physicist Roger Jones⁶² considers physical space and time as the limiting case where a linear structure is imposed on something which is inherently fluid. In other words, he regards mental time as primary and physical time as derivative, imposed on reality.

A great challenge facing mind research is to find measures of time and space appropriate to the different levels of mind. Mind is clearly subject to limitations of time and space. But from the perspective of the physical world, the mental worlds appear to be *atemporal* and *non-local*, that is, unconstrained by ordinary time and space. More generally, each higher level on the spectrum of mind is non-local and atemporal to the level below.

What is the Origin of Life?

We approach this question by returning to the fourth pillar of perennial philosophy – that within creation there is a cyclical flow. The myriad animate and inanimate things in our universe emerge from Brahma and merge back into Brahma in a rhythmic cycle known as *Brahma Cakra*, the cycle of creation.⁶³ Cosmic Consciousness *devolves* into mind and mind devolves into matter after which matter *evolves* into mind and mind into Cosmic Consciousness. The Sikh Guru, Gobind Singh expressed it most beautifully:

Just as waves break on the shore and ebb back to the ocean,
Just as a million sparks leap from the fire and fall back to the fire,
So too, all things come from God and all things return to God.⁶⁴

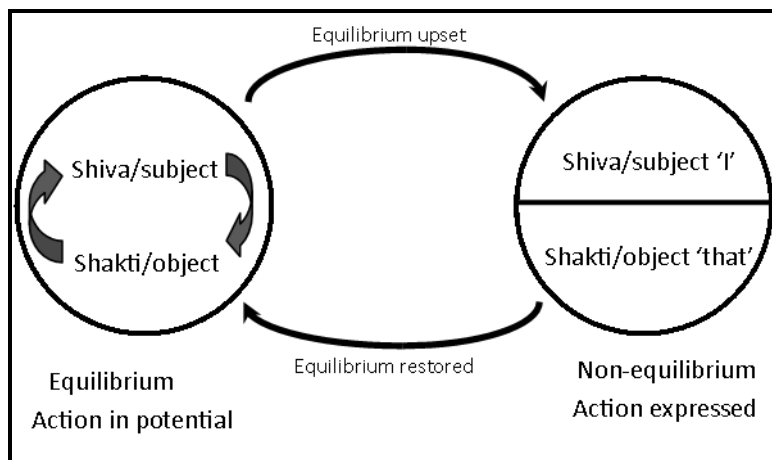


Figure 4: The manifest creation emerges and withdraws as the equilibrium of Brahma is lost and then restored. Note that in the non-equilibrium state there is a separation of subject and object – ‘I’ am distinct from ‘that’.

Oscillation between expressed and unexpressed

As described in Kashmiri Tantra, Brahma or Spirit alternates between the equilibrium and non-equilibrium states (Figure 4).⁶⁵ The equilibrium state is unmanifest, without attribute, the creation in potential. The non-equilibrium state is manifest, attributional, the creation actualized.

The first phase of the cycle of creation, in which equilibrium is increasingly upset, is described as outward, extroversial and centrifugal. Brahma unfolds as a spectrum of waves. The return part of the cycle, in which equilibrium is restored, is inward, introversial and centripetal (Figure 5). These words will acquire more meaning as we progress. Wilber describes the outward journey as *involution* and the return journey as *evolution*:

...“in the beginning” there is only Consciousness as Such, timeless, spaceless, infinite and eternal. For no reason that can be stated in words, a subtle ripple is generated in this infinite ocean. This ripple could not in itself detract from infinity, for the infinite can embrace any and all entities. But this subtle ripple, awakening to itself, forgets the infinite sea of which it is just a gesture. The ripple therefore feels set apart from infinity, isolated, separate... the ripple creates ever tighter and more restricted modes of consciousness...

Thus, this movement from the higher into the lower – which is *involution* – is at once an act of pure creation and effulgent radiation [on the part of Brahma] and a tragic tale of suffering [for the ripple]... The ultimate aim of *evolution* – the movement from the lower to the higher – is to awaken as Atman [Brahma].⁶⁶

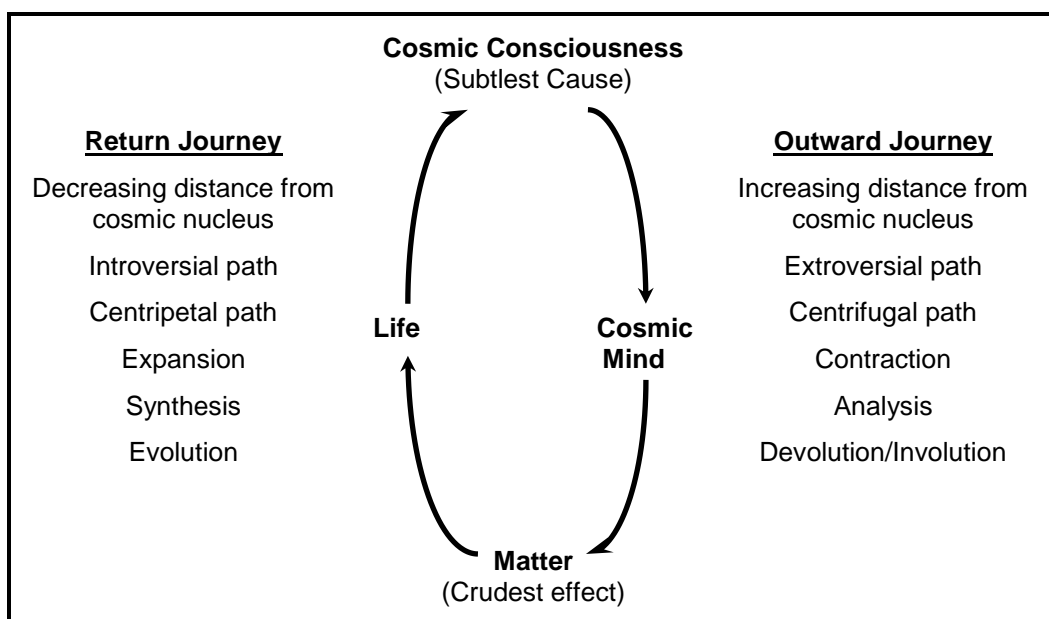


Figure 5: The outward and return journeys of Brahma Cakra.

Macrocosm and microcosms

During the outward journey the sentient principle at first dominates then the mutative and finally the static. As a consequence, the waves emanating from the Cosmic nucleus acquire shorter wavelength, so generating the spectrum that underlies the great chain of being. At key points along the spectrum, the character of the three relativities changes abruptly so creating new spaces or worlds (*lokas*) each with its unique kind of time, space and particle charge (Figure 6).

The outward journey therefore creates the Cosmos as a whole. The word *Cosmos* derived from the Greek, *Kosmos*, means *ordered whole*.⁶⁷ Sarkar uses the term *Macrocosm* to include not just the physical universe but also Cosmic Mind and Cosmic Consciousness. Within the Macrocosm are all the raw materials required for embarking on the return journey of Brahma Cakra.

The return journey begins when the three binding principles gradually withdraw their influence, first the static, then the mutative and finally the sentient. The effect is not a withdrawal of Cosmic Mind but rather the building of unit structures, *microcosms*, of ever increasing complexity and subtlety. Western science understands this to be the evolution of life – atomic matter gives rise to bacteria which give rise to plants and animals which in turn give rise to humans. Eventually the human mind becomes subtle enough to merge back into pure undifferentiated consciousness. Thus the completed cycle is:

Cosmic Consciousness → Cosmic Mind → Matter →
Living organisms having Unit Minds → Cosmic Consciousness.

Although the cycle follows a circular sequence of cause and effect, it happens everywhere simultaneously, just like the water cycle can be drawn as a cycle but in reality happens everywhere simultaneously. Thus there is no point asking what the universe looks like at the end of devolution prior to evolution. As Sarkar puts it, Brahma Cakra is the “eternal dance of Macrocosm”.

The unit living structures (microcosms) generated during evolution live within the Macrocosm and are built from the physical and mental ingredients created during devolution. The atoms that constitute a human body are no different from those in the universe at large and likewise human mind stuff is the same as that of the Macrocosmic mind. Note that Brahma Cakra agrees with materialists who argue that human mind emerges from matter but it traces the chain of cause and effect back further to say that matter originally came from the ‘stuff’ of Cosmic Mind.

Despite being made of the same ‘stuff’, there is an important difference between unit (microcosmic) mind and Cosmic Mind. The former emerges out of and ‘sits on’ a physical base. The human mind for instance, emerges out of the physiological clash and cohesion of cellular metabolism. The dependence of unit mind on its physical base limits its jurisdiction, just as a tall building cannot extend sideways beyond its foundations. By contrast the Cosmic Mind is prior to and independent of the physical universe and consequently has seemingly unlimited jurisdiction. The human mind is imaginative and creative. The Cosmic Mind, being of the same stuff, is also imaginative and creative but vastly more

capable. What it imagines is the entire material universe with all its galaxies, stars, atoms and so on.

The outward journey of Brahma Cakra creates the seven Macrocosmic worlds (lokas). There are many sub-worlds but the detail is not necessary and indeed not understood for higher levels. The waves which pass through the Macrocosmic worlds may either be in motion or 'standing'. *Standing waves* take on a closed, shell-like structure (*kosa*). We may compare them to eddies and whirlpools by the bank of a fast flowing stream. They possess no fixed boundary yet take on a life of their own. Both the Macrocosm and the microcosms contain kosas as part of their coarse and fine structure.

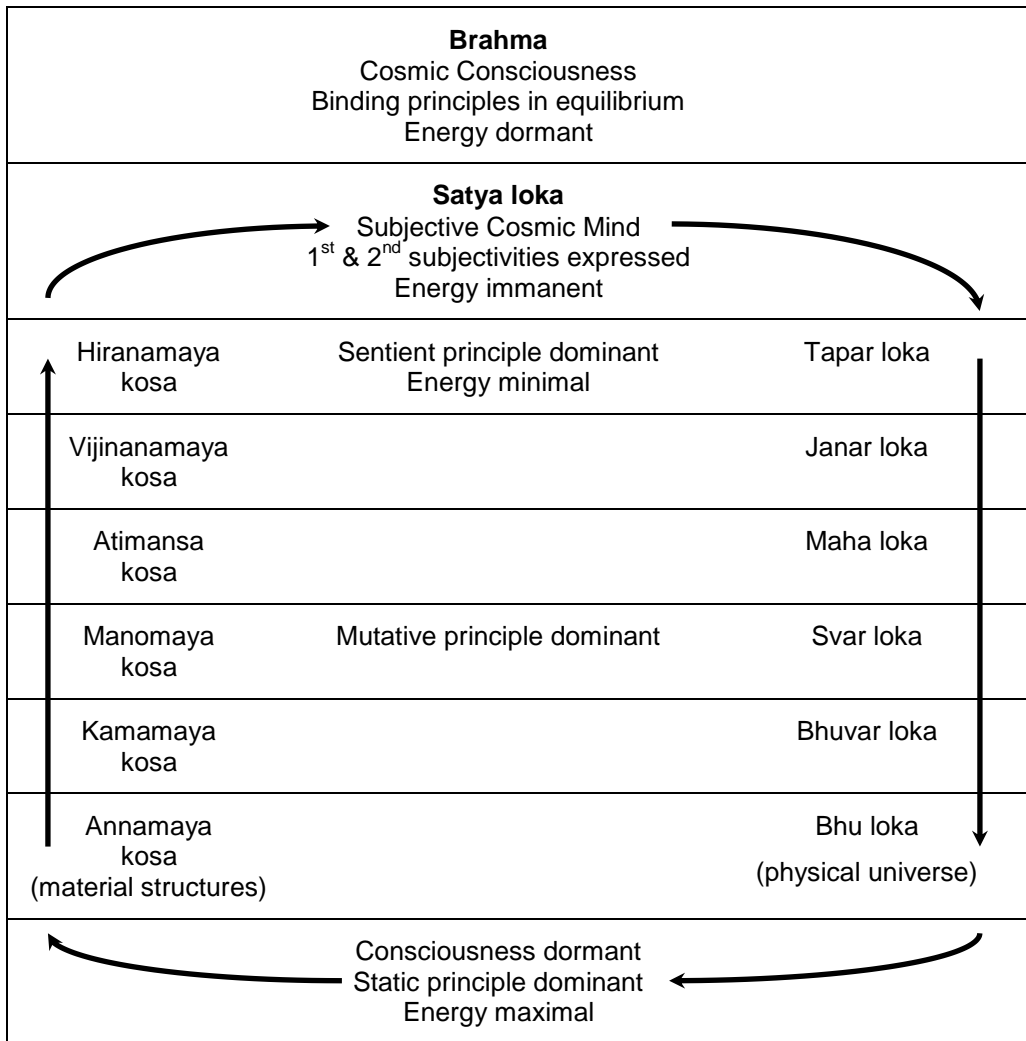


Figure 6: The cycle of creation creates and cycles through the lokas (spaces or worlds) and the kosas (structures composed of standing waves). Note: There are both Macrocosmic and microcosmic kosas.

The Outward Journey – analysis, compression, condensation

The first objective manifestation of creation is the *aum* vibration. At this point the totality of all particles ever to be created has already come into existence. The effect of the binding principles on the resultant of this preliminary act of creation is repeated cycles of subdivision (analysis), compression and condensation, so generating spaces within spaces, lokas within lokas. These cycles continue onwards to create the five levels of the physical universe, ethereal, aerial, luminous, liquid and solid, or in Sarkar's terminology the *five fundamental factors*. See *The Structure of Matter* in this volume for a discussion of the five fundamental factors and their relation to the kinds of matter known to Western physics.

Sarkar's description of the outward journey of Brahma Cakra is almost entirely concerned with the creation of the physical universe, presumably because it is most well-known to us. But we may assume (once again invoking the principle of self-similarity or *as above so below*) that the creation of the higher lokas involves the same dynamics that he describes for the five physical levels.

Bala and Prana

The compressing action of static principle is termed *bala* (Figure 7).

The external pressure of the static principle on the aforesaid five factors [ethereal to solid] is known as *bala*. As a result of this *bala*, two opposing forces develop, one centrifugal and the other centripetal in character. The centre-seeking or interial force tries to maintain the structural solidarity of the object; while the centrifugal one has a fissiparous tendency, that is, it tries to split up the object into thousands. The collective name of these external and interial forces is *prana* or 'energy'.⁶⁸

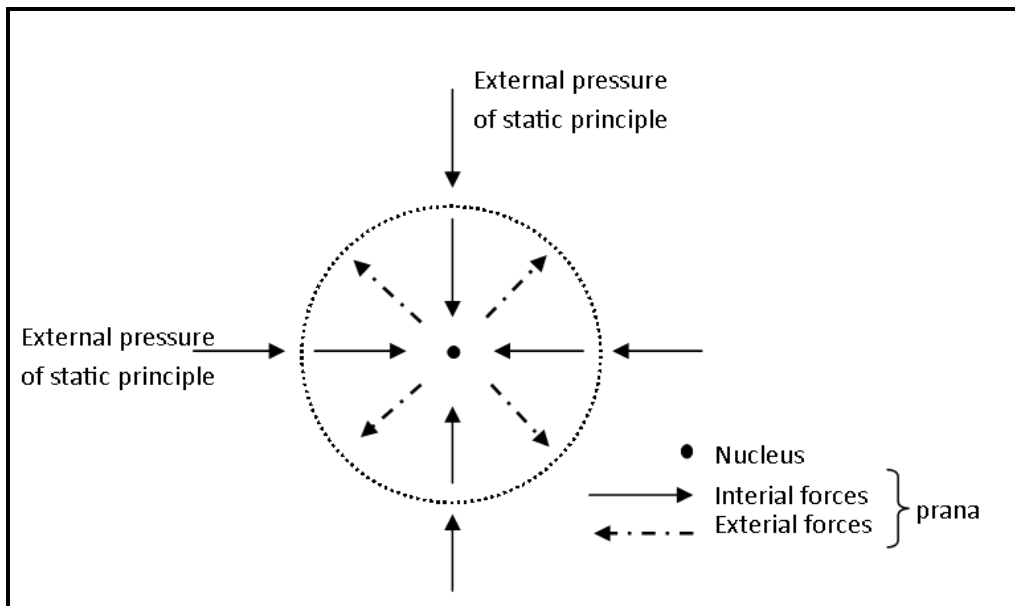


Figure 7: The consequence of *bala* (the compressing effect of static principle) is to generate *prana*.

We can illustrate the repeated cycles of analysis and compression using an example from Western cosmology. Shortly after the big bang, the universe is believed to have consisted of a perfectly smooth distribution of atomic matter.⁶⁹ Not quite perfectly smooth because small quantum fluctuations allowed focal points to develop, slight concentrations of matter that attracted more matter due to gravity. Ultimately these clusters of atoms became galaxies and stars. In short, structure appeared in a previously smooth distribution of matter due to two factors, quantum fluctuations (division) and gravity (interpreted in Brahma Cakra as *bala*, an externally applied compression). The pull of gravity however accelerated matter towards each focal nucleus, so increasing cluster temperature. For each cluster, a point was reached (depending on its size) where the inward pull of gravity balanced the outward thermal pressure. The structural integrity of the celestial bodies so formed therefore depended on two factors: a balance of interial and exterial forces (the combination of which in Sanskrit is called *prana*, Figure 7) and the persistence of a focal nucleus. The concepts of prana and pranic nuclei are quite general in Sarkar's cosmology. They apply to all kinds of celestial, molecular and biological structures and even to social structures.

Let us suppose that compression continues and prana increases inexorably. At some critical point the pranic tension (clash of opposing interial and exterial forces) must be defused or the structure will explode. Such a fate is avoided by *condensation* – the creation of a new kind of cruder space and particle *within* the existing space. An obvious physical analogy is the condensation of water vapour due to compression. The end result is a denser particle world ready for a new round of division, compression and condensation. Thus during the outward journey of Brahma Cakra (devolution), condensation defuses the ever-increasing static tension (prana) by absorbing some part of that energy into newly created worlds having their own time, space and particle.

The Big Bang

We may suppose that repeated iterations of division, compression and condensation generate all the lokas (and their sub-layers) and then successively the five fundamental factors of the physical universe. This process however cannot continue indefinitely. There comes a point, after the formation of solid factor (the densest form of matter), where the build-up of static tension cannot be released by another episode of analysis and compression. Instead the unresolved accumulation of static tension is finally released by a violent reaction (Sanskrit, *jadasphota*) in which the solid object is blown apart into smaller physical particles (shown in Figure 8 as the reverse dotted arrow). Solid factor is converted back to the subtler physical factors, liquid, luminous, aerial and ethereal. Jadasphota is very familiar to us in the form of supernovas (exploding stars) and nuclear explosions. The origin of our universe in the *big bang* was also jadasphota. The enormously high energy and density of the seed universe required to initiate the big bang (at least according to contemporary cosmology⁷⁰) is consistent with the notion of a highly compressed state of matter at the nadir of Brahma Cakra.

Note that according to this interpretation, our physical universe arose from some unstable point in a *pre-existing* physical universe and exactly the same notion is being explored in new versions of string theory – physical universes spawn new physical universes. Theoretical physicists are exploring various ways this might occur but of course the concept is a long way from being confirmed observationally.⁷¹

Wear and tear

In addition to “instantaneous jadasphota”, Sarkar also refers to “gradual jadasphota” or “wear and tear” which can be illustrated using the earlier example of a collapsing celestial gas cloud. The cloud’s on-going structural integrity depends on a balance of internal and external forces and the maintenance of a nucleus. If, in some part of the cloud, the external influence dominates, that part of the nascent star or galaxy will slough off. The concept is quite general for biological, social and celestial structures and is illustrated in Figure 8 by the reverse (anticlockwise) arrows. Concerning the evolutionary side of Figure 8, it is important to bear in mind that all living structures sit on a physical base. Thus the reverse arrows on the left side of Figure 8 can be understood as wear and tear of the physical base. The concept of “wear and tear” brings us to *entropy*.

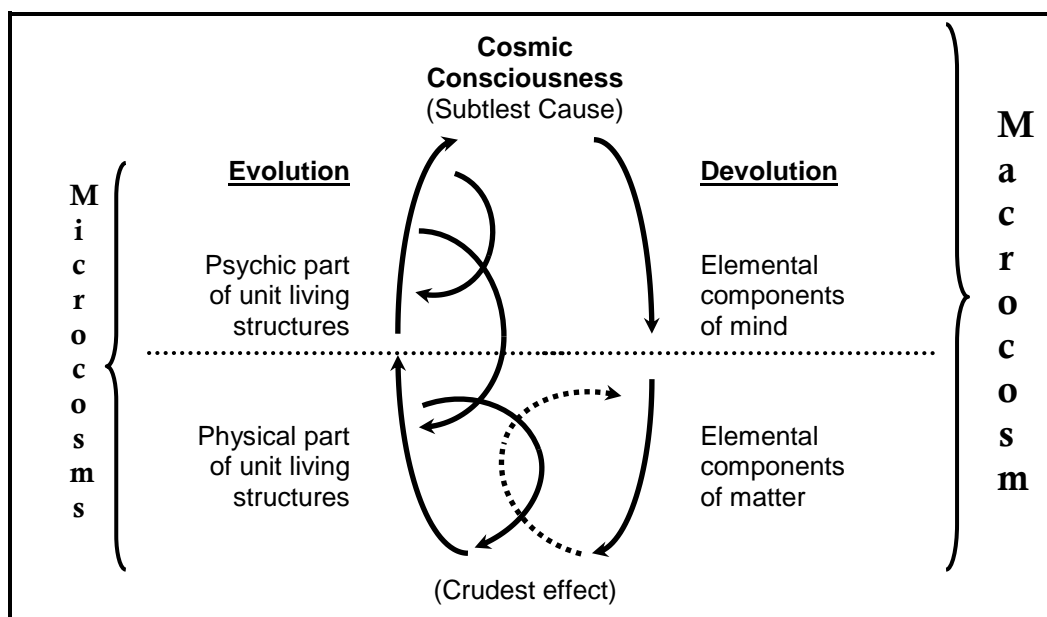


Figure 8: Brahma Cakra from the perspective of the Macrocosm and microcosms. Note that energy can also cycle in the reverse direction subject to constraints – see text. The dotted arrow represents the phenomenon of *jadasphota* – see text.

Entropy

The concept of entropy is fundamental to modern cosmology and we must ask where it is to be found in Brahma Cakra? Entropy is a measure of how evenly energy and matter are distributed through a system composed of many parts and

therefore able to exist in many states.⁷² The second law of thermodynamics states that the entropy of a closed system always increases, that is, closed systems evolve spontaneously towards greater energy dispersal. For example, a small amount of gas released in one corner of a room will quickly disperse through the room. Entropy is also a measure of system disorder and probability. A system having maximum energy dispersal is more disordered and more probable because a dispersed state can happen in so many more ways than an ordered state.

If the physical universe is a closed system, as is contemporary belief, it must have begun in a very low entropy (low disorder, low probability) state and have been moving spontaneously ever since to higher entropy states.⁷³ Indeed it is argued that spontaneous entropy increase gives rise to our sense of time as moving forward in one direction.⁷⁴ It also follows that if the universe is a closed system, it must one day reach a maximally dispersed energy state from which there is no escape, the so-called *thermal death* of the universe. Sarkar makes a special point of saying this will not happen because the physical universe is not a closed system but rather an intermediate stage in a flow of consciousness and energy through the cycle of creation.

The Meaning of Entropy

There is a subjective and objective side to every phenomenon and the subjective endows meaning. Entropy can be interpreted subjectively as the attempt of a system to find maximum *freedom* within the constraints imposed on it. All substance, including matter, has an innate resistance to being confined, ordered and structured. Non-attributional Cosmic Consciousness may be considered a state of infinite freedom because there are no boundaries or spaces in which any entity could be confined. The action of the Operative Principle is to demarcate spaces (*quantum microstates* in the language of physics) and confine particles within them. As Consciousness becomes increasingly divided there arise innumerable possibilities to combine particles and spaces. However, as if to rebel against their confinement, particles adopt configurations that maximise the freedom available to them – rather as prisoners distribute themselves throughout their exercise yard. All substance strives to return to its original state of infinite freedom.

Black holes provide an interesting illustration of this principle. They are the densest manifestations of matter, so massive that not even radiation escapes their boundaries. They are the ultimate example of *pranic* tension without *jadasphota* taking place. Physicists understand this by noting that black holes trap entropy (disorder). In fact, although to the outside observer a black hole is the ultimate confinement of matter, internally they are the highest entropy structures in the known universe. That is, from a matter particle perspective, the inside of a black hole offers the greatest possible freedom anywhere in the physical universe.⁷⁵ Surely the ultimate physical contradiction!

Entropy also has a more obvious meaning from the human perspective. The survival of life depends on maintaining highly ordered physical structures in a low entropy state. Thus all life, plant, animal, human and social, is engaged in a

constant struggle against the fissiparous influence of entropy (the reverse arrows on the left side of Figure 8).

The Speed of Light

In Brahma Cakra, the gradual and instantaneous dissociation of physical structures meets with an obstacle. Solid factor can dissociate into the four subtler factors, ethereal, aerial, luminous and liquid, but it cannot go beyond ethereal factor – it cannot dissociate into the subtler waves of the Cosmic Mind. In the language of Brahma Cakra, matter is a thought projection of the Cosmic Mind and Cosmic Mind refuses to withdraw its thought projection. Thus matter is trapped.

Is there any phenomenon in the physical sciences that might reflect this obstruction? I suggest that the limiting speed of light is just such an obstruction. Any matter particle which attempts to approach the speed of light accumulates extra mass and therefore remains trapped in physicality.

We can understand this phenomenon intuitively as follows. If a matter particle were to increase its speed without restriction, theoretically there would be nothing to stop it eventually acquiring infinite speed in which case it would be in all places at one time, that is, it would become omnipresent. But only Cosmic Consciousness has this attribute. The limiting speed of light is a boundary condition which separates matter from the subtler entities of mind and Consciousness.

The physical universe is therefore trapped between two boundaries – at the subtle end by the limiting speed of light and at the crude end by *jadasphota*. Although trapped, the physical universe is not a closed system. There is a continual inflow of Cosmic Mind stuff to become ethereal factor and there is continual outflow by way of conversion of matter into the mind stuff of plants, animals and humans. However neither inflow nor outflow can be significant in terms of the energy and mass that physicists normally measure otherwise discrepancies would show up in their energy accounting. The conservation of energy is a fundamental empirical law of physics which implies that the universe is an energetically closed system.

At the time of publication, a group of scientists working at CERN in Switzerland has just announced that neutrinos appear to travel faster than the speed of light.⁷⁶ If proven to be correct, this discovery will rock the foundations of contemporary physics. For our purposes the discovery reminds us to be cautious about the way in which we pursue parallels between Western science and Eastern cosmology.

The Evolution of Life

The return journey of Brahma Cakra does not retrace the same path as the outward journey (Figure 5). Instead it builds structures using the raw materials created during the outward journey. It is best described as *evolution by synthesis*.

Evolution by Synthesis

From the perspective of materialism, evolution generates structural and behavioural complexity in matter. Increasing complexity is most apparent if we trace a path through the tree of life from atoms to humans:

Atoms → Small molecules → Macromolecules → Prokaryotic cells⁷⁷ (i.e. bacteria) → Eukaryotic unicells (i.e. protozoa) → Multicellular plants and animals → Reptiles → Mammals → Apes → Human beings

Increasing complexity is not limited to individual organisms. Life's macrostructure (the exterior-collective quadrant of the AQAL schema) also becomes more complex with the emergence of diverse communities, ecosystems and biomes. Likewise with the advent of humans, there is increasing complexity of social macrostructure that is, family, tribe, kingdom, nation and global society. For the purposes of comparing Western science with Brahma Cakra, we must reduce the evolution of complexity to a few major steps (Figure 9, left side):

atoms → cells → human beings → global society

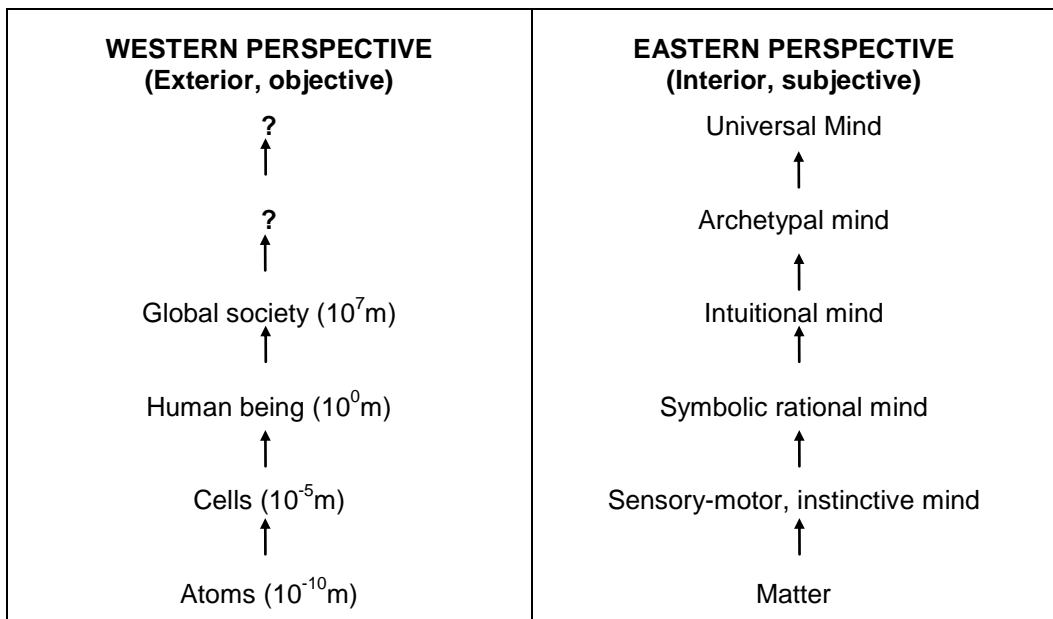


Figure 9: Western and eastern descriptions of evolution. The former concentrates on objective physical structures, the latter on subjective mental characteristics. Figures in brackets indicate typical size scales for the structure. 10^{-5}m is the size of a large bacterium or small eukaryotic (nucleated) cell. 10^7m is the diameter of earth. Obviously, these evolutionary steps represent big jumps. Between a cell and an organism, there are tissues, organs and organ systems. The sequences have been written this way to reveal the correspondence between the two. Both admit sub-steps.

From the exterior (objective) perspective, each step in the above sequence involves billions of parts making a whole. That is, evolution by synthesis creates holoarchies. Every holoarchy is a pyramid that sits on a physical base – the higher

up the holoarchy, the larger the physical base. The largest possible physical base is the universe. *Pyramidal structure* is common in both natural and human organisations and its investigation comes within the domain of *systems theory*.

From the interior (subjective) perspective, evolution unfolds higher layers of mind with increasingly subtle and expanded consciousness (right side of Figure 9). We may compare it to the opening of a flower in which successive layers of petals reveal their charms in turn.

For the remainder of this section we consider the evolution of life from the external (objective) perspective. In the next section, *The Evolution of Consciousness*, we consider the internal (subjective) perspective.

The Synthetic Reaction

The big three objective synthetic steps (left side of Figure 9) can be written as a sequence of ‘chemical reactions’:

- | | | | | | |
|-----|-------------|---|----------------|---|------------------------|
| (1) | many atoms | ⇒ | cell | + | instinctive mind |
| (2) | many cells | ⇒ | human being | + | symbolic-rational mind |
| (3) | many humans | ⇒ | global society | + | intuitional mind |

Synthesis produces wholes that are *more than the sum of their parts*.⁷⁸ In each case the first product on the right hand side is the *sum of parts* and the second product is the more subtle *emergent part*. The sum of parts and the emergent part are inextricably meshed to constitute the whole. Note that the parts are not purely material (although that is what we see objectively) because they are themselves the products of prior synthetic reactions.

There is a symmetry between the three equations which Western science understands in terms of *autopoiesis*.⁷⁹ Autopoiesis means *self-creating* or *self-producing*. The original proposal, due to Chilean biologists Maturana (1928-) and Varela (1946-2001), combined biological concepts, such as homeostasis, with systems theory. Further syntheses took place with cognitive science, phenomenology and Buddhism. Today the proposal has evolved into a new paradigm of the natural sciences known as *enactivism*.^{80 81 82} Here we are concerned only with autopoiesis, but we approach the concept in gradual steps.

1. Ordered complexity: The whole in each of the above equations is composed of billions of parts. Furthermore there is a diversity of parts in each case – a cell contains many kinds of atom and a human being many kinds of cell. Not surprisingly the wholes are complex but they are also ordered. The ordered complexity of cellular structure or of the modern industrial state is self-evident. By contrast, a rock crystal has a highly ordered structure but it is not complex, while a turbulent flow of water has complexity, but its dynamics are chaotic as opposed to ordered. Computer modelling suggests that the *ordered complexity* of living systems resides close to the boundary between order and chaos, the so-called *edge of chaos*.⁸³

2. Unstable equilibria: Residing on the boundary between order and chaos is like walking a tight-rope – equilibrium exists but it is unstable. We must distinguish

stable from *unstable* equilibria. A marble in the bottom of a bowl is in stable equilibrium. After a disturbing force, the marble returns to its original position. Balancing a broom on one's finger-tip and walking a tightrope are examples of maintaining an unstable equilibrium. Constant adjustments are required to remain upright. The equilibrium collapses if one's attention wanders. Sarkar describes life as "a ceaseless fight to restore an unstable equilibrium... Fight is the essence of life".⁸⁴

The equilibrium point for a tightrope walker is easy to define – it occurs when his/her centre of gravity is vertically above the rope. The equilibrium point for a living system is more abstract but, according to Sarkar, conceptually similar. Recall that the stability of a composite structure depends on its external and internal forces finding a common focus, the *pranic nucleus* (Figure 7). The stability of a living system depends on finding a common focus for its many pranic nuclei. Such systems, says Sarkar, have *vital energy* (*pranah*). Vital energy is not a new kind of energy – it refers to the ability of a living system to maintain its unstable equilibrium.

If maintaining an unstable equilibrium is energetically expensive, why should life have evolved this way? An obvious answer is that unstable systems are able to respond rapidly to a small stimulus (for example, the fright and flight response in animals). By contrast, stable equilibria are sluggish. *Irritability* (one of the key characteristics of life) thus depends on maintaining an unstable equilibrium. Note: some enactivists use the adjective *precarious* to describe systems that maintain an unstable equilibrium.⁸⁵

3. Reservoirs: In fact living systems must maintain many kinds of internal, unstable equilibria (known as *homeostasis*), each of which requires regular adjustment. Regular adjustment, in turn, requires ready supplies of energy and material resources (food). Cells maintain constant internal concentrations of sodium, potassium and chloride ions, despite external fluctuations. Mammals maintain constant blood glucose and body temperature despite environmental fluctuations. Societies attempt to maintain food availability despite fluctuating agricultural yields. Without ready availability of food and a congenial environment, life cannot survive.

Sarkar generalizes this concept with the principle of *prama trikona*. "Whenever there are three or more forces operating, the tendency is invariably to form a stable triangular figure."⁸⁶ *Prama* means "well measured" and *trikona* means a "three sided figure", a triangle. Being inherently stable, triangles persist, where other polygonal structures tend to collapse. The concept is useful in the context of unstable equilibria. As an example, Sarkar uses the economic market for rice. One side of the triangle is rice production, the second is rice consumption (demand) and the third side is a stockpile of rice. Stability in this case is achieved by arranging for the rice stockpile to fill in times of plenty and diminish in times of scarcity. The object is to maintain price stability. More generally, the maintenance of reservoirs (starch, protein, fat globules inside cells; fat and carbohydrate stores inside the human body; food silos and drinking water dams inside societies) is absolutely essential for the survival of precarious living systems.

4. Open systems: Complex, far-from-stable-equilibrium structures are highly improbable. They have low entropy. Without expenditure of energy, the entropic tendency of the parts will win out and the structures will decay (as indicated by the analysis arrow in Figure 10). Living systems apparently defy the second law of thermodynamics (that entropy increases spontaneously) because they are open systems, not closed. Open systems allow the transport of energy and matter across their boundaries. Living systems import order (in the form of food and information) and export disorder or entropy (as waste products and heat). In other words, they *dissipate* energy for synthesis, a process known as *synergetics*.

5. Autopoiesis: Autopoietic systems are complex, precarious, open systems which are also *operationally closed*. The new concept is operational closure. It simply means that an autopoietic system contains within its boundaries all the processes required to create and maintain itself. Maturana and Verela equate autopoiesis with life and with cognition (Life = Autopoiesis = Cognition).

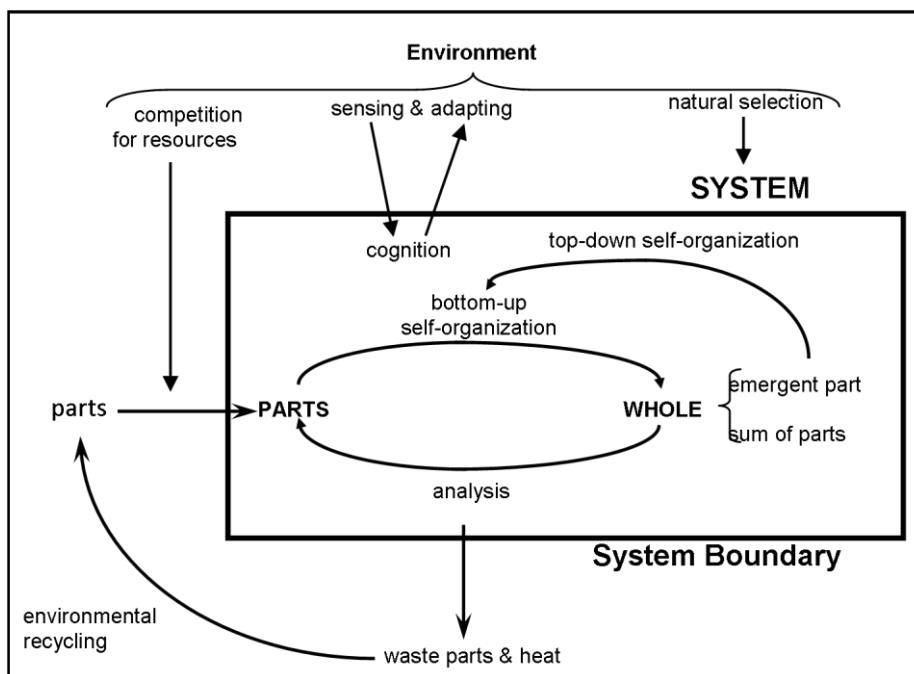


Figure 10: The structure of an autopoietic system.

However autopoietic systems have two features that force us to expand our understanding of life. First the boundaries of an autopoietic system may or may not be physical. A cell is enclosed by a membrane and an animal by a skin (physical boundaries) but the definition of autopoiesis also encompasses businesses, universities and many kinds of institutions that do not have physical bounds. The concept of operational closure means that there exists a *closed network of processes* that define the system. The processes may be metabolic, economic, contractual, etc. Thus autopoiesis allows us to recognize institutional and cultural structures as living.

Second, autopoietic systems do not necessarily reproduce themselves by asexual or sexual means. Certainly biological life reproduces this way but human institutions reproduce by apprenticeships, education and so on. Once we remove reproduction (whether sexual or asexual) from our definition of life, the universe becomes a different place. As futurist and biologist Elisabet Sahtouris writes:

Autopoiesis (continuous self-creation) shall be adopted as the core definition of life. Since galaxies, stars, planets, organisms, cells, molecules, atoms, and sub-atomic particles all fit this definition, this implies that life is the fundamental process of the cosmos, a self-creating living whole with self-creating living components in co-creative interaction.⁸⁷

6. Self-organization: There are two possible mechanisms for self-organization: 1. *bottom-up dynamics* in which structure emerges spontaneously from the interaction of parts; 2. *top-down dynamics* in which the emergent part coordinates the coming together of parts (Figure 10). The first requires only local communication between adjacent parts, whereas the second postulates global communication between parts. The two options are not exclusive.

Over the past 30 years a solid theoretical foundation for bottom-up self-organisation has been developed, for example, dynamical systems, synergetics and autopoiesis. Finding a theoretical foundation for top-down self-organisation has been slow in coming because Western scientists distrusted the concept of *emergence* with its non-material implications. Computer simulations have shown that complex systems can settle into stable patterns of behaviour even when only simple rules define the local interactions (bottom-up dynamics). These patterns are the outward manifestation of some deeper internal logic within the system. “There is order for free!” says Kauffman, one of the pioneers in the field of complexity.⁸⁸

Kauffman is enthusiastic because the ordering found in computer simulations of complex systems and simple chemical models of the same, could explain how life emerges against the ‘opposition’ of entropy. The self-organization of complex structure arises from the internal dynamics of the whole itself, in a deterministic but not easily predictable way. The difficulty with bottom-up self-organisation is that the known examples of it (certain kinds of chemical reaction as opposed to computer simulations) produce relatively simple structures far removed from the extraordinary complexity of even the simplest bacterial cell. Consequently the contribution of top-down self-organisation cannot be ignored.

7: Top-down self-organisation: The second self-organizing option, an overarching control mechanism using long range interactions, is favoured by a group of biophysicists who include Fritz-Albert Popp (1938-), Sergiy Sitko (1936-) and Vasily Gzhko.⁸⁹ Says Popp:

Without supra-molecular, long-range interactions, evolution, i.e. the development of increasingly higher levels of organization, would be impossible and, of course, senseless.⁹⁰

Popp concludes from his investigation of very low-intensity long-range photon interactions within plants, that coordination in living organisms is established by photon exchange at specific wave-lengths.⁹¹ Evolution, he argues, is driven by an

optimization principle which causes an “expansion of coherent states”, that is, incorporates longer and longer electromagnetic waves to achieve greater spatio-temporal coordination. Although Popp’s model of evolution is explained in physical terms, he states that interconnectedness at the global level is necessary to account for the emergence of consciousness.

In a sense, the whole entity of living systems is a more or less considerably interlinked developing unit. Just as cells in an organism perform different tasks for the whole, different populations enfold themselves not only for their own, but principally more for the totality of all living systems, toward expanding a ‘consciousness’ of the whole, and becoming more and more aware of it.⁹²

The Quantum View of Life

Biophysicists Sitko and Gizhko⁹³ have suggested that the long-range coordinating mechanism proposed by Popp can be given a formal treatment in terms of quantum theory. They describe living cells as fundamental quantum systems just like nuclear, atomic and molecular structures. The concept of a fundamental system has a particular significance:

...there exists a strict definition of the notion of fundamentality in natural sciences. They are the sciences in which the objects of investigation have discrete spectra of characteristic eigenfrequencies.⁹⁴

There are three levels of quantum structure, the nuclear, atomic and molecular. Each of them has its characteristic size and frequency scale and each is amenable to analysis using the quantum principles of *identity*, *discreteness* and *characteristic frequency*.⁹⁵ Victor Weisskopf (1908-2002⁹⁶) described the three levels as rungs of a *quantum ladder*. In descending the ladder (decreasing size scale), the energy of quantum transitions increases (and *vice versa*).⁹⁷ On the smallest nuclear scale, large energies are associated with nuclear reactions. On the larger scale of a protein molecule, smaller energies are involved but nevertheless energy is absorbed or emitted in quanta.⁹⁸ The stability of structures at this level is ensured by the discreteness principle, that is, a macro-molecule can only absorb or emit energy corresponding to discrete changes in its characteristic vibration.

Table 7

The quantum ladder showing the approximate scale of its rungs.

<i>Structure</i>	<i>Electromagnetic Region</i>	<i>Wavelength (m)</i>	<i>Frequency (Hertz)</i>	<i>Energy (relative)</i>
Living cell	Microwave	10^{-3}	10^{11}	1
Macro-molecule	Infrared	10^{-5}	10^{13}	1000
Atom	Optical - UV	10^{-7}	10^{15}	100,000
Nucleus	X – gamma rays	10^{-12}	10^{20}	100,000,000

Sitko and Gizhko believe that living cells constitute a fourth rung of the quantum ladder, obviously larger in size and lower in energy than the other three (Table 7). The stability of living organisms (and their taxonomic groupings) is therefore due to the three quantum principles. In particular, they believe that cytoplasmic membranes act as oscillators producing mechanical (sound) and electromagnetic waves.⁹⁹ The important point is that the waves produced have a wavelength similar to the scale of the structure itself and therefore have the potential to coordinate activity across the scope of the structure.

An important concept here is *coherence*. If a structure is composed of billions of parts which only interact locally, it is difficult to explain how distant parts coordinate their activity, that is, how they display coherence. Coherence in living systems requires: 1. efficient long-range forces that produce oscillations on the scale of the system within a restricted frequency range; 2. the internal infrastructure and resources to produce those oscillations; and 3. quantum properties to ensure stability of the system.

Parallel descriptions

We have arrived at this point from a discussion of bottom-up and top-down modes of self-organization. Bottom-up mechanisms include synergetics and autopoiesis. Top-down mechanisms depend on quantum principles. Sitko and Gizhko regard the quantum and synergetic descriptions of life as complementary accounts of the same phenomenon.¹⁰⁰ The two necessarily occur together in order to account for the emergence of living systems. They then extend these complementary descriptions *down* the quantum ladder to include molecules and atoms. In other words atoms are synergetic systems as well as quantum systems.

The dynamic stability of an atom, as of a dissipative system, is created at the interchange between virtual photons with the physical vacuum.¹⁰¹

We may represent this exchange more generally in the following equation:

$$\text{quantum vacuum} \leftrightarrow \text{virtual particles} \leftrightarrow \text{physical particles.}$$

Having arrived at this fundamental description of subatomic matter, it is time to introduce Sarkar's *theory of microvita* into our account of Brahma Cakra.

The Theory of Microvita

Each of the three synthetic reactions (Figure 9) produces a level of mind on the right hand side. Mind is a substance. If we are to understand the three equations in greater depth we need now to consider what kind of substance mind is. Note that such a question is unusual in Western philosophy because we are treating mind objectively, that is, we are placing it in the exterior-individual quadrant of the AQAL schema. In traditional Cartesian dualism, mind is always subject.

The theory of microvita is best approached as a theory of fundamental substance. Sarkar introduces the theory in the context of matter particles. Microvita are an intermediate form of particle, a "silver lining", between matter and pure idea. "Microvita are the initial stage of matter...microvita are transmuted into matter

and matter is transmuted into microvita.”¹⁰² Furthermore there is a continual creation and destruction of microvita which we can best interpret as an exchange of microvita between particle and vacuum state. We write this two-way flux of microvita as follows:

ethereal space ↔ microvita ↔ physical particles.

The parallel with virtual particles in the previous equation is clear and I suggest we can understand microvita as virtual particles. Physical particles continually exchange microvita (and energy) with other particles and with the vacuum state. *Ethereal space* refers to the substance of space-time or the vacuum state. According to Sarkar, matter particles such as electron and quark are not singular entities but rather ‘condensations’ of innumerable microvita.

Sarkar now takes a significant step – the relationships which exist between matter, microvita and ethereal space in the physical arena are extended to the psychic arena, the world of mind. In fact, they apply to the entire spectrum of energy and substance, from the crudest to the most subtle, as expressed in the following equations for the two ends of the spectrum:

ethereal space ↔ crude microvita ↔ physical structures

psychic space ↔ subtle microvita ↔ psychic structures.

Thus the theory of microvita is a particle description of the matter-mind spectrum which complements the wave description of Brahma Cakra. We may think of mind as either a wave or a particle phenomenon.

The theory of microvita is more completely elaborated in other essays in this volume. Three concepts are important for this essay. First, microvita are amenable to quantum treatment; second, they participate in both bottom-up and top-down processes; third, the microvita which constitute electrons, neutrons and protons include both crude physical and subtle mental kinds. In other words, every atom has both crude and subtle parts – every atom has a dormant mind. We return to this idea later. It will be our starting point for understanding how unit mind arises from the cellular metabolism of plants and animals.

Quantum evolution

We introduced the return journey of Brahma Cakra as three giant steps: atoms ⇒ cells ⇒ humans ⇒ global society. Of course, the entire sequence has proceeded through innumerable steps but the process is not, as Neo-Darwinists would have us believe, simply an accumulation of miniscule changes. The fossil record indicates that there were indeed long periods of time, sometimes millions of years, when the biosphere remained stable but these were interrupted by periods of extremely rapid change. From this observation, Niles Eldridge (1943-) and Stephen Jay Gould (1941 - 2002) developed the theory of *punctuated equilibrium*. There is much debate about the mechanism of rapid evolutionary change. According to the palaeontologist George Gaylord Simpson (1902 - 1984) rapid change occurs when a population is much reduced in size and environmental circumstances ‘permit’ the expression of novel combinations of genes.¹⁰³ Key points in human evolution, for example, have been marked by an extraordinary

reduction in population as advancing ice forced humans into ‘islands’ of relative warmth. But the important feature of Simpson’s theory (known as *quantum evolution*¹⁰⁴) is that not all combinations of genes produce viable organisms and not all combinations of organisms produce stable ecosystems. Therefore transitions from one biological/ecological state to another do *not* occur incrementally but in *quantum steps*. In recent years ecologists have used complexity theory to understand rapid ecological, economic and social change.¹⁰⁵ It is possible that these two descriptions (quantum and complexity) will turn out to be complementary just as Sitko and Gizhko consider the quantum and synergetic descriptions of life to be complementary.

The Evolution of Consciousness

From the physicalist perspective, it is not obvious how complex structures composed of inert atoms become conscious. According to Neo-Darwinism, consciousness is a by-product of the brain’s extraordinary neural complexity. “Perhaps”, says Dawkins, “consciousness arises when the brain’s simulation of the world becomes so complete that it has to include a model of itself.”¹⁰⁶ Not all biologists find this convincing. Fritz Popp, for example, is concerned that Neo-Darwinism has become a theory which cannot in principle be falsified. It strictly forbids teleological or deterministic explanations for the origin of consciousness and yet the theory can be used to contrive *ad hoc* after-the-fact explanations for any observed evolutionary process.¹⁰⁷ It should be emphasized that Popp is *not* questioning the *fact* of evolution or the great antiquity of life, just the exclusively Neo-Darwinian mechanism by which it is said to occur.

We approach the evolution of consciousness by situating it in the larger context of the Brahma Cakra cycle. The cycle begins and ends in a non-dual state of consciousness and passes through dualism:

non-dualism \Rightarrow dualism \Rightarrow non-dualism.

Sarkar develops this concept in his critique of the various schools of Indian philosophy¹⁰⁸ and offers it as a resolution of debates about the doctrine of illusion.

...the jīvas [microcosms] indeed proceed from dvaeta to Advāeta [dualism to non-dualism], but ... the dualistic nature of the jīvas, and their emergence on this earth, is due to the fact that they have come out of Parama Puruṣa [Cosmic Consciousness] in the centrifugal movement of His creation. We come therefore to the final conclusion that the jīvas are initially non-dualistic in nature. It is only in the middle stage that they are dualistic in nature. Later they ... return to their non-dualistic character. Thus ... the real philosophical stance should be Advāetadvāetadvāetavāda, that is, non-dualistic dualistic non-dualism.¹⁰⁹

On the return journey, dualism evolves back to non-dualism. Recall that dualism is a relationship between subject and object and that in the AQAL schema we distinguished three kinds of subject-object relationship. Thus there are three ways that we can approach consciousness as the subjective aspect of evolution.

1. Evolution of self

We noted previously that in ascending the levels of the AQAL schema, the interior-exterior relationship changes. Sarkar explains this in terms of the three binding principles, sentient, mutative and static. The sentient principle is responsible for the “existential-I” feeling and mutative principle for the “doer-I” feeling, two aspects of self. On the return journey, the static principle wanes first, then the mutative and finally the sentient. The effect is that static principle dominates in the physical world, mutative principle in the human world and sentient principle in the transpersonal and spiritual worlds.

Sarkar notes two milestones on the return journey. The first occurs when the influence of the mutative principle exceeds that of the static, at which point *intellect* manifests in unit structures. The second occurs when the influence of the sentient principle exceeds the mutative at which point *intuition* manifests.¹¹⁰ Thus human intuition in the present day is poorly developed compared to intellect. But from the perspective of Brahma Cakra, the future evolution of humanity will increasingly concern the emergence of intuition.

The increasing influence of sentient principle on the return journey (relative to the mutative and static principles) results in the expanding domain of self (the interior). In human evolution, self-identity gradually expands from individual concerns to those of family, community, country and planet. Self can only exist in relation to *other* (the exterior) but with the expanding domain of *self*, the domain of *other* diminishes and human consciousness moves into the transpersonal world. In the final stage, there is non-dualism, no boundary, no division of self and other.

2. Expansion by Synthesis

The second subject-object relationship in the AQAL schema is that between levels. Evolution proceeds by a succession of syntheses in which parts become wholes. If we consider the evolution of life in its biggest steps,

Atoms \Rightarrow Cells \Rightarrow Humans \Rightarrow Social system,

then each whole belongs to an AQAL level one above its immediate parts. The domain of unit consciousness expands by synthesis – the whole becomes subject to the parts and the parts become objects to the whole. Thus the mind of a cell is subject to its constituent atoms but, from the perspective of a human being, his/her cells are objects. Subjects appropriate objects. Sarkar calls this theory *Supreme Synthetic Subjective Appropriation* (SSSA).¹¹¹

3. Yoga or union

The third subject-object relationship in the AQAL schema is that between collective and individual, which we interpret here as the Macrocosm-microcosm relationship. Recall that this relationship is of great spiritual significance yet is curious because the human being relates as object to Cosmic Consciousness who is subject.

The separation of self from other is a source of much frustration for human beings. Recall Wilber’s description that dualism is “a tragic tale of suffering”. We

may interpret the struggle of evolution by synthesis as a struggle to reduce the gap between self and other. But the evolutionary steps from atom to social system have taken some billions of years and we are still struggling with globalization. The significance of spiritual practices in human life (for example, the eight practices of austanga yoga) is that they accelerate the process by which *yoga* can be achieved. Yoga in this second sense means *union*, the union of individual consciousness with Cosmic Consciousness. Thus throughout their lives, every human being is engaged in two kinds of struggle: the individual struggle for self-realization through spiritual practice and the collective struggle to evolve by synthesis.

The Law of Consciousness

Note that the logical progression of each of the three subject-object relationships described above culminates in Cosmic Consciousness. Thus we state a fundamental law of the cosmology: *expansion of consciousness drives evolution*. This is the *law of consciousness* which has a similar status in Eastern cosmology to the *law of entropy* in Western cosmology. The interplay of these two opposing tendencies lies at the heart of evolutionary struggle. Expansion of consciousness builds life; entropy, if allowed to become dominant, destroys it (see the forward and reverse arrows on the left side of Figure 8).

That expansion of consciousness drives evolution has been proposed by such disparate Western philosophers as Teilhard de Chardin and Hegel but the issue has become hugely controversial due to religious fundamentalists muddying the debate with creationism. To reiterate: the fact of evolution, its antiquity and the contribution of competition and natural selection in shaping structural complexity are not under question. The assertion is that subtler factors also have a role.

The Biological Equation

The origin of life

The first synthetic reaction concerns the origin of life and the appearance of mind stuff from matter. The origin of life is a fundamental puzzle of science. The machinery to replicate and manage the business of staying alive, even within the simplest of bacterial cells, is breath taking in its complexity. The complexity appears to be irreducible and there is no satisfactory account for its origins which falls entirely within the ambit of known physical processes.

Structure on the astronomical scale is explained by the force of gravity and structure on the atomic and molecular scales is explained by the nuclear and electro-weak forces. There is no known physical phenomenon on the scale of living organisms (microns to meters) to explain biological complexity. Another puzzle is that life seems to have appeared on earth almost as soon as it possibly could have – probably even while the oceans were still boiling. Furthermore, it seems quite possible that life may have arisen more than once because its first vestiges may have been wiped out time and again, sterilized by cataclysmic

collisions of planetary bodies in the early solar system. In other words, nature did not require endless time to hit upon the secret formula of life by chance.¹¹²

Building the complex structures of life requires information and synergetics. For living cells that information is encoded in genes. But what and where was the information to build life prior to genes? Physicalist explanations for the origin of life focus on bottom-up and top-down approaches. The bottom-up approach attempts to understand life as an emergent property arising out of the self-organization of its molecular parts. The top-down approach posits a role for gravity. For example, given that the precursors of biological molecules are found throughout space, physicist Penrose has speculated that gravity might be able to influence biological molecules through some quantum process.¹¹³

According to physicist Paul Davies, “Real progress with the mystery of biogenesis will be made, I believe, not through exotic chemistry but from something conceptually new.” The secret of life, he says, “lies not in its chemical basis, but in the logical and informational rules it exploits”. Davies believes new laws of information are required: “My proposal means accepting that information is a genuine physical quantity that can be traded by ‘informational forces’ in the same way that matter can be moved around by physical forces.” It should now be clear that, from the perspective of Eastern philosophy, the ‘informational forces’ for which Davies is searching are not all necessarily physical.

The Origin of Mind

According to the theory of microvita, atoms have mind. To be more precise, the fundamental constituents of subatomic particles include both crude physical and subtle mental particles. If atoms have mind, why do we not recognize it in a rock. Or, to pose the question another way, how does a living organism manifest mind when its molecular parts do not?

Here we invoke the previously described metaphor of a magnetized iron bar. Mind emerges due to a *phase change* brought about by a tight coupling of cellular structure and metabolism. We may suppose that subtle microvita distributed throughout a biological structure begin to behave coherently and thereby produce a recognizable macroscopic psychic field. What initiates this phase change? Sarkar offers a clue when he describes mind as a product of “chemical clash” and the “powdering” of the physical body.

Whenever and wherever, as a result of chemical clash, a portion of the physical body gets powdered down, that is, transformed into factors subtler than [the physical], the effect is known as ‘unit mind’. Unit mind is the product of a chemical reaction of physical clash.¹¹⁴

“Chemical clash” refers to the ceaseless making and breaking of molecular bonds in chains of anabolic and catabolic chemical reactions. Thus mind is in a constant state of production, entirely dependent on an underlying, never-ending physical metabolism. But which part of cellular metabolism? Cells expend a large portion of their energy budget on maintaining an electric tension (approximately 105 Volts/cm) across their cytoplasmic membranes. The biophysicist Herbert Fröhlich (1905-1991) believed this to be extremely significant. He proposed that cell

membranes function as transmitters of coherent radiation in the millimetre range of the electromagnetic spectrum.¹¹⁵ The proposal is not without difficulties because it requires a great degree of structural coupling in the cell to prevent thermal agitation from destroying the effect.¹¹⁶ Nevertheless Sitko has taken the proposal further to argue that:

...there exists (actually exists, because it can be measured) something that it is impossible to see – the so-called electromagnetic framework of a man ... in mm-range of electromagnetic waves. This field is formed owing to electromagnetic activity of each cell of a body, but having been formed, it coordinates, synchronizes and directs the functioning of each organ, each structure of a body in a mother's womb and after the child birth during the whole life.¹¹⁷

In this view, the tight coupling of metabolism with membrane structure generates the emission of coherent radiation in the microwave band. The process may be considered a 'powdering down' of matter since the emitted photons are derived from membrane molecules. We take this idea one step further to propose that mind is simply another form of coherent radiation emitted by cellular transmitters. The emitted particles are not photons but subtler psychic forms of radiation (microvita) derived from the atomic substance of cell membranes.

To summarize the reasoning that leads to this account of the origin of mind:

1. Observation: Living cells produce light radiation which is used internally to maintain autopoiesis. (Popp)
2. Observation: The membranes of living cells emit radiation in the microwave band. (Fröhlich)
3. Proposal: A network of cellular transmitters and receivers of electromagnetic radiation coordinates biological life. (Sitko)
4. Conjecture: The above mechanisms (the chemical clash and powering down of matter) result in the coherent radiation, both physical and psychic. Longer-wavelength psychic components are thereby incorporated into biological structure. (Sarkar)

The Sociological Equation

Recall the sociological equation:

$$\text{many humans} \Rightarrow \text{global society} + \text{collective mind}.$$

The humans on the left hand side are themselves pyramidal structures of atoms, and cells, so the synthesis of billions of organisms takes place on three levels to create an emergent 4th level, the collective mind of the human race.

The speciality of the rational level 3 mind is its ability to create and manipulate symbols. Thus humans invent spoken, mathematical, computer and musical languages to organize their world. Computer languages program robots to perform complex routines. Musical notation coordinates the finger movements of an entire orchestra. According to the sociological equation, numerous symbolic-rational minds combine to form social structures which manifest a subtler form of

mind and consciousness. This is the *transpersonal, trans-symbolic, intuitional* mind of level 4. It is poorly understood precisely because it operates just beyond the ken of everyday consciousness.

The implied connection between intuition and social phenomena is at first puzzling. It is usual to regard intuition as a personal experience. It plays a significant role in many aspects of human life, including artistic creativity, personal relationships and problem solving. Scientists acknowledge its role in moments of insight and creative genius.

... there exists a kind of intuitive intelligence which sometimes secretly guides certain brilliant minds in the early phases of their research. That concept is now rarely mentioned, least of all by scientists themselves, who tend to shy away from such a difficult-to-defend idea. But it had figured prominently in the writings of philosophers such as Baruch Spinoza, Immanuel Kant, and Henri Bergson. Arthur Schopenhauer, widely read at the time, even held that intuition is the hallmark of genius. Einstein referred to it as “Fingerspitzengefühl”, a sense or a feeling at the tips of one’s fingers, and specifically referred to intuition as necessary ... “There is no logical path to the elementary laws, but only intuition, resting on empathy gained by experience”.¹¹⁸

Mozart said of his composing;

When I feel well and in good humour, or when I am taking a drive or walk thoughts crowd into my mind as easily as you could wish. Whence and how do they come? I do not know and have nothing to do with it. Once I have a theme, another melody comes, linking itself with the first one, in accordance with the needs of the composition as a whole. It does not come to me successively, with its various parts worked out in detail, as they will later on, but it is in its entirety that my imagination lets me hear it.¹¹⁹

These descriptions suggest that intuition is not a product of logical effort (level 3 mind) but rather an integrating power more subtle than the symbolic mind. It is trans-symbolic and therefore, importantly, it is potentially accessible to everyone.

Musicians, scientists, philosophers and even the creators of public taste and fashion are all interconnected through a subtle, transpersonal mind. Every particular historical age is coloured by a style of thinking, behaving and creating which becomes its *spirit of the times (zeitgeist)*. The Romantic age of Beethoven, Wordsworth and Napoleon had its particular aspirations and style, quite different from those of the Age of Reason that preceded it and the Industrial Age which followed. The coordinating factor by which scientists, artists, politicians are creative in a particular style is the level 4 mind. Societies dance to the rhythm of a *collective intuitional mind*. When an event in this mind is experienced by an individual, it is perceived as a personal revelation. We remain unaware of its transpersonal origins.

There are times however when the exhilarating effect of level 4 mind makes itself obvious. A significant example, because it was one of the first globally coordinated musical events, was the Live Aid concert for Ethiopia in 1987. Millions of young people from Russia, Europe, the Americas and Australasia were caught by the exhilaration of doing something to help others less fortunate than themselves. Events such as these demonstrate the power of level 4 mind

when it is tapped by millions of people simultaneously focused on the same goal. We are far from understanding the full potential of level 4 mind.

Globalization

The sociological equation is the story of globalization which, in turn, is the story of human history. It began with the first emergence of human beings and will not end until a sustainable global civilization has been established. According to the theories of quantum evolution and punctuated equilibrium, human biological, social and cultural evolution should be characterised by a succession of discrete synthetic steps, both structural and cognitive. Sarkar refers to periods of rapid evolutionary change as *galloping jumps* and implies that humanity and indeed planet Earth itself is about to make such a jump.¹²⁰ It is obvious that, if humanity is to cope with the challenge of globalization, some change in collective consciousness will be necessary.

The key concept here is that galloping jumps by their very nature cannot be limited to just one dimension of life. Because all levels of life are thoroughly integrated and coherent, quantum change will make itself felt on all levels. Biological evolution works simultaneously on individuals and ecosystems and likewise social evolution must work simultaneously on human psychology and culture. In *After Materialism* (in this volume), I drew on the work of American psychologist Julian Jayne (1920–1997) who argued that the human mind changed some 3,000 years ago from a *bicameral* state (mind divided between a ‘speaking’ part and a ‘listening’, ‘obeying’ part) to our contemporary *unicameral* mind.¹²¹ This rapid transition was catalysed by major social changes due to the invention of writing¹²² and changes in language.¹²³

Today the bicameral mind is hard to imagine, yet history is repeating itself. We are confronted with another information revolution whose structural consequence is once again the integration of a larger grouping of humanity, *globalization*. But there is also a cognitive side to the story, a bicameral to uncameral transition. As I suggested in *After Materialism*, the contemporary human mind is bicameral in at least two respects. First, the faculty of intuition is not properly integrated into the modern psyche – it is our contemporary equivalent of ‘voices in the head’. Second, our culture is divided: crass materialism versus a subtle culture; neo-liberal economics versus community; and a mechanistic view of the universe versus a living universe. The distance between these two views can no longer be bridged in small steps. If the human mind is to achieve a stable uncameral state, a quantum or “galloping” jump is inevitable.

The Limits of Sociology

Sociology is a potentially vast subject, so much so that sociologists are inclined to believe that the entirety of human experience comes within its jurisdiction. All feelings, all values, all states of consciousness, all human endeavours are contingent upon the social condition. But sociologists are also human beings and are obliged to question why they prefer one social interpretation to another, one set of social values to another. The only escape from this maze of self-reflections is

to find something beyond sociology with which to get a bearing on the problems it examines.

In the 19th and early 20th centuries, it was implicitly believed that a technological solution was available for any social problem, whether in agriculture, town planning or mental health. Today we are more aware that the natural sciences have limitations. The 'green revolution', for example, was supposed to end world hunger but produced unexpected social and economic problems far beyond the ability of agriculturalists to solve.

Despite its successes public distrust of science is growing. Consider the ease with which climate sceptics could question the integrity of climate science. This problem is due in part to a history of imposing inappropriate technological fixes on what are really social and political problems. As the limitations of the natural sciences became apparent, the social sciences moved to fill a vacuum that might otherwise have been filled by religion. They succeeded in placing the natural sciences in a 'problematic' perspective. Unfortunately in aspiring for omnipotence, the social sciences could well repeat the same mistake.

The error made by the natural sciences was to assume that human beings are purely physical beings. But humans are also mental and social beings and problems in these domains cannot be remedied by a technological fix. Likewise it would be foolish to assume that humans are purely social beings. The fundamental premise of Eastern philosophy is that humans are ultimately spiritually orientated. Of course the physical, mental and social worlds require sound management, but the requirements of humanity do not stop there. Thus it is time to ask what lies beyond the world of the social sciences.

Beyond the Sociological Equation

The path of evolution by synthesis inevitably brings us to the question: what entity is created by the synthesis of billions of human societies? (See Figure 9) We begin by recognizing that a society is more than a collection of people and their collective mind. Humanity lives not just in a culture and an economy but also in a biosphere and our future depends on the integrity of the biosphere. In the 1970s, James Lovelock (1919-) and Lynn Margulis (1938-) introduced the *Gaia hypothesis* according to which the Earth with its lithosphere, hydrosphere, atmosphere and biosphere is a single, self-regulating system. Since Earth is dependent on the sun for energy, we take another step and propose that the solar system is the truly independent living entity. The seeds of animate life spread around the solar system (in meteorites according to current theory¹²⁴) and germinate on planets as they become habitable. Still later, after the emergence of intelligence, life spreads to inhospitable planets. In short, we postulate that level 4 mind, the intuitive mind, is the mind of our solar system.

We must therefore reword our initial question. What entity emerges from the synthesis of billions of solar systems? Clearly a galaxy, but from this perspective, a galaxy is a life form with an extremely subtle mind, the archetypal mind (Figure 9). Note that this is very different from *panspermia*, the hypothesis that 'seeds of life' are distributed throughout the universe. Here we are arguing, as did Rudolph

Steiner, that galaxies and even the universe itself can be considered vast, living beings. In Steiner's cosmology, the universe is a hierarchy of living, creative forms at many different stages of development.¹²⁵ Humans live within these larger life-forms whose internal efforts to maintain homeostasis must affect humanity in ways that we cannot yet possibly understand.

This animate view of the universe is not confined to mystics. We have already quoted the evolutionary biologist Elisabet Sahtouris who believes that even Western scientists are beginning to reject the mechanistic, materialist view of the universe:

... ever larger numbers of people either cannot accept it [the reductionist materialist paradigm¹²⁶] or feel impelled to revise and expand it. These include many scientists dissatisfied with its limitations. In fact, they are changing Western science very rapidly now, toward an understanding of nature as alive, self-organizing, intelligent, conscious or sentient and participatory at all levels from subatomic particles and molecules to entire living planets, galaxies and the whole Cosmos, from local human consciousness to Cosmic Consciousness.¹²⁷

We cannot, as yet, imagine what kind of mind and consciousness a galaxy has but the logic of the principle of self-similarity has brought us inexorably to the point where we must postulate some link between the archetypal mind and its physical base, the galaxy. The same logic suggests that when a human being taps his/her archetypal mind, he/she is making some connection with life on the galactic scale.

Taking yet another step on the path of evolution by synthesis brings us to the synthesis of billions of galaxies. Clearly we have arrived at the entire universe and its universal mind (Level 6 in Table 5) in which resides the aum vibration. Aum is the primordial sound of the universe, the resultant of all its activity and the subtlest expression of the Macrocosm. But the return journey is not yet over. The final step is to go beyond sound and beyond dualism:

Parama Puruśa [Cosmic Consciousness] is drawing the microcosms through the sound inference ... When people enter the core of the world of sounds, they experience their existential feeling ... and in the subtlest [sound inference] they get Parama Puruśa in the form of onmkāra [aum vibration] ... But at the last stage of realization, a sādḥaka [a person searching the spiritual path] discovers that there is no sound, because if there is no curvature, there cannot be any sound. When waves get straightened, all sounds stop – only an all-pervading silence prevails. When sound is transcended, the spiritual aspirant enjoys unbounded spiritual bliss due to perfect psycho-spiritual parallelism. This [sound inference] leads human beings towards the state of communion between [unit flow] and [Cosmic flow].¹²⁸

Supra-aesthetic science

The physical, biological, psychological, social and aesthetic sciences are all concerned with the advancement of humanity. They allow humans, in Sarkar's words, to experience more subtle joy and to offer more subtle joy to others. Ascending the hierarchy of sciences, joys become more subtle and sweet.

This universe of Parama Puruṣa [Cosmic Consciousness] has been moving along the path of *pratisaincara* [the return journey of Brahma Cakra]. The more it advances on the path of *pratisaincara*, the sweeter is its expression, because it comes nearer to the nucleus of the Cosmic body. Birds and animals are more beautiful than bricks, stones or wood, and human beings are more sublime than birds and animals. The human mind is full of tenderness, softness, sweetness and other qualities of the divine flow.¹²⁹

Each of the sciences described so far, even physics, is ultimately an attempt to satisfy a deep mystical urge – to become one with the Cosmos. “Mysticism is a never-ending endeavour to find a link between the finite and the Infinite.”¹³⁰ But now we come to a very different kind of science – supra-aesthetic science.

In this introduction to Eastern Cosmology it may have appeared as if the return journey of Brahma Cakra is all about the science of managing unstable equilibria, synergetics and coherence, the end purpose being to walk the tightrope of evolution by synthesis. However supra-aesthetic science turns all this on its head. In a universe full of living entities and personalities, Cosmic Consciousness is the Supreme Personality. And rather than humans struggling toward Cosmic Consciousness, the Supreme Personality attracts all to Himself.¹³¹ And herein lies the essence of supra-aesthetic science.

He has been creating, maintaining and destroying this universe through *saincara* and *pratisaincara* [the outward and return journeys of Brahma Cakra]. Now during the phase of *pratisaincara* He attracts everyone and everything towards Himself. This work of attraction may be done in various ways ... In this process of *pratisaincara*, the vast multitude of microcosms evolves. How do they evolve? They evolve because Parama Puruṣa [Cosmic Consciousness] loves them, and the force of His intense love draws them towards Himself ... Parama Puruṣa is always attracting the microcosms. Although some are reluctant to respond to His call of love, even then they will have to come. This is the speciality of [supra-aesthetic science].

All the entities of this universe are mutually attracting all other entities. But Parama Puruṣa is attracting all entities by dint of His love for all, by dint of His personal relationship with all. So Parama Puruṣa alone is the presiding Entity of [supra-aesthetic science], and not any other entity.¹³²

And so we return, like Brahma Cakra, to the beginning. We return to the ancient *shloka* which began this essay and we return, but with a fresh appreciation, to an idea that was already in human minds at the beginning of history:

Behind all the manifestations in the universe,
There is One, a Cosmic Magician, who controls all.
Whatever has been or will be created is that One alone.
Those who realise this One Entity become immortal.

Acknowledgements

The author wishes to thank Jake Karlyle, Firdaus Ghista, Acarya Vitaragananda Avt., and Marcus Bussey for reviewing earlier manuscripts and for stimulating comments.

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Endnotes

¹ Bohr, Niels. *Atomic Physics and Human Knowledge*, NY: John Wiley and Sons 1958, p. 20.

- ² Oppenheimer, J.R. *Science and the Common Understanding*, London: OUP, 1954, pp. 8-9. After witnessing the first atomic test explosion, Oppenheimer, the chief architect the atomic bomb, was moved to quote a passage from the *Bhagavat Gita* in which Krisna appears to Arjun in the form of God the Destroyer.
- ³ Capra, (ToP), p. 18.
- ⁴ More precisely, realism is the assumption that an observed entity has measureable properties with definite values *prior* to those measurements being made.
- ⁵ The English philosopher C. E. M. Joad (1891-1953) was a great popularizer of philosophy and as famous in his day as Bertrand Russell and George Bernard Shaw.
- ⁶ Capra, Fritjof, (ToP).
- ⁷ Zukav, Gary. *The Dancing Wu-Li Masters: an overview of the new physics*, William Morrow and Company, 1979
- ⁸ Capra, (ToP), p. 17.
- ⁹ This assertion is made in Capra, (ToP), p. 17, and also on p. 133, Ch. 10.
- ¹⁰ Capra, (ToP), p. 133.
- ¹¹ Capra, (ToP), pp. 234 235, Ch 11.
- ¹² Capra, (ToP), Ch 13.
- ¹³ This assertion is made in Capra, (ToP), Ch. 2.
- ¹⁴ Capra, (ToP), p. 35.
- ¹⁵ Capra, (ToP), p. 86.
- ¹⁶ Wilber, (E2E).
- ¹⁷ Wilber's philosophy is now known as *integral philosophy*. See Towsey, *After Materialism* for a more complete discussion.
- ¹⁸ Capra, (ToP) p. 25.
- ¹⁹ Wilber, (E2E), pp. 134-135.
- ²⁰ Wilber, (E2E), pp. 160-162.
- ²¹ Wilber, (E2E), pp. 253-255.
- ²² Wilber, (E2E), p. 137.
- ²³ Note that Hinduism is not included in this list. The term *Hindu* dates from the Mughul period in India (1200 CE) and is the Persian word for a person who lives east of the Indus river. The term *Hinduism* dates only from the 19th century and was introduced by the colonial English as a collective term for the numerous religious traditions of the Hindus. There is no single Hindu religion or prophet or founder although the term continues to be used as a generic reference to the schools Vedic theism.
- ²⁴ Cárváka is the Indian school of scepticism, atheism and materialism that dates back to the 5th century.
- ²⁵ Siddha Path, (IKS).
- ²⁶ Dyczkowski, Mark, S.G. *The Doctrine of Vibration – an analysis of the doctrines and practices of Kashmiri Shaivism*, Delhi: Motilal Banarsidass, 1989.

- ²⁷ The historical relationship between Tantra and Veda is a matter of some academic controversy. See Ramesh Bjonnes, *The Dawn of Enlightenment*, in this volume and also his forthcoming book, *Tantra*, India: Hay House, 2012.
- ²⁸ Huxley, Aldous. *The Perennial Philosophy*, UK: Chatto & Windus, USA: Harper & Row, 1944; Harper Modern Classics 2004 edition: ISBN 0-06-057058-X. The idea of a perennial philosophy has great antiquity. The first use of the term appears to be in *De Perenni Philosophia Libri X*, 1540. See en.wikipedia.org/wiki/Perennial_philosophy.
- ²⁹ See for example *The Holy Science* by the 19th century Indian yogi, Swami Srii Yukteswar Giri, who attempts to demonstrate the unity of Hindu and Christian belief by comparing passages from the Bhagavad Gita and the Bible. Published by the Yogoda Satsanga Society of India, 1949. Originally published under the title *Kaivalya Darsanam*, 1894.
- ³⁰ Wilber, (E2E), p. 144. Wilber cites Carl F. F. von Weizsäcker, the eminent German physicist, who believed the concept of *prana* to be compatible with quantum theory. In Eastern philosophy, *prana* is a form of substance/energy intermediate between mind and matter which links the two.
- ³¹ Weinberg, Steven. "Dr. Unification – an interview by Amire D. Aczel", *Scientific American* **303** (5), November 2010, p. 44.
- ³² *Physicalism* is today the preferred term for *materialism* in order to avoid ambiguity with the cultural and consumerist senses of materialism. In this essay the words 'materialism' and 'physicalism' are used interchangeably. Materialism is the philosophy that underpins Western science. It is not so well known that India has its own school of materialism known as *Cārvāka*, after its founder.
- ³³ Shrii Shrii Anandamurti, (NKS), pp. 149-150.
- ³⁴ Many of these debates go back to the Greeks. Plato promoted the dualism of body and soul. Parmenides however was a monist – the only true being is 'the One' which is infinite and indivisible. See Bertrand Russell, *A History of Western Philosophy*, Unwin University Books, New Edition, 1961. For a discussion of the monism-dualism debate in Eastern philosophy and especially for a pragmatic resolution of it, see (NKS).
- ³⁵ See for example later versions of string theory, Greene (FC).
- ³⁶ The term *holoarchy* (spelled *holarchy*) was first used by Arthur Koestler in his 1975 book, *The Ghost in the Machine*. Ken Wilber has adopted the term with the spelling *holoarchy*. He also appears to give it a slightly different meaning – as a single level of creation in which the whole governs the immediate parts.
- ³⁷ Gunderson, Lance H. and Holling, C.S. (eds) *Panarchy: Understanding transformations in human and natural systems*, Washington: Island Press, 2002.
- ³⁸ Wilber, (E2E).
- ³⁹ Wilber typically uses the terms Sensory, Symbolic, Psychic and Archetypal for levels 2, 3, 4 and 5 respectively although he uses several different terms for each. Sarkar also uses a variety of terms depending on context.
- ⁴⁰ Hence the phrase 'I am in *seventh heaven*', the seventh heaven being a transcendent state of consciousness.

- ⁴¹ At the end of each Veda is a section called the Upanishad which literally means, “sitting close, with devotion.” These final sections contain the “secret teachings” of the ancients. The Upanishads inquire into the nature of reality, God, and the universe. They teach that Absolute Reality or Brahma resides in the human soul and that this Reality is meant to be known. The teachings of the Upanishads are called Vedanta, which means “at the end of the Vedas.” See <http://www.onelittleangel.com/wisdom/quotes/upanishads.asp>
- ⁴² Wilber, Ken. “An Integral Theory of Consciousness”, *Journal of Consciousness Studies*, 4 (1), February, (1997) pp. 71-92.
- ⁴³ Sarkar, (I&I), p. 23.
- ⁴⁴ Strictly speaking the *Satya Loka* is not equivalent to *Brahma* or *Cosmic Consciousness* but this distinction is not important for the arguments made here.
- ⁴⁵ Sarkar, (I&I), pp. 20-21.
- ⁴⁶ Shrii Shrii Anandamurti, (AS). A Sútra is an aphorism or concise statement of an important philosophical principle. Ánanda Sútram therefore means ‘aphorisms of bliss’. The sútra form has been valued over the centuries as a powerful tool for communicating deep philosophy in a condensed, memorable way. The literal meaning of sútra is ‘thread’, implying that numerous jewels of thought can be strung on a single such thread. In the best traditions of sútra literature, the eighty-five sútras of Ánanda Sútram are a framework for the entirety of Sarkar’s ideology.
- ⁴⁷ Chalmers, (JCS).
- ⁴⁸ Verela, Francisco, Thompson, Evan and Rosche, Eleanor. *The Embodied Mind*, Cambridge, MA: MIT Press, 1991.
- ⁴⁹ Wilber, (E2E), p. 99.
- ⁵⁰ Hegel, G.W.F. *Lectures on the Philosophy of History* in “Treasury of World Philosophy”, Ed D.Runes, Littlefield, Adams & Co, Paterson, New Jersey, 1959.
- ⁵¹ Shrii Shrii Anandamurti, (AS).
- ⁵² Wilber (Eye to Eye, Op. Cit. p. 156) illustrates the problem using an example from Shrii Ramana Maharshi. In order to say all that we understand to be true about human experience we need three statements. (1) Brahma alone is real; (2) The world is illusion; (3) Brahma is the world. Clearly these three statements are contradictory but omit any one of them and we are left with a flawed perception of reality. In particular, omit (2) and we reduce Brahma to pantheism. Omit (3) and we have no way to live in the world. Omit (1) and all we have is illusion.
- ⁵³ Wilber, (E2E), p. 75.
- ⁵⁴ Wilber, (E2E), p. 129.
- ⁵⁵ Shrii Shrii Anandamurti, (NKS), chapters 25-27.
- ⁵⁶ Shrii Shrii Anandamurti, “Mysticism”, Discourse from 2 June 1990, Anandanagar, Published in *Ánanda Vacanámrta*, Part 30
- ⁵⁷ It is because something has happened, if only in a philosophical sense, as a result of the expression of the Sentient and Mutative principles that Eastern philosophy draws a distinction between the Brahma and Satya Loka. In the former none of the binding principles are expressed. Refer back to Table 4 and relevant footnote.

- ⁵⁸ Sri Yukteswar, Swami. *The Holy Science*. India: Yogoda Satsanga Society of India, 1949. Originally published under the title *Kaivalya Darsanam*, 1894, p. 3.
- ⁵⁹ Sarkar, P. R. *Ananda Marga Ideology and Way of Life*, AM Publications, Kolkata, p. 395.
- ⁶⁰ Sarkar, P. R. "Relativity and the Supreme Entity" in *Notes on Social and Spiritual Philosophy*, AM ISMUB, Kolkata, India, May 1989, p. 32.
- ⁶¹ As quoted by Fritjof Capra in (ToP), p. 170.
- ⁶² Jones, Roger. *Physics As Metaphor*, US-MN: University of Minnesota Press, 1990.
- ⁶³ *Cakra* in Sanskrit means circle or wheel. In English dictionaries the word appears as *chakra*. However in these essays, for the most part, we adopt Sarkar's Romanized spelling of Sanskrit.
- ⁶⁴ There are various versions of this saying. The following is likely to be more authoritative. "As out of a single fire, millions of sparks arise; arise in separation but come together again when they fall back in the fire. As from a heap of dust, grains of dust sweep up and fill the air, and filling it fall in a heap of dust. As out of single stream, countless waves rise up and being water, fall back in water again. So from God's form emerge alive and inanimate things and since they arise from Him, they shall fall in Him again." Guru Gobind Singh - Akal Ustat. <http://www.gurugobindsingh.net/historyofsikhism14.htm>.
- ⁶⁵ Adapted from Siddha Path, (IKS).
- ⁶⁶ Wilber, (E2E), p. 131. Note that strictly speaking Atman and Brahma are not identical in Sarkar's philosophy but the difference may be ignored for current purposes. Also in this essay Wilber's term *involution* is replaced by *devolution*.
- ⁶⁷ Laszlo, E. and J. Currivan, *CosMos*, USA: Hay House, 2008.
- ⁶⁸ Sarkar, (I&I), p. 4.
- ⁶⁹ More exactly, this moment in the history of the universe occurred at the end of a brief burst of inflationary expansion. The burst was so fast and massive as to defy imagination. See Greene, (FC), chapters 10 & 11.
- ⁷⁰ Greene, (FC), p. 323.
- ⁷¹ For a further investigation of these ideas see Greene (FC), "Cyclic Cosmology", pp. 404.
- ⁷² Introducing entropy as energy *dispersal* rather than system *disorder* is due to Dr. Frank L. Lambert. See <http://entropysite.oxy.edu/>.
- ⁷³ According to current theory, the universe began in a brief but massive explosion of energy (the Big Bang, see Greene, (FC), Chapter 11) giving rise to all the radiation and particles in our universe. Since then it has been expanding more slowly. At the end of that initial burst of extraordinary 'inflation', the early universe had a perfectly smooth distribution of atomic matter (aside from quantum fluctuations). Surely this smooth distribution is a high entropy (high probability) state from which the universe would be unlikely to stray. Yet we reasoned that the universe must have begun in a low entropy (low probability) state. Entropy is a subtle concept that sometimes presents apparent contradictions. This is one such case.

Measures of entropy are dependent on all the forces at play within the system of interest. In the case of the early universe the presence of gravity ensured that an even

dispersal of particles was in fact a very low probability state. A gas fills a room because on that scale gravity is not important. However in the early universe gravity must be considered and gravity clumps matter. However the clumping of matter raises its temperature (think of the heat produced when pumping a bicycle tyre) and rising temperature increases the dispersal of energy. Thus from the perspective of entropy two opposing tendencies were at play in the early universe. The clumping of matter due to gravity decreased entropy (increased order) but the heat generated thereby more than compensated by increasing entropy. Thus there was no contravention of the law of entropy. Black holes are an extreme case because, being so massive, gravity does not allow even heat or radiation to escape their boundary. Thus black holes trap entropy and are the highest entropy objects in the known universe.

⁷⁴ See Greene, (FC), whose account of Western cosmology is entirely structured around the question: why does time's arrow fly in only on direction?

⁷⁵ The physicist Stephen Hawking demonstrated that the amount of entropy trapped in a black hole tells us something interesting about the very structure of space – that it has an atomized or particulate structure and each particle represents a unit of entropy, meaning that it cannot in principle have an internal structure. In other words, physics has arrived at the ultimate elemental spatial entity. See Green, (FC), pp. 477 – 481.

⁷⁶ For the Scientific American report see <http://blogs.scientificamerican.com/basic-space/2011/09/23/faster-than-light-neutrinos-show-science-in-action/>

⁷⁷ Prokaryotic cells lack a membrane bound nucleus, for example bacteria. Eukaryotic cells have a nucleus.

⁷⁸ In Marxist philosophy, this principle is described as *the transformation of quantity into quality*. In Brahma Cakra however, evolution by synthesis is not a purely material phenomenon.

⁷⁹ Maturana, Humberto and Varela, Francisco. *Autopoiesis and Cognition: the Realization of the Living*. (Eds.) Robert S. Cohen and Marx W. Wartofsky, *Boston Studies in the Philosophy of Science* 42, Dordrecht: D. Reidel Publishing Co., 1980. This publication formally describes autopoiesis as follows: “An autopoietic system is a system organized (defined as a unity) as a network of processes of production (transformation and destruction) of components that produces the components. At this time, the components have the following characters: (i) through their interactions and transformations continuously they regenerate and realize the network of processes (relations) that produced them; and (ii) they constitute it (the system) as a concrete unity in the space in which they (the components) exist by specifying the topological domain of its realization as such a network.”

⁸⁰ Verela, Francisco, Thompson, Evan and Rosche, Eleanor. *The Embodied Mind*, Cambridge, MA: MIT Press, 1991.

⁸¹ Di Paolo, E., Rohde, M., & De Jaegher, H. *Horizons for the Enactive mind: Values, social interaction, and play*. In J. Stewart, O. Gapenne & E. Di Paolo (Eds.), *Enaction: Towards a New Paradigm for Cognitive Science*. Cambridge, MA: MIT Press, 2010.

⁸² Di Paolo, Ezequiel. *Shallow and Deep Embodiment*, an on-line lecture, University of Sussex, <https://cast.switch.ch/vod/clips/74nrkbwys/>.

⁸³ Kauffman, Stuart 1991 *Antichaos and Adaption* Scientific American, August.

- ⁸⁴ Sarkar, P.R. "Conflict" in "Talks on Prout", Original discourse 1961, Published in *Prout in a Nutshell 15*, 1st edition. Kolkata: A.M. Publications.
- ⁸⁵ Di Paolo, Op. Cit.
- ⁸⁶ Sarkar, P.R. *Prama*, Kolkata: A.M. Publications, 1987.
- ⁸⁷ Sahtouris, Elisabet. *Gaia Education*. <http://www.selba.org/EngTaster/Worldview/AwakeningAndTransfor/ElisabethSahtouris.html>
- ⁸⁸ As quoted in Lewin, *ibid*.
- ⁸⁹ Sitko, S.P. and Gizhko, V.V. "Towards a Quantum Physics of the Living State", *J. Biol. Phys.* **18**, pp. 1-10, 1991. <http://users.iptelecom.net.ua/~sitko/A92.html>
- ⁹⁰ Popp, Fritz-Albert. "Evolution as the Expansion of Coherent States" in *The interrelationship between mind and matter*, Proceedings of a Conference hosted by the Centre for Frontier Science, ed. B. Rubik, Temple University, Philadelphia, 1992.
- ⁹¹ See McTaggart, (TF), chapter 3, for a non-technical introduction to the work of Popp.
- ⁹² *Ibid*.
- ⁹³ Sitko, S.P. and Gizhko, V.V. "Towards a Quantum Physics of the Living State", *J. Biol. Phys.* **18**, pp. 1-10, 1991. <http://users.iptelecom.net.ua/~sitko/A92.html>
- ⁹⁴ Sitko, S. "Disease and Treatment in the Notions of Quantum Medicine", *Physics of the Alive*: **12**, No1, pp. 5-18, 2004. http://www.sergiysitko.org.ua/2004_01e.htm. The term *eigen-frequency* simply refers to a resonant vibration for a given system.
- ⁹⁵ The three quantum principles that govern all levels of the quantum ladder are, according to Sitko, *identity, discreteness and characteristic frequency*. They are best illustrated with the electrons in an atom. *Identity*: No two electrons can have identical quantum attributes. *Discreteness*: electron transitions between one quantum state and another are not continuous. Hence atoms display characteristic line spectra due to the discrete quantum orbitals of their electrons. *Characteristic frequency*: Each electron can be understood as a standing wave having a characteristic frequency.
- ⁹⁶ http://en.wikipedia.org/wiki/Victor_Frederick_Weisskopf.
- ⁹⁷ Weisskopf, V. and W. H. Freeman, "The Privilege of Being a Physicist", reviewed by David Goodstein in *New Scientist*, 29 April, 1969, p. 62.
- ⁹⁸ *New Scientist*, "Proteins change their shape in the blink of a laser flash", 16 March, 1991. p. 18.
- ⁹⁹ The recognition that cell membranes can act as oscillators that transmit coherent radiation is due to Herbert Frohlich (1905-1991). See Frohlich (*Ed.*): *Biological Coherence and Response to External Stimuli*, Berlin: Springer – Verlag, 1988, p. 268.
- ¹⁰⁰ Sitko, S. "Quantum-mechanics basis of the Diverse Differential Stability of the Alive", *Physics of the Alive*: **T.13**, (1), 2005, p. 9-12. http://www.sergiysitko.org.ua/2005_01e.htm
- ¹⁰¹ Sitko, S.P. and Gizhko, V.V. "Towards a Quantum Physics of the Living State", *J. Biol. Phys.* **18**, pp. 1-10, 1991. <http://users.iptelecom.net.ua/~sitko/A92.html>
- ¹⁰² Sarkar, (MVINS), p. 67.

- ¹⁰³ See http://en.wikipedia.org/wiki/Quantum_evolution.
- ¹⁰⁴ The word *quantum* is being used here in the sense of a discrete jump from one biological state to another. Biophysicists, Sitko and Gizhko, would probably take the word more literally and argue that a *fundamental quantum process* is involved. (Recall definition of *fundamental* above.)
- ¹⁰⁵ *Panarchy: Understanding Transformations in Human and Natural Systems*, L. H. Gunderson and C. S. Holling (editors), Washington, DC: Island Press; 1st edition, 2001.
- ¹⁰⁶ As quoted by Susan Blackmore, "Consciousness: science tackles the self", *New Scientist* 1st April, 1989.
- ¹⁰⁷ Popp, Fritz-Albert 1992 *Evolution as the Expansion of Coherent States* in The interrelationship between mind and matter, Proceedings of a Conference hosted by the Centre for Frontier Science, ed. B. Rubik, Temple University Philadelphia.
- ¹⁰⁸ Shrii Shrii Anandamurti, *Namami Krsna Sundarum*, (NKS)
- ¹⁰⁹ Shrii Shrii Anandamurti, (NKS), pp. 188-199. In Eastern philosophy, Cosmic Consciousness (Puruṣa) has always been regarded as a male entity and this convention has been preserved by Sarkar. Brahma, on the other hand, being beyond all philosophical elaboration, is always given the neutral gender.
- ¹¹⁰ See Sutras 16 and 17 in *Ananda Sutram*; Anandamurti, (AS). Note: Sarkar describes these milestones on the return journey in terms of the I-exist and I-do feelings (*mahattattva* and *ahamtattva* respectively) but these are in turn explained in terms of the binding principles (See Sutras 14 and 15).
- ¹¹¹ For a more detailed account of SSSA, see *After Materialism*, in this volume.
- ¹¹² The oldest fossils ever found are sulphur bacteria dated fairly accurately to 3.4 billion years ago. The Earth at this time was hot and violent with numerous volcanic eruptions and meteor strikes. The sky would have been cloudy and grey, keeping the oxygen-less atmosphere hot. The oceans would have been around 40-50° Celsius. Still today sulphur bacteria can thrive in these conditions. See Kate Kelland, *Life on Mars? Fossil find shows its possible*, <http://au.news.yahoo.com/tech-news/a/-/technology/10081708/life-on-mars-fossil-find-shows-its-possible/>, Reuters, 22/08/2011. See also Davies, (5thM).
- ¹¹³ This speculation is attributed by Davies to physicist Roger Penrose. (5thM, p65)
- ¹¹⁴ Sarkar, (I&I).
- ¹¹⁵ Fröhlich, Herbert. "Long Range Coherence and Energy Storage in Biological Systems", *International Journal of Quantum Chemistry*, v.II, pp. 641-649, 1968. See also http://en.wikipedia.org/wiki/Herbert_Fr%C3%B6hlich.
- ¹¹⁶ <http://nonlocal.com/hbar/frohlich.html>
- ¹¹⁷ http://www.sergiysitko.org.ua/2004_01e.htm
- ¹¹⁸ This passage appears in an account of Enrico Fermi's discovery of the controlled nuclear chain reaction. See: Gerald Holton, "The Birth and Early Days of the Fermi Group in Rome", in *Proceedings of the International Conference, "Enrico Fermi and the Universe of Physics"*, Rome, September 29 – October 2, 2001, p. 66. Accademia Nazionale dei Lincei and the Istituto Nazionale di Fisica Nucleare

http://www.enea.it/com/ingl/New_ingl/publications/editions/pdf/8_Proceedings_FERMI_2001.pdf

- ¹¹⁹ As quoted by Brian O'Neill; *Mozart, Creativity and Gestalt Therapy*, http://www.behavior.net/forums/gestalt/1998/16_5.htm.
- ¹²⁰ Sarkar, *The Coming Ice Age*, (EIEEdit), 1990.
- ¹²¹ Jayne based these insights on an analysis of changes in the language of the Old Testament and early Greek literature. The bicameral or two-chambered mind was, from the perspective of our modern mind, a divided mind. See Jayne, (OC). See also http://en.wikipedia.org/wiki/Julian_Jayne.
- ¹²² According to Gil Stein, director of the Oriental Institute, "It [writing] was the first true information revolution. By putting spoken language into material form, people could for the first time store and transmit it across time and space." See http://library.bridgew.edu/mt/max/2010/10/hunting_for_the_dawn_of_writin.html. The development of writing appears to coincide with the development of agriculture and the transition from a nomadic life style to large settled populations.
- ¹²³ Doidge (BCI) describes how the emergence of language, writing and reading must have made important changes to cortical brain maps, presumably with accompanying changes to human consciousness.
- ¹²⁴ <http://aquapour.com/alien-bacteria-fossils-found-in-meteorite-by-nasa-scientist/556290/>. Also www.space.com/12569-meteorites-dna-building-blocks-discovery.html.
- ¹²⁵ Steiner (1861-1925) was much influenced by the Theosophical Society and Blavatsky who considered the planets, solar systems, galaxies, and the cosmos to be conscious entities. <http://oaks.nvg.org/steiner-bio.html>
- ¹²⁶ See Michael Towsey, *After Materialism*, in this volume for a discussion of the materialist paradigm.
- ¹²⁷ Sahtouris, Elisabet. "Living Systems in Evolution", *New Renaissance Magazine*. <http://www.ru.org/10-2sahtouris.htm>. This article is from the proceedings of *At Home in the Universe: a symposium on the developing dialogue between science and religion*, at the World Parliament of Religions, Capetown, South Africa, December 1999.
- ¹²⁸ Shrii Shrii Anandamurti, (NKS), p. 242-243. The words in square brackets are translations of the original Sanskrit.
- ¹²⁹ Shrii Shrii Anandamurti, (NKS), p. 240.
- ¹³⁰ Shrii Shrii Anandamurti, (NKS), p. 231.
- ¹³¹ In Eastern philosophy, Cosmic Consciousness has always been regarded as a male entity and this convention has been preserved by Sarkar. Brahma, on the other hand, being beyond all philosophical elaboration, is always given the neutral gender.
- ¹³² Shrii Shrii Anandamurti, (NKS), p. 236.

The Dawn of Enlightenment

A Brief History of Tantra and Yoga

Ramesh Bjonnes¹

Introduction

Indian civilization was born about 11,000 years ago, during or shortly after Neolithic farming settlements were established in the Fertile Crescent in the Middle East, during the period referred to as the cradle of civilization. Recent research into this important period of history has revealed that India was, in so many ways, also the cradle of human civilization, not just geographically and culturally, but also spiritually. For South Asia, including India, Pakistan and Afghanistan, was one of the first areas on the planet where people settled to farm and create urbanized city complexes on a considerable scale. In Mehrgarh, for example, an area in today's Pakistan, wheat, barley and eggplant were cultivated, sheep and cattle were domesticated, and people lived in cities as early as nine thousand years ago (7000 BCE). India was also the birthplace of the world's first great religions, Buddhism and Jainism. More significantly, long before the birth of Buddha (500 BCE), India had already developed the sophisticated sciences of yoga, meditation, Ayurvedic medicine, and the world's most advanced and sacred language, namely Sanskrit.

While there is general agreement among scholars regarding the antiquity of India's civilization, there is less agreement about how and when it developed its sophisticated culture and sacred traditions. There are currently three main theories on ancient Indian history:

1. Most Western and Indian academics hold the view that India was invaded by Vedic Aryan settlers around 1900 BCE. These Aryans worshiped the sun god Suria and brought with them their Rigvedic religion based on sacrifices and rituals offered to "placate and please the Gods, [and] to force them to fulfil wishes and demands".² These patriarchal and martial Aryans soon conquered northern India and destroyed the great Indus Valley civilization, where yoga was already practiced by Tantric (*Shaeva*) ascetics. They massacred populations and reduced the surviving Dravidian *shudras* to slavery (*dasyu*) without regard for rank or learning. This conflict has been described in the famous epics *Mahabhart*a and the *Ramayana*. Over time, India became a blended civilization – part Aryan Vedic, part Dravidian *Shaeva*, with a liberal admixture of Jain and Buddhist traditions – and this blended culture is what we today know as *Hindu* civilization.
2. Western yoga scholars, including Georg Feuerstein and David Frawley, as well as some Indian writers, especially within the fundamentalist *Hindutva* movement,³ subscribe to the theory that there was never an Aryan

invasion around 1900 BCE and that Yoga comes solely from the Vedic tradition. This “One River Theory” proclaims that the Indus Valley was not destroyed by Aryan warrior but instead by climatic changes. According to these writers, the Aryans are indigenous to India and represent everything that is noble about Indian culture. In their book *In Search of the Cradle of Civilization*, Feuerstein and Frawley outline seventeen points for why the invasion never took place. In one of these points, however, they reflect on the possibility that the Aryan settlers arrived in India at a much earlier date.

3. This last option brings us to the *Two River Theory*, that the history of Yoga represents a blend of the Tantric and Vedic traditions of India. According to Puranic history as well as recent genetic science discoveries, the Vedic Aryans arrived in India at an early age, most likely as early as 7–5000 BCE. Therefore the blending of the Vedic and Tantric (Shaeva) cultures of India had already matured by the time the Indus Valley civilization was destroyed and depopulated around 2000 BCE. Not long after, around 1500 BCE, India produced the world’s first coherent philosophy and cosmology, namely sage Kapila’s Tantric-inspired *Samkhya* philosophy, which today is popularly known as the philosophy of Ayurveda, India’s ancient medical science. About 700 years after Kapila, some of the greatest spiritual literature the world has ever witnessed, namely the oral teachings in the epic Mahabharata, the Vedantic *Upanishads*, the spiritual teachings of the Gita, and the historical mythology of the Ramayana were written down for the first time. And around 200 BCE, sage Patanjali wrote his *Yoga Sutras* and codified the oral teachings of the Tantric yogis for the first time in the form of *Asthanga*, or Raja Yoga.

While these three versions of Indian history may seem entirely at odds, there are important overlapping agreements, and the theories do in many ways complement each other. The first theory has dated the Aryan invasion rather late (1900 BCE) and does not reflect the genetic research of Spencer Wells, who claims the invasion started much earlier – about 7-5000 BCE. As suggested by Feuerstein and Frawley, proponents of theory number two, this migration started when the Rig Vedic Aryans arrived via the Russian steppes and the deserts of Iran more than 3000 years before the Indus Valley eventually was abandoned. Indeed, in Feuerstein’s new version of his book *The Yoga Tradition*, he suggests the Indo-European Aryans arrived in India as early as 6500 BCE. Looking for better pastures for their cattle and for other riches, these skilled warrior nomads arrived in successive raids and migrations over a period of several millennia. They arrived in an already inhabited land, and its peoples, the Dravidians, Mongolians and Austriacs, had already developed a sophisticated, urban culture, and the art and science of Tantric Yoga was already in practice among them. In other words, by the time the Indus Valley was finally abandoned around 1900 BCE, the indigenous Indians and the invading Aryans had already experienced 3000 years of conflict and gradual integration. Hence these peoples, representing different civilizations, cultures and outlooks, one we may term Vedic/priestly, the other Tantric/yogic, gradually formed what we today know as the Indian or Hindu Civilization.

A Brief History of Tantra: The Two River Theory

In his award-winning book, *A Brief History of India*, Alain Danielou outlines in broad, colourful strokes an ancient history of India that contrasts with the one presented to most Western yoga students, who are often told that Tantra and yoga come from the Vedas. Danielou reminds us, however, that yoga originated with the ancient sage Shiva and that these practices were “wholly unknown” to the early Vedas and their authors, the invading Aryans.⁴

Danielou is not alone in this assertion. According to multiple sources (including ancient scriptures such as the *Puranas*, the *Agamas*; the Tantric literature of South India; the various *Tantras* of the Middle Ages; and more recently the writings of Alain Danielou, N. N. Bhattacharyya, A. L. Basham, Thomas McEvilly, Shrii Shrii Anandamurti, and others) it was the Shiva Tantrics who taught the early Indians yogic spirituality, the arts and sciences. Moreover, these Shiva teachings, which according to Anandamurti originated with the historical Shiva some 7000 years ago, remained the dominant culture and spiritual teachings in India even though its adherents were often violently attacked by the early Vedic Aryans. The Tantric teachings of Shiva continued to be the religion of the people, Danielou asserts, and what we today have come to appreciate as Indian spiritual culture and religion was more influenced by Tantra than the Vedas. This assertion, however, is contrary to what most modern yogis are taught about the history of their practice.

Danielou also emphasizes the importance of Shiva Tantra in shaping yoga philosophy, culture and practice. “It should be remembered”, he writes, “that in Hinduism, Yoga is a discipline created by Shiva...”⁵ From early on, the culture and spiritual practices that originated with Shiva's Tantra also spread outside India, even as far as Europe. Writes Danielou: “Although, due to scarcity of documentation, the importance of this great fundamental religion in the formation of later religions has been largely under-estimated, it was almost universal.”⁶

If Shiva's teachings are 7,000 years old, why were Tantric wisdom and rites only written down starting as late as 500 AD, thus making most scholars and lay people believe this is when the history of Tantra began? Mainly because almost all of the great texts based on ancient oral teachings and history, such as the *Agamas*, The *Upanishads*, the *Brahmanas*, and the *Tantras* were transcribed during the so-called Tantric Renaissance of the Middle Ages (circa 400 to 1500 AD). As many scholars have pointed out, Tantric teachings were assimilated into Vedic and Brahmanic teachings and writings at an early age; thus one will find Tantric influences in the earliest writings in India, starting around 700 BCE with the compilation of the Vedas. All the yogic references to breathing exercises and yoga in general in the Atharva Veda can, according to Anandamurti, be traced back to the Tantra of Shiva thousands of years earlier. So, by the time of the Tantric Renaissance, when Tantric yogis further developed Hatha Yoga, Tantra had already blended with and influenced Hinduism and Buddhism to a great extent. In summary, yoga is thus not an invention of the Vedic people but rather a result of the spiritual aspirations of yogis who lived in India both prior to and after the time of Shiva, the great systematizer of Tantra. Thus, as popularly celebrated in India,

Shiva is “the King of Yoga” and the ancient history of yoga is mostly represented by the history and practice of Tantra.

During the Vedantic period (1500 BCE onwards), however, the history of yoga is also reflected in the blending of the two great rivers of India’s sacred history: the Vedic (or Vedantic) and the Tantric traditions. But, it is important to remember, that it was Tantra, not the Vedas or Vedanta, which gave us all the practical teachings of yogic discipline, such as the science of mantra, yoga postures, and breathing exercises.

Vikings and Tantrics

Long before I knew anything about Tantra and ancient Indian history, I met a traveller and writer from Norway, my native country. He had just returned from an adventurous trip to Afghanistan, Nepal and India. Inspired by American spiritual seekers, most notably the well-known psychologist and author Ram Dass and the popular beat poet Allen Ginsberg, he was one of the first Europeans to visit these countries by traveling over-land through Turkey, Iran and Iraq. His name was Eivind Reinertsen and he told remarkable tales from his many trips to the East. In 1976 he published a landmark book called *Journey Without Arrival* (*Reise Uten Ankomst, Aschehoug Forlag*) about his travels and a few years later, he became an award-winning poet.

I met Reinertsen during a visit to some student friends living in a community in Oslo. My friends had recently learned transcendental meditation (TM), so our conversation that night focused mainly on their newfound practice. Our topic quickly changed, however, when Reinertsen suddenly made a startling claim. He said there had been a secret society of Tantric yogis on the west coast of Norway during the Viking era (ca. 800-1200 CE). Although I have never been able to verify this rather fantastic historical possibility, there are interesting clues scattered about in Viking history that makes Reinertsen’s claim seem at least remotely probable.

The Vikings were not exactly renowned for their peaceful and introspective ways, so the story seemed a bit far-fetched, and I was reluctant to believe him. But his story did pique my interest in yoga. Shortly thereafter, I began reading about the mysterious world of Tantra, its philosophy, history and especially its yogic practices. A few years later, after having lived in a yoga ashram in Copenhagen, Denmark, for a couple of years, I decided to go to India in order to immerse myself fully in the study and lifestyle of Tantra Yoga.

Pashupati: The Tantric God Who Travelled the World

Some time after I met Reinertsen, I was reminded of his fantastic stories by a photo I discovered of a bronze sculptured yogi sitting in lotus pose on a ‘bucket’ found on the Oseberg, Norway’s most famous and best preserved ship from the Viking era. In the summer of 2005, I visited the Viking museum in Oslo to see this remarkable bucket with my own eyes. This so-called “Buddha bucket” is a wooden pail made of strips of yew held together with brass bands. The ‘ears’ to which the handle is attached depicts two yogic brass figures sitting in lotus

position with closed eyes. Prominently displayed on the chests of these two meditating yogis are four swastikas or *hakekors*, as the Vikings called this sacred symbol. The swastika, a symbol of spiritual victory in Tantra, has been in existence in India since at least the time of Shiva but is also known as a sacred symbol among the Vikings, the Greeks as well as the Egyptians. In fact, the swastika is a symbol of Shiva and Shakti and is often prominently displayed on houses and temples all over Asia. Unfortunately, the Nazis misused this deeply spiritual symbol for their evil purposes.

What could be the origin of this 'meditating Viking'? Such practices could have originated from the contact Europeans had with Asian people during the migration times. On the other hand, the technique could have been known among Celtic and Germanic people, passed down since the time of Shiva. It is also possible, but less likely, that these meditation practices developed independently by Nordic shamans. Shamanic elements are well known in the North Germanic religions as well as in most native cultures all over the world. We also know that the term *útisetia* (literally 'sitting outside') from ancient Norse literature indicates a trance technique that could indeed refer to yogic meditation. We know for certain that the practice of sitting in the lotus position is not common among all shamanic cultures. Hence, it is very likely the Buddha Bucket illustrates a Viking practicing yogic meditation. Even the figure itself is most likely made locally since a similar made standing figure has been found at Myklebostad in Norway. Indeed, the metallurgy used to create these Buddha figures was commonly used in Norway at the time.

Not long after I encountered the Buddha Bucket figure, I learned about the Gundestrup Cauldron (400-100 BCE), a silver bowl found in a peat bog in Denmark. This famous artefact appears to depict the image of Pashupati or Shiva. The image of the alleged Shiva on the Gundestrup Cauldron is strikingly similar to the many seals attributed to Shiva found in the Indus Valley during archaeological digs by Sir John Marshall between 1922 and 1931. Commonly known as a place where Tantra was widely practiced, this great culture, located at the archaeological site of Harappa and Mohenjo-Daro (4000-2000 BCE), is as old and as sophisticated as the ancient civilization of Mesopotamia. At the time, these and the other rice-growing areas of Asia boasted a concentration of approximately one-quarter of the world's population.⁷

In the famous seals found at Harappa and Mohenjo-Daro, Shiva sits in a yogic posture allowing the back to remain comfortably erect and thus to make it easier to concentrate during meditation. His feet are formed into an advanced Tantric practice that forms a lock under the genital area and thus helps direct psychic energy up through the spine. On the Gundestrup Cauldron, however, the Shiva figure sits in a different posture, in the 'easy pose' also commonly used for meditation practice.

During my monastic training in India the 1980s, I became intimately familiar with Pashupati, the Lord of the Beasts. It happened while I spent time alone as a *sadhu*, meditating and begging for my food near Pashupatinat, a Shiva temple located in the small town of Deopatan to the east of Kathmandu. This ancient temple is a

major destination for Hindu pilgrims from all over India and Nepal. It is situated to the south of a gorge carved out by the Bagmati River. Pashupatinat, often crowded by both pious pilgrims and wild monkeys, resides by the river, above the sacred funeral *ghats* where the dead are cremated daily on top of large piles of burning wood.

Snaking along the Pashupatinat temple walls, the Bagmati is considered as sacred as the Ganges itself. For Hindus, to bathe at Pashupatinat on particular phases of the moon is to ensure a place in Shiva's Paradise, Kailash. For Tantric yogis, however, all rivers and places are sacred, and Shiva's Paradise is to be realized within each yogi's own heart, not in some distant place in the afterlife or at a sacred site.

Like the Indus Valley seal, the Nepali temple is dedicated to Pashupati. *Pashu* means 'beast' or 'animal', so the esoteric meaning of Pashupati in Tantra is 'the controller of animal instincts'. In other words, in order to become free, we must redirect and become free from our instinctual tendencies, our psychological bondages. According to yoga, there are eight bondages, or *asthapashas*, fear, shyness, doubt, pride of heritage, pride of culture, vanity, and backbiting, as well as six enemies or *sadripus*, lust, rage, greed, attachment to objects, pride, and envy. Lord Pashupati is thus a symbol of someone who has overcome these inner beasts, and Tantric yoga is a spiritual path whose ultimate goal is to overcome, or not be controlled by, these 'wild beasts' of the mind.

Embracing the Wild Beasts of the Mind

In the evening, that first day at Pashupatinat, I was walking by the river, careful not to step on meditating or sleeping yogis. I noticed a group of half-naked bodies sitting in a circle around a towering figure with long, matted hair and beard. He was seated, like Shiva himself, in lotus pose. A few of his words, drifting in the smoke-filled breeze, caught my attention. "Astapasha and sadripu..." Then he recited them, first the eight bondages: *bhaya, ghr'na, lajja, shamka, kula, shiila, mana, yugupsa*. Then the six enemies: *kama, krodha, lobha, moha, mada, matsarya*. The ancient Sanskrit flowed out of him like poetry. And even though I did not understand the Hindi commentary that followed, I sat down to join the small circle of yogis around the glowing embers from the dying fire. After some time, the yogi on the tiger skin became silent. His eyes of piercing kindness looked into mine for a moment. Then, oblivious to the chatter and commotion among the pilgrims along the river, he closed his eyes and began to meditate.

A few days later, I walked down a street near the temple toward the fireplace where I prepared my one meal for the day. My cotton shoulder bag contained two potatoes, a handful of rice, a few coins, some matches and one red chili. The meagre collection from my begging round that morning was not unusual. Most shopkeepers thought it rather unlikely a Westerner could be a wandering sadhu, at least not a real holy man. Thinking I was a fraud, they often refused to give me anything. They were partly right, of course. As part of my monastic training, I was a wandering beggar, but only for a while, not for life.

An old woman, a real beggar, suddenly stopped me on the street and held out her hand. I was not allowed to speak during my begging period, so I gestured with my hands that I did not have anything to give her. My answer did not satisfy her. She became very angry, waved with her hands and pointed at my tan yet unmistakably white skin. Obviously, she was unable to tell that I also was a beggar, even if only temporarily. To her, I was simply a 'rich Westerner'. So, I gave her my last few coins, which I usually used to buy matches and cooking oil with. Not satisfied, she threw them on the ground and spat on them. Disappointed, I asked her to open her own bag, and I emptied my own bag of goods into hers. Potatoes, rice, chilli, matches, coins, all my money and my one and only meal for the day, it all disappeared into the old beggar's dilapidated bag. That, I thought, was a truly benevolent act. I had given up all my food for that day to an old woman, a beggar for life. I was proud of myself for accomplishing such a great act of unselfish service, despite my rather meagre condition.

After the old woman looked into her bag, she became more furious. She was truly insulted. How could I, a rich Westerner, give her so little? She stomped her bare feet; she spat; she held up the two potatoes. Then she threw both of them on the ground and walked away.

My inner beasts, especially the fetters of pride and rage, were cruelly awakened that day. When I finally succumbed to my day of hunger and meditation, and my anger subsided, I was humbled, truly humbled. I had yet to learn the art of true selflessness, to give the gift of love and compassion without expecting anything in return. But since Tantra teaches us that our problems are our best friends, I eventually learned to look at that old, angry beggar as a great friend and teacher.

Tantra and Ayurveda

A few years before my journey to India and Nepal, I received my initiation in Tantra meditation at a retreat in a pine forest in Sweden by a Tantric monk in saffron robes who had recently arrived from India. In accordance with ancient tradition, the charismatic monk whispered a mantra into my right ear and told me it was never to be uttered aloud, except back to him. He prescribed a specific technique for withdrawing my mind from its external preoccupations, guiding it away from attachment to the body, and meditating on and become one with the mantra's deep meaning. I was to recite the mantra silently, in harmony with my breath, while concentrating on a particular chakra. This first of the six lessons I was to learn in Tantric meditation seemed a bit complicated at first, but I soon got the hang of it. Indeed, I experienced some very powerful visions and spiritual insights at that very first retreat. I had found my spiritual home, and ever since that gathering, I have practiced Tantric meditation daily.

Later on that auspicious day, I heard several stories about Shiva, not the well-known Hindu deity, but the historical Shiva, a living person who, like the Buddha, was an enlightened yogi. According to the oral history of the Tantric tradition, it was he who systematized Tantra Yoga and who also enhanced *Vaedyak Shastra*, the ancient system of yogic or Tantric medicine, which is basically the same as what we today know as Ayurveda. In the book *In Search of*

the Medicine Buddha, author David Crow quotes a contemporary Ayurvedic alchemist, practicing this ancient art and science in Nepal today, who says, "Lord Shiva was the first Ayurvedic physician."⁸ It is common knowledge among Ayurvedic doctors in Nepal and India that there is a historical and spiritual interrelationship between Tantra and Ayurveda. Furthermore, when I was in India, I was taught that Shiva was the preceptor of the first group of Ayurvedacharyas or the teachers of Ayurveda.

When I studied Ayurveda at the California College of Ayurveda, a school that maintains that Ayurveda is a Vedic science only, I learned that Lord Dhanvantari was 'the God of Ayurveda and of healing'. Lord Dhanvantari is said to have been a high-caste king of Benares, which during Shiva's time was called Kashi, and who taught an Ayurvedic form of surgery. From a Tantric perspective, it makes sense that Dhanvantari taught surgery because that was part of the science of Tantric Ayurveda. Dhanvantari could not have been a follower of the Vedas, however, since Vedic dogmas prohibited high-caste Brahmins to touch people of a lower caste and thus prohibited them from performing surgery. As is said in the oral tradition of Tantra, it is more likely to conclude that Dhanvantari was a Tantric and also Shiva's first and main apprentice in Ayurveda. In other words, as Ananadmurti claims, Dhanvantari was most likely the world's first Ayurvedic teacher.

Contemporary Ayurvedic writers, including Deepak Chopra, David Frawley and Vasant Lad, have, in their books, revealed some of the sublime wisdom found in Ayurvedic medical texts, including the famed *Carakasamhita*. Yet these popular writers have overlooked the fact that Ayurveda's ancient roots also trail back to Tantric teachings passed down through the ages since Shiva's time. "Indian medical science as revealed in the *Carakasamhita* and *Susrutsamhita* is basically Tantric," writes N. N. Bhattacharya in his acclaimed book *History of the Tantric Religion*.⁹

Tantric and Ayurvedic Medical Science in Ancient India

According to Ayurveda, disease occurs when the balance of the body is lost due to an increase or decrease of the body's three humors, *vata*, *pitta* or *kapha*. Medicine is applied to restore balance. If the amount of *vata* or *pitta* decreases, medicine is applied to increase it; if the amount of *vata* or *pitta* increases, medicine is applied to decrease it. This, in simple terms, is the Ayurvedic system of medicine.

Rudimentary forms of Ayurveda were possibly brought to India by the Aryan people as early as 8-7,000 years ago. About 7,000 years ago, Shiva further developed the Tantric system of medicine that incorporated and refined Ayurveda. This new, advanced system of medicine also included surgery. For thousands of years, the Indian medical system was a mixture of these two schools of medicine, Tantric and Vedic. Thus, in the Ayurvedic teachings popularized today, it is difficult to distinguish which feature is Tantric and which is Vedic.

During the age of the Mahabharata, about 1500 BCE, surgery, Ayurveda, Vaedyaka Shastra, and even a rudimentary form of homeopathy existed in India. During that time, Lord Krishna developed another branch of medicine called *Visa*

Cikitsa. Due to certain Vedic religious dogmas, however, the Tantric science of surgery was largely discontinued because it was forbidden to touch dead bodies.

From the ancient Tantric seers, we have learned there were eight main branches of medicine, which form the basis of the eight main divisions of Ayurveda:

1. Salya Tantra: Healing of wounds in the lower limbs through surgery.
2. Salakya Tantra: Healing of wounds in the upper limbs through surgery.
3. Kayacikitsa Tantra: Healing of internal and external diseases.
4. Bhutavidya Tantra: Healing of mental diseases.
5. Kaumarabhritha Tantra: Healing of children's diseases.
6. Agada Tantra: The science of toxicology.
7. Vajikarana Tantra: The science of sexual balance and vigour.
8. Rasayana Tantra: The science of rejuvenation.

In Ayurvedic books today, we learn that the medical source for this ancient science is a book called the *Caraka Samhita*. This book, however, is actually a revised version of an earlier work called *Agnivesa Tantra*, written by the Tantric sage Agnivesa. These ancient Tantric yogis were also skilled in the art of alchemy and, much like today's homeopaths, used many altered toxic substances, including mercury, for healing and transformation. In Tantra, the body is seen as a microcosm of the universe. Longevity and health are thus achieved through spiritual union with Cosmic Consciousness and in living in harmony with the complex, yet orderly, natural forces in the cosmos within and beyond us.

Shiva in Europe?

In 1979, I had another pivotal experience in my understanding of Tantric history. It occurred during a meeting with my spiritual guru, Shrii Shrii Anandamurti. An enigmatic person who allegedly could wake people from the dead, read people's present and past lives as if they were books, Anandamurti was hailed as "one of the greatest philosophers of modern India" by former Indian President Giani Zail Singh. Already well known in India with a fast-growing group of devoted followers, he had embarked upon a whirlwind tour to nine countries on four continents.

After a few days of listening to this electrifying and mysterious man's lectures and watching people fall in yogic trance or *samadhi* around him, I found myself walking beside him with a group of people along a mountain road in the beautiful Fiesch valley of Switzerland. Once in a while, my guru would stop, point toward a flower I had never seen or toward an unusual shrub and explain in detail these plants' local and Latin names, their medicinal properties and the kind of soil they best thrived in. At other times, he would pick up a rock and give a lengthy description of its various mineral properties, or he would point toward a picturesque farm far away and explain in great detail what kind of fruit crops the farmer cultivated and what other types of crops would be good to grow in that

area. His encyclopaedic knowledge of everything around us was simply breathtaking, especially since he had never before been out of India. I had never experienced anything like it – there seemed to be no limits to this man's knowledge.

On one of these walks, with another group of people, Anandamurti suddenly stopped and looked out across the snow-covered Swiss Alps and exclaimed that Shiva travelled from India to this valley about 7,000 years ago on a yak.

During his European trip in 1979, Anandamurti made some predictions about the future. While standing beside the infamous Berlin Wall, which at that time still divided West Germany from East Germany, Western democracy from Eastern Communism, he said, "This wall symbolizes the brutal suppression by communism against human liberties. It is a kind of artificial madness. In the near future, you will see this wall crumble piece by piece, stone by stone. East and West Germany will be united as one."¹⁰

As predicted, this historical unification occurred 10 years later, in 1989. Two years earlier, in 1987, Anandamurti made another prediction about the future by saying that Communism would soon "fall like a house of cards." Indeed, it did – starting in 1989, country by country, communism disappeared from Eastern Europe.

I have often wondered, is it not conceivable that this mystic seer and sage, who could read people, rocks and plants as if they were books, who could see into the future as if it happened before him--that he could also, with equal accuracy, see into and explain the past?

When a Tantric yogi, through psycho-spiritual practice, makes his/her mind as expansive as the Cosmic Mind, he/she can receive information directly from that Source. This is sometimes referred to as the *akashic records*, a cosmic storehouse of information and knowledge, easily accessible to great, clairvoyant souls. In other words, by mentally accessing this subtle field of consciousness, it is thus possible for a great yogic master to reveal the secrets of both the past and the future.

So, if Shiva, the father of Tantra indeed left his Himalayan abode to travel all the way to Europe, one might assume that some of the Tantric teachings also took root in the rocky soil of the Swiss Alps and from there ventured beyond. In accordance with my Norwegian author friend, as well as John Mumford, a scholar and yogic adept who has written about the ancient interconnection between pagan and yogic history, Tantra, at least in mythological form, could thus have spread toward the Celts in Germany, France and the British Isles and even farther north toward the Bronze Age farmers and Vikings of Scandinavia.

Tracing Tantra from the Roots

India is an enormous country with a long and culturally rich history. In the past, it has included Pakistan, Bangladesh, Afghanistan, Burma, and Sri Lanka. Perhaps the most ancient civilization on the planet, India has an uncanny ability both to move beyond and embrace its past. And, more often than not, this multifaceted country mirrors the vastness, depth and history of humanity itself.

Indian civilization may not only be the planet's oldest continuous civilization, but also the one with the richest and most enduring spiritual legacy. As Anandamurti has explained, basic forms of Tantra existed even prior to Shiva's time, leaving a trail back to early shamanic cultures. In fact, he once directed some of my yogi friends to a cave in North-east India where they discovered depictions of the esoteric yogic chakra system painted, in graphic detail, on the cave walls. These cave paintings, it is estimated, are nearly 9,000 years old.

Many writers on yoga claim that Tantra had its early roots in the scriptures of the Vedas (ca.1500 BCE). However, it is more probable that the Vedic and the Tantric traditions are two parallel streams of Indian history. The Vedic stream originated with the *Rig-Veda*, the oldest and one of four books of Vedic scriptures. Yoga scholar Georg Feuerstein writes that many Hindus "distinguish between Vedic and Tantric (vaidika and tantrika) currents of Hindu spirituality."¹¹ Anandamurti would agree with this assertion. He makes a clear distinction between Tantra and Veda. Tantric teaching represents, according to him, a predominantly yogic path whereas the Vedas are more philosophical, mythological and ritualistic in orientation. Although the Tantric oral tradition is more than 7,000 years old, the first Tantric books, or Tantras, were not written before around 500 CE.

Anandamurti's contribution to this historical and philosophical quandary is to trace many of the original Tantric teachings scattered throughout the Vedas, the Puranas, the Agamas, and the Upanishads. By applying his exceptional spiritual vision and scholarly erudition, he has highlighted the timely validity and renewed significance of these ancient teachings.

In India, I was taught that the earliest systematic Tantric teachings are formulated in the *Agama* and *Nigama* Tantras. These esoteric teachings are allegedly based on conversations between Shiva and his wife Parvati. The Nigama teachings constitute the philosophical teachings of Tantra, or the deeply inquisitive questions that Parvati posed to Shiva. The Agama teachings make up the practical aspects, or the answers that Shiva gave.

The more I delved into Anandamurti's teachings, the more I realized how Tantra had influenced the Vedas. I found that the *Atharva-Veda*, for example, is marked by a distinct Tantric influence. The *Nrimha Tapaniyya Shruti*, in particular, clearly demonstrates Tantric rather than Vedic influences.¹² The Upanishads, which were written after the Vedas, also include many references to Tantric concepts, including the subtle life-force energies or *vayus* and the psychic energy vortexes today commonly known as *chakras*. "The Tantric esprit", writes Feuerstein, "continues to evolve through the period of the Brahmanas and Upanishads (ca. 2000 BCE), as well as the intellectually and spiritually fertile era of the Mahabharata, until it reached its typical form in the Tantras of the early common era."¹³ In the ensuing centuries, Tantra experienced a booming renaissance, and its philosophy and practices had a remarkable influence on Tibetan Buddhism, Hinduism, as well as the lesser known Jainism.

The age-old spiritual science of Tantra is as timely as ever. Within its vast synthesis of spiritual cosmology and yogic techniques, you will find all the

required knowledge to achieve physical, mental and spiritual balance. Tantra's integral approach to life (for Tantra sees our human body, mind and spirit as a microcosmic mirror of the cosmos itself) is especially relevant to all those who appreciate the value of a spiritual and sustainable lifestyle.

Dispelling Some Myths about Yoga and Tantra

The more I learned about the Tantras and the Vedas, the more I also learned about the many misconceptions about Tantra among yoga scholars and practitioners today. One of the most common misunderstandings is that the Vedas, as taught by the Rishis and the Brahman priests, are the original source of yogic philosophy and practice. This misunderstanding, I discovered, has in part arisen because many important Tantric texts were not written down before the early Common Era. Like the Vedas, the oral teachings of Tantra were transmitted from guru to disciple for thousands of years before being written down. But the main source of this misunderstanding arose from the Vedic Brahmins themselves. Although many of them practiced Tantra, due to their own prejudices, they attempted to demonstrate the Vedic origin of Tantra and yoga. Therefore, writes N. N. Bhattacharya, "they often twisted Vedic passages to suit their own purpose".¹⁴

One may find an example of such misrepresentation in the Rudrayamala Tantra, where it is said that "The science which comes from the mouth of Lord Shiva, goes to the ears of Parvati, and is approved by Lord Krishna, is called Agama." As Anandamurti has pointed out, however, it is illogical that Krishna of the Mahabharata era (1500 BCE) would approve something that Shiva said 3500 years earlier. This aphorism, Anandamurti asserts, "was cleverly included in the Rudrayamala Tantra by the protagonists of the Vedas."¹⁵

Arthur Avalon (a.k.a. Sir John Woodroffe), the famous British writer on Tantra, spent half his life searching for secretly guarded Tantric texts in India. In his path-breaking book on the chakras and the kundalini, *The Serpent Power*, published in 1918, he also traced the origins of Tantra back to the Vedas.¹⁶ Avalon, as well as many other eminent Western writers on Tantra and yoga today, vehemently proclaims the Vedic origins of Tantra. They do not explain, however, why Tantric spirituality in India has long been considered *vedabahya*, an inferior path that belongs outside the Vedas. While we may excuse these Western writers for their ignorance, history speaks for itself: for several millennia, the followers of Tantra faced ridicule and suppression, its practices have been misunderstood, and its origin as the source of yoga either ignored or forgotten.

Despite these misgivings, Avalon is unparalleled in his comprehensive understanding of Tantra. More importantly, for those on the spiritual path, Avalon reminds us that Tantric spirituality "has the supreme merit of accomplishing within a short time what other methods can hardly accomplish within a life."¹⁷

Even *Yoga Journal*, undoubtedly the most popular magazine on yoga in the world today, perpetuates the myth that the history of yoga and Tantra started in the Vedic period. One of this magazine's regular contributors, Linda Sparrowe, writes

that the history of yoga started in the Vedic Period (1500 BCE), continued to grow in the pre-classical period (800-500 BCE), was systematized by Patanjali in the classical period (200 BCE), and has continued to develop into our times. She writes, “Tantra emerged early in the post-classical period, around the fourth century CE, but didn't reach its full flowering until 500 to 600 years later.” She concludes that, for most students of yoga today, Tantra “represents a rather radical departure for yoga philosophy.” In the same esteemed journal, Maria Carrico writes that the Vedas, India's ancient religious texts, gave birth to both the literature and the technique of yoga.¹⁸ Thus, these writers perpetuate the Tantric myths prevalent among writers, teachers and students of yoga today.

Veda and Tantra: The Two Spiritual Rivers of India

When studying Tantra in India, I found such bias to be quite common among Vedic scholars. Many of the Tantric teachers and scholars I met, however, explained that Tantra developed in the pre-Vedic period when it was popular among the Dravidians and the Mongolians and to a lesser extent among the Austriacs. It was during this time, Shiva's authority as Tantric yogi, spiritual preceptor, medical scientist and musician emerged.

It is impossible for us to fully measure the comprehensive nature of Shiva's influence today, but it appears that Shiva was not only the *King of the Yogis* but also the leader of many tribal groups. Thus, as popularly accepted in India, none other than this Tantric yogi, deserves the term ‘father of yoga’ as well as ‘father of Indian civilization.’

That said, I also discovered that there are many philosophical similarities between Vedic and Tantric teachings. This you will especially discover in many Sanskrit verses from the Vedas and the Tantras. In the Vedas, it is said:

Yato va' ima'ni bhu'tani
Ja'yante yena ja'ta'ni jiivanti
Yatprayantyabhisam'vishanti
Tadvijijina'sasva tadbrahma.

Translation: All created beings emerge, are maintained and finally dissolve in the flow of Cosmic ideation. Make an attempt to know that Supreme Entity, the veritable Brahma.

In Tantra, a similar idea has been expressed:

Yato vishvam' samudbhu'tam' yenaja'tainca tis't'hati
Yasmin sarva'n'i liiyante jinayam' tadbrahmalaks'aen'ach.

Translation: The entity in whom the creation, preservation and destruction of the universe takes place is Brahma.

Both the Vedic and Tantric teachings are in philosophical agreement that Brahman, the Cosmic Consciousness, is the all-pervading source of all creation. Moreover, both paths believe that the goal of life is to realize this infinite source. So, what has been the most obvious difference between Vedic and Tantric

teachings? Its practices. While Tantrics meditate and practice yoga asanas, the Vedic Brahmin priests chant hymns and offer ablutions to the sacrificial fires. Since the dawn of Tantra, many Vedic Aryans practiced Tantra, however, and thus over time, these two distinct streams of Indian culture have fed and nourished each other.

In one of his many discourses, Anandamurti states that it was Tantra, and to a lesser extent the Vedas, that was the sacred thread holding the colourful fabric of Indian society together. Indians have always been a deeply spiritual people, and Tantra has been part and parcel of their daily life since the early dawn of civilization. While in India, I saw firsthand how Tantric culture is expressed through the devotion people have for such popular deities as Kali, Durga and Shiva. An especially popular practice is the age-old worship of the Shiva *lingam* and the *yoni*, ancient male and female fertility figures.

The lingam and yoni were originally worshiped by the early fertility cults. But over time, these sacred stones were infused with Tantric esoteric meaning. The male lingam represents Shiva, or Cosmic Consciousness, and the female yoni represents Shakti, or Cosmic Energy, of the Tantric cosmology. In other words, the lingam is the masculine Shiva, and the yoni is the feminine Shakti principles of creation. Merged together in union, they are the two faces of Brahma – the sublime fusion of duality that dissolves in Cosmic non-duality.

But what is the main reason why so many believe Tantra came from the Vedas? First, the *Tantra Shastras*, the Tantric writings of the early Common Era, were to some extent influenced by Vedic philosophy. Second, the Vedas were also influenced by the Tantras, because many if not most of the Vedic sages and philosophers, including the famous Vedantic yogi and philosopher Shankaracharya (788-822CE), were Tantric adepts. Why? Because it was Tantra, not the Vedic teachings, that contained the more practical and sophisticated wisdom and techniques needed to attain spiritual enlightenment. It is namely within the Tantric heritage that one will find the time-tested tools to become an accomplished yogi or yogini, including the esoteric sciences of *kundalini* awakening, yogic breathing, yoga exercises, and mantra meditation.

In summary, Tantra influenced the Vedas and the Vedas influenced Tantra. However, it is the Tantric path that is most responsible for the teachings we know and practice today as yoga and meditation.

It was the famous sage Patanjali who codified yoga philosophy in his famous Yoga Sutras (ca. 200 BCE). This complex treatise, from which most ancient and modern yogic philosophy is derived, was not solely based on the Vedas, however. These ancient sutras were also formulated from the ancient teachings of Tantra. In fact, one can trace most forms of yogic philosophy and practice back to Shiva and Parvati. How? Patanjali was influenced by Kapila's Samkhya philosophy, which also evolved from Tantra, and many aspects of this philosophy and, most notably his eightfold path of Astanga Yoga, also evolved from Tantric yoga. Indeed, Anandamurti maintains that of the eight practices of Patanjali's Asthanga Yoga, at least six had been systematized by Shiva almost 5,000 years earlier.

In the insightful book, *History of Mysticism*, S. Abhayananda reveals the story of humanity's recurrent experience of enlightenment in various cultures throughout the ages. To him, it appears that the Dravidyan civilization was based on a "full-blown Shiva-Shakti mythology" and that we therefore may trace the Tantric and Yogic tradition back to non-Aryan India.¹⁹ As Anandamurti repeatedly states, all authentic yoga practice is based on Tantra.

Shiva, according to Danielou, "is the Central figure of pre-Aryan Dravidyan religion in India and in all its branches in the Near East and around the Mediterranean, as far as pre-Celtic Europe."²⁰ Danielou further claims that Shiva Tantra at one point was "almost universal" and has maintained its original form in India until today. The widespread veneration of Shiva in prehistoric times, from the banks of the Ganges to the shores of Europe, may explain the legends and sculptures of Viking yogis, puts in perspective Shiva's seal found in a Bronze Age peat bog in Denmark, makes it possible that Shiva travelled all the way to the Alps, and might be the source for why the Greeks speak of India as the sacred homeland of Dionysus.

Genetic and Linguistic Science and Ancient Indian History

On a rainy evening in 2003, I sat glued to the television screen watching the PBS program, *Journey of Man*, by Spencer Wells. The main reason I was so captivated was that Wells offered scientific evidence for what Sarkar and others had claimed – that the Aryan Vedic people migrated to India from Eastern Russia.

Indeed, Wells' genetic discoveries confirm the many stories I have heard from scholars and storytellers in India. Actually, his extensive research shows that India experienced four large migratory settlements over a period of nearly 55,000 years. By sampling DNA of people in a village close to Madurai in Tamil Nadu, he spotted a genetic mutation that had been passed on to aboriginal people in Australia, thus offering the first biological proof that African ancestors of the Australian natives passed through India on the way to their new home. His research also proved beyond a shadow of doubt that the people who later moved into India in the north were of Aryan stock.²¹

A few days after I had seen this captivating PBS program, I continued my research and located an interview with Wells in the online *Rediff* magazine. There he states emphatically that there is genetic evidence that "the Aryans came from outside India." The Rig-Vedic Aryan peoples, he claims, emerged on the southern steppes of Russia and the Ukraine about 5-10,000 years ago. From there, they migrated east and south through Central Asia toward India. He further emphasized that "there is clear evidence that there was a heavy migration from the steppes down toward India." Wells maintains that he does not agree with scholars David Frawley and Georg Feuerstein, who claim the Vedic Aryans were the "original inhabitants" of India. To Wells, there is clear genetic evidence that "the Aryans came later, after the Dravidians." In other words, Wells' genetic research clearly supports Sarkar's assertions.²²

The research work of a team led by Michael Bamshad of the University of Utah in Salt Lake City, USA, compared the DNA of 265 Indian men of different castes with DNA from nearly 750 African, European, Asian and other Indian men. First, they analyzed mitochondrial DNA, which people inherit only from their mothers. When the researchers looked at specific sets of genes that tend to be inherited as a unit, they found that about 20 to 30 per cent of the Indian sets resembled those in Europeans. The percentage was highest in upper-caste males, which is natural since the early Aryan settlers were by and large men.

The genes that entered India when Aryan settlers emigrated from Central Asia and the Middle East are still there. And, according to these scientists from the University of Utah and from Andhra Pradesh University in India, they still remain entrenched at the top of the caste system. The invaders apparently subdued the local men, married many of their women and created the rigid caste system that exists even today. Their descendants are still the elite within Hindu society.

Geneticist Lynn Jorde of the University of Utah found that “a group of males” was largely responsible for the Aryan invasion. If women had accompanied the invaders, the evidence should be seen in the mitochondrial genes, but it is not evident. The research team found clear evidence that women could be upwardly mobile, in terms of caste, if they married higher-caste men. In contrast, men generally did not move higher, because women rarely married men from lower castes. Since the caste system is still in vogue today, the same practice prevails.

Genetic science therefore corresponds with the Tantric view that the Indo-Europeans or true Aryans indeed came from the outside and conquered the northern parts of the Indian subcontinent. The people they subdued, the Mongolians, Dravidians and the Austrians, descended from the original inhabitants who had arrived thousands of years earlier from Africa, the Middle East and other parts of Asia.²³

Finally, studies conducted by the *People of India* project of the Anthropological Survey of India assigned the entire Indian population to 4,635 ethnic communities by putting together detailed information from over 25,000 individual informants from all over India. It was found that there are four major language families in India, Austro, Dravidian, Indo-European and Sino-Tibetan. These languages also correspond to the four main racial groups in India: the Austrians, Dravidians, Aryans and the Mongolians respectively.²⁴ According to this study, it appears as if the Indo-European Aryans brought the Vedic language to India from Central Asia, a fact that has also been substantiated by the historical sequences and also outlined in Anandamurti's many far-seeing discourses on the history of India and thus the ancient history of Tantra and Yoga. In other words, genetic science and linguistics seem to confirm what yogis and Indian historians have maintained: the sacred history of India is best told by looking at the combined history of the Vedic and the Tantric traditions. Moreover, it is becoming increasingly evident that yoga has its origins in the history and practice of Tantra. In the words of Shrii Shrii Anandamurti, “Yoga, which is a paramount factor in spiritual practices, is itself based on Tantra.”²⁵

Endnotes

- ¹ This essay consists of extracts from a forthcoming book by the author: *Tantra: The Yoga of Love and Awakening*, New Delhi: Hay House India, 2012
- ² Storl, Wolf-Dieter. *Shiva: The Wild God Of Ecstasy*, US-VT: Inner Traditions, 2004, p. 178.
- ³ The Hindutva movement is a militant Hindu organization that upholds Aryanism and the Vedic heritage as India's primary culture.
- ⁴ Danielou, Alain. *A Brief History of India*, Rochester, US-VT: Inner Traditions, 2003, p. 27.
- ⁵ Ibid, p. 27.
- ⁶ Ibid, p. 29.
- ⁷ Hensberger, Beth. *The Ultimate Rice Cooker Cookbook*, Harvard Common Press, 2002.
- ⁸ Crow, David. *In Search of the Medicine Buddha*, NY: Tarcher/Putnam,, 2000
- ⁹ Bhattacharya, N. N. *History of the Tantric Religion*, New Delhi: Manohar Publishers, 1999, p. 32.
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- ²² Interview with Dr. Spencer Wells, www.rediff.com/news/2002/nov/27inter.htm, November 27, 2002.
- ²³ Cooke, Robert. "History of Aryan Conquest of India told in Genes", in the *San Francisco Chronicle*, 26 May, 1999.
- ²⁴ "Peopling Of India," Independent research paper published by Madhav Gadgil, N. V. Joshi from Indian Institute of Science; U. V. Shambu Prasad, Centre for Research in Indo – Bangladesh Relations; S. Manoharan and Suresh Patil from Anthropological Survey of India. <http://ces.iisc.ernet.in/hpg/cesmg/peopling.html#sec1>

- ²⁵ Anandamurti, Shrii Shrii. *Discourses on Tantra, Volume 1*, Kolkata, India: AM Publications, 1994

The Structure of Matter

Michael Towsey

Two Schools of Cosmology

Introduction

This essay compares two descriptions of the physical universe, that of modern Western physics and that of Tantra, the ancient spiritual tradition of the Indian subcontinent. We use Tantra as a surrogate for Eastern cosmologies in general. More specifically we compare Western physics with Prabhat Ranjan Sarkar's exposition of Tantra delivered in a series of discourses in 1959 and subsequently compiled into a book, *Idea and Ideology*.¹ The assertion will be that Tantra's classification of matter into *ether*, *air*, *fire*, *liquid* and *solid* (which Sarkar retains) is not as naïve as it might seem to the modern Western mind. In fact it is possible to find points of correspondence between the two descriptions that might be of benefit to theoretical physics.

The essay is in nine parts. 1: The briefest possible introduction to particle physics – the reader is assumed to have some familiarity with the basic ideas. 2: An overview of Tantra's description of the physical world. 3: The proposed correspondence between the two cosmologies. 4-8: A discussion, in turn, of the elements ether, air, fire, liquid and solid. 9: The concepts of hierarchy and interpenetration in the physical universe.

Western Cosmology

Atomism, the idea that the ultimate substance of the universe consists of discrete indivisible particles, was first proposed (at least in the West) by the Greeks in the 8th century BC. The word itself is derived from the Greek meaning 'indivisible'. The Greeks believed, like many other ancient peoples, that the diversity of the observable world could be accounted for by just four fundamental elements, *earth*, *water*, *fire* and *air*, presumably based on their observation of the phases of matter. Aristotle added a fifth element, the *ether*,² believing that the unchanging stars and heavens must be composed of something different to the four mutable earth-bound elements.

Modern atomic theory was not scientifically formulated until the early 19th century and by the end of that century 92 different elements had been discovered. Today there are over 100. Scientists have an aversion to complicated theories and the existence of so many fundamental particles suggested that the atom might not be the ultimate unit of matter after all. And indeed the gradual recognition of the

periodic table of elements pointed to some internal atomic structure which was finally confirmed when Rutherford split the atom.

After a few years the electron, the proton and the neutron were recognized as elementary particles and this idea remains familiar to all high school students. However the development of particle accelerators (atom smashers) revealed many more particles related to protons and neutrons suggesting that protons and neutrons were likewise not fundamental. Today physicists believe that the bulk of nuclear matter consists of *quarks* bound in groups of two or three. So now we are back to two fundamental particles, the electron and the quark. In addition, there exists another abundant fundamental particle, the neutrino. Neutrinos are emitted in great number from the sun and also during radioactive decay. Their existence was postulated in 1930 but proven only in 1956 due to extreme difficulty of detection. We only detect a particle if it interacts with other particles and neutrinos seldom interact with anything – it is possible for a neutrino emitted by the sun to pass straight through planet Earth without any deviation or interaction.

Finally in this brief introduction to matter particles, mention must be made of the vacuum state. In classical physics the vacuum state is pure nothingness, the condition which exists in the absence of any matter or field. In quantum mechanics however, the vacuum state is characterised by some kind of energy and appears to possess a granular structure.³

For the purposes of achieving a correspondence between the particles of Western physics and Tantric cosmology, let us make a simple summary – matter consists of just four particle types. In order of increasing mass-energy they are: 1) Vacuum state particles with so little energy that until recently the vacuum was thought to be an absence of energy; 2) the neutrino having a very small (as yet undetermined) amount of energy; 3) the electron and; 4) the quark having highest mass-energy of the particles described. In addition there are four fundamental forces by which the above particles interact: gravity, the weak force, electromagnetism and the strong force. They manifest as both waves and particles, the particles being known as gravitons, W and Z bosons, photons (light particles) and gluons respectively.

Tantra's account of the physical universe

In Tantra, the physical universe is said to be composed of five elements collectively described by Sarkar as the *five fundamental factors*. These factors (hereafter the 5FF) constitute a spectrum of waves divided into five sub-spectra: ethereal, aerial, luminous, liquid and solid factors (in order of decreasing wavelength and increasing energy). The terminology suggests an obvious connection with the five elements of the ancient Greeks and indeed we may suppose that the two schools of cosmology were in contact in ancient times.

The 5FF are an “ocean of waves”, a pattern of vibratory energy within some common more fundamental and more subtle substance, the ocean of Cosmic Consciousness.⁴ Ethereal factor having the longest wavelength is the most subtle (least energetic, least dense) while solid factor having the shortest wavelength is the most tangible and most dense.

The factors arise sequentially, each cruder factor from the one subtler. Ethereal factor is the first manifestation of matter and is “more or less a theoretical factor”. It is clear Sarkar uses the term *ether* in its traditional sense as the ‘substance’ of space-time. Then by a process of compression and division, aerial factor arises within ethereal, and so on down to solid factor (see Table 1). Subtler waves surround and penetrate cruder waves and act as a constraint or hindrance to the flow of cruder waves but not vice versa. For example ethereal factor pervades all the other factors but liquid factor can only pervade solid factor. None of the cruder factors can step outside the domain of ethereal factor or space-time.

Akasha or ethereal factor being the subtlest of all the Bhutas [fundamental factors] has got the maximum wavelength, so its flow faces no physical hindrance, whereas the other Bhutas do face some. A wave can move freely only when it is in harmony with previous [subtler] waves and their curvatures. A wave can pass through an object where there is no physical obstruction or hindrance from a subtler wave, ...⁵

Table 1

The five fundamental factors of Tantric cosmology and their attributes

<i>Factor</i>	<i>Energy</i>	<i>Wave length</i>	<i>Sensory Attributes</i> (<i>tanmatras, inferential waves</i>)
Ethereal	Increasing Energy ↓ ↓ ↓ ↓	Decreasing Wavelength ↓ ↓ ↓ ↓	sound
Aerial			sound, touch
Luminous			sound, touch, vision
Liquid			sound, touch, vision, taste
Solid			sound, touch, vision, taste, smell

The 5FF themselves are not known to us directly but are inferred from their sensory attributes known as *tanmatras*. There are five tanmatras whose names correspond to the five human senses. Ethereal factor has just one sensory attribute, *sound*. Aerial factor has both sound and *touch* tanmatras. Luminous factor has sound, touch and *vision* tanmatras. (Sarkar sometimes uses other terms such as *form* and *radiation* to describe the vision tanmatra.) Liquid factor has sound, touch, vision and *taste*; and solid factor has sound, touch, vision, taste and *smell* (Table 1). Thus our understanding of the structure of matter and the physical world is intimately linked to our five senses.

Particles enter this wave description when Sarkar defines a *tanmatra* as the “minutest quantity” or “microscopic fraction” of a fundamental factor. Described in this way, the fundamental factors are particulate in the same way that an ocean of waves is a huge collection of water molecules. But tanmatras are also described

as *inferential waves* – thus the dual wave-particle nature of matter (one of the puzzles of modern physics) enters Sarkar’s cosmology.

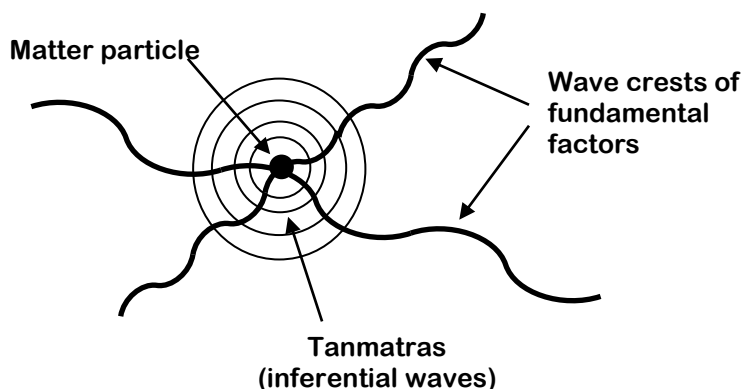


Figure 1: The relationship between the 5FF (as waves) and tanmatras (inferences). The interaction of two fundamental waves gives rise to inferential waves. The fundamental waves are known only indirectly through the inferential waves because only the latter are detected by our sense organs and instruments. In the correspondence between Tantra and Western physics proposed in this essay, tanmatras appear to be emitted and absorbed by a matter particle located at the point of intersection between two fundamental factors.

Some confusion can arise because we now have two kinds of waves, those of the fundamental factors and those associated with tanmatras. Tanmatra waves are produced when a fundamental factor wave interacts with a cruder wave – “as a result of reflection of the subtler *bhuta* [fundamental factor] on the cruder ones.”⁶ In other words, tanmatras are derivative waves superimposed on (or “carried by”, to use Sarkar’s terminology) the fundamental waves when the latter interact (Figure 1). By analogy, they are ripples on the surface of an ocean of waves. In the correspondence proposed here, the point of interaction of two fundamental wave-crests manifests as a matter particle.

Contradictions

If we interpret the words ethereal, aerial, luminous, liquid and solid according to everyday usage, then several contradictions arise. For example gases such as chlorine and sulphur have both colour and smell yet aerial factor is said to carry only sound and touch tanmatras. Ethereal factor conveys sound, yet sound as we normally understand it does not pass through a vacuum; it requires a gaseous medium. Liquid water cannot penetrate a solid bar – in fact the reverse occurs. This does not exhaust the list of problems but it suffices to show that we cannot take a naïve approach to the terminology. We need to look more deeply.

Matter as Wave and Particle

A common feature of Western physics and Tantra is that they both describe matter as wave and particle. Here we have a fundamental paradox of

modern physics because wave and particle are contradictory notions. Waves are energetic oscillations of a field and, mathematically, the wave is a non-local entity that spreads throughout space. By contrast, particles are local point-like concentrations of energy. An electron is both wave and particle, both universal and local. How can these contradictory attributes be accommodated within the one theory?

Here we present three accounts of the wave-particle paradox. Two of them employ the ocean wave metaphor but the first, *complementarity*, purposefully avoids metaphor altogether.

Complementarity

According to the orthodox interpretation, the attributes of wave and particle are *complementary*, meaning that whatever matter might ‘really be’, only its wave or particle attribute can be observed at any one time – never simultaneously. It depends on the apparatus the observer chooses to deploy. There is no visual metaphor adequate to describe what really is and there is no point speculating about the reality behind observations.⁷ Nature defies logical description and furthermore there is no obligation for it to be amenable to logical description.

The Ocean Wave

According to this metaphor matter is continuous on the large scale, behaving like a body of water through which waves pass. However at some level of detailed description (the local scale) water becomes a collection of discrete water particles and a wave description becomes irrelevant. The properties of the large-scale wave depend on the interactions between particles at the local scale. In this interpretation wave and particle are separate elements of reality that operate on different scales. Sarkar’s description of the five fundamental factors as an ocean of waves having a particulate structure also appears to treat wave and particle as separate elements of reality.

The Implicate and Explicate Orders

Imagine you are sitting at the tip of a promontory looking out to sea. In front of you is a turbulent patch of ocean where waves arrive from all directions. The meeting of two crests is additive and the extra high peak is capped by spot of white foam. Squint your eyes and all that remains are dancing foam caps (white particles) appearing, disappearing, merging, splitting and bouncing off one another in complex patterns. Open your eyes and the underlying waves become obvious.

In this metaphor, particles are transient phenomena or *processes* entirely dependent on the underlying order of waves. Physicist David Bohm⁸ referred to the particle world as the *explicate order* and to the underlying order of waves as the *implicate order*. The existence of a particle, he said, is “enfolded” in the implicate order even before it appears in explicate form, just as we can predict the forthcoming appearance of a foam cap even while two waves are far out to sea.

A Simple Correspondence

We are now ready to attempt a correspondence between the 5FF and the wave-particle categories of modern physics. We look for sequences, patterns and symmetries common to both schools. The 5FF create physical structures and the size of those structures corresponds to the wavelength of the subtlest factor involved. Since ethereal factor corresponds to space-time we associate it with the structure of our universe. There are five obvious levels of physical structure, the universe, galaxies, solar systems, atoms and nuclei and we begin by associating them with ethereal, aerial, luminous, liquid and solid factors respectively.

From a particle perspective, the known matter particles (neutrino, electron and quark) form a sequence in which charge attributes become more numerous as mass increases. This appears to correspond to the accumulation of tanmatras as the factors become denser. Thus we may link aerial factor to dark matter particles (having so-called *flavour* charge), liquid factor to electrons (having flavour and electric charge) and solid factor to quarks (having flavour, electric and colour charges - see Table 2).⁹ Matter particles corresponding to ethereal factor and luminous factor will be discussed subsequently. It is interesting that, for the more recently discovered particle charges, physicists have coined sensory names although of course these bear no relation to those in Tantra.

Table 2

A proposed correspondence between the five fundamental factors of Tantra and the structures and particles of western physics.

<i>Factor</i>	<i>Sensory Attributes</i>	<i>Physical Structure</i>	<i>Matter Particle</i>	<i>Particle charges</i>	<i>Force</i>
Ethereal	sound	universe	spatial particle ¹⁰	unknown	gravity (gravitons)
Aerial	sound, touch	galaxy	dark matter particle	flavour	weak (W^+, W^-, Z)
Luminous	sound, touch, vision	solar system	unknown	magnetic monopole ?	magnetic (?)
Liquid	sound, touch, vision, taste	atom	electron	flavour, electric	electric (photons)
Solid	sound, touch, vision, taste, smell	nucleus	quark	flavour, electric, colour	strong (gluons)

As a final step in the correspondence we link the tanmatras to the force fields of modern physics. There are five forces if we divide electromagnetism into its two components, electric and magnetic. Thus sound tanmatra corresponds to gravity

waves, touch to the weak force, vision to magnetic force fields, taste to electric force fields and smell to the strong nuclear force.

This simple correspondence has another appealing feature that will be appreciated by students of Tantra. There exist according to Tantric philosophy certain physical entities known as *luminous bodies* composed only of ethereal, aerial and luminous factors. Luminous bodies are not substantial in the usual sense because their bodies are not composed of atoms and molecules. It is reasonable to suppose therefore that the absence of a molecular body is due to the absence of liquid and solid factors, just what we would expect if liquid and solid factors correspond to electrons and quarks respectively.

Two of the contradictions which arise if we take the Tantric terminology at face value (that is, if we assume aerial factor is equivalent to the gaseous phase of matter, and so on) can now be resolved. The significant point is that atoms and molecules are composed of liquid and solid factors and hence carry all the sensory tanmatras. Gases for example are not pure aerial factor and an isolated chlorine molecule can express the sensory attributes of colour and smell. Elsewhere Sarkar notes that solid objects contain all the 5FF, not just solid.¹¹

Concerning the second contradiction, Tantra says that a subtler factor interpenetrates and encompasses a cruder factor but not vice-versa. It is now apparent how this can be. The vacuum state (or space-time) encompasses all forms of matter but it cannot be said that a proton encompasses space.

Why does Sarkar use the words aerial, liquid and solid to describe the 5FF in apparent confusion with the phases of matter? There is an ancient aphorism, "As above, so below". Its modern equivalent is the principle of *self-similarity* according to which the patterns in a system at the smallest size scale are similar to those at the largest size scale. Phenomena having this property, e.g., fractals, are described as *scale-invariant*. Atoms, solar systems and galaxies have some structural and behavioural features in common (for example satellites revolving around a dense nuclear mass) despite their totally different orders of magnitude. Many common gases such as oxygen, nitrogen and hydrogen are colourless, odourless and tasteless and it is not unreasonable to associate aerial factor metaphorically with the gas phase. The only senses these gases stimulate are sound and touch (wind). Likewise students learn the principles of electricity (liquid factor in the preceding correspondence) using the metaphor of a liquid flowing through pipes.

We now turn to a treatment of the five fundamental factors in turn, highlighting where the proposed correspondence seems to work and where there remain problems, particularly in the case of luminous factor. We begin with ethereal factor.

Ethereal Factor

Ethereal factor corresponds to the vacuum state of modern physics. We approach the correspondence from two size scales, the very small and the very large. *Quantum mechanics* describes the vacuum state on the smallest sub-atomic scale

while *general relativity* describes space-time on the largest cosmic scale. We begin with the quantum mechanical approach.

A particle approach to the vacuum

In several passages Sarkar refers to an *etheron* as the particle associated with ethereal factor.¹² According to the preceding correspondence it would be a particle of space-time. Sarkar also notes elsewhere that time has a particulate character, contrary to our usual understanding of it as some kind of continuous flow. Time passes in chunks or quanta but so minute that our minds register its flow as continuous. In Tantra, Cosmic Consciousness is the only strictly continuous entity, that is, the only entity without division or demarcation. All other derived entities, whether mental or physical, are quantized. The question arises as to whether something equivalent to the etheron is to be found in modern physics.

In recent years the vacuum state, far from being *nothingness*, has come to be understood as a seething ocean of virtual particles, particles that are allowed fleeting existence within the constraints determined by Heisenberg's *uncertainty principle*. This phenomenon, known as *quantum field fluctuations* or *quantum jitters*,¹³ is possible because all the known force fields and matter fields extend throughout the reaches of space and each of them 'jitters'. Strange as it seems, space can also be treated as a field and on the extremely small scale, it also 'jitters'. In other words there is a form of 'jittering' energy uniquely associated with the vacuum state and consequently we may say in the words of physicist Alan Guth¹⁴ that "space-time is definitely a kind of stuff".

String theory offers some insight into what that 'stuff' might be. In order to achieve its grand unification of gravity with the other forces of nature, string theory postulates that space-time cannot be divided, compressed or reduced below the Planck time (10^{-44} seconds) and the Planck distance (10^{-35} meters). In other words the vacuum has a granular structure, each granule of which consists of a vibrating string.¹⁵ String theory shot to fame when it was realised that this primordial string particle had attributes consistent with a graviton, the messenger or force particle associated with gravity.

Space-time as a field

On the cosmic scale, the structure of the universe is described by Einstein's equations of General Relativity. On this scale entire galaxies are point-like concentrations of matter distributed more or less evenly through space. Space-time has an elastic quality, expanding and contracting as it interacts dynamically with the galactic 'particles' embedded in it. The distortion of space around a galaxy manifests as its gravitational pull. A common metaphor is to visualize space-time as a trampoline. A ball placed at the edge of the trampoline will fall to the feet of a person standing in the centre, just as a star in the vicinity of a galaxy will be gravitationally attracted to the galactic centre.

I suggest that this notion of matter distorting the space around it corresponds to Sarkar's description of a tanmatra as the "result of reflection of the subtler *bhuta* [fundamental factor] on the cruder ones."¹⁶ In the case of a gravitational field, the

subtler factor is ethereal factor (space-time) reflecting off the cruder aerial factor (a galaxy). Since galaxies are always in motion, the reflection results in gravitational waves (sound *tanmatra*) radiating through space. Perhaps surprisingly, a sound wave is not an unreasonable metaphor for a gravity wave because both are pressure waves. In other words in the passage of a gravity wave, space successively contracts and expands.

Dark Energy

Today it is generally accepted that the universe is expanding following some primordial *big-bang*. However gravity acts as an attractive force and it might be expected that its effect would be to slow the expansion. The question arises in this scenario as to the long term fate of the universe. One possibility is that when the momentum of the big-bang has exhausted itself, gravity will take over and the universe will collapse back on itself. In this scenario the universe could forever expand and contract (ignoring friction) as one might expect of ethereal factor behaving as a wave.

However in the 1990's it was discovered that the expansion of the universe is actually accelerating and immediately cosmologists postulated the existence of a form of repulsive gravity (or negative pressure) with more than sufficient energy to overcome the attractive force of gravity. Calculations showed that to account for the accelerating expansion, some 70% of the total energy of the universe had to be in the form of an invisible *dark energy* embedded in the very fabric of space-time. A mere 5% of the total cosmic energy is the familiar stuff of protons and neutrons that compose our earth and human bodies. The implications, as Brian Greene observes are significant.

... not only does ordinary matter – protons, neutrons, electrons – constitute a paltry 5% of the mass/energy of the universe, and not only does some currently unidentified form of dark matter constitute at least *five times* that amount, but also the *majority* of the mass/energy in the universe is contributed by a totally different and rather mysterious form of dark energy that is spread throughout space. If these ideas are right, they dramatically extend the Copernican revolution: not only are we not the centre of the universe, but the stuff of which we're made is like flotsam on the cosmic ocean. If protons, neutrons, and electrons had been left out of the grand design, the total mass/energy of the universe would hardly have been diminished.¹⁷

If dark energy is suffused through space, what form does it take? One possibility is that the 'energy jitters' we have already noted at the smallest quantum level contribute to dark energy at the cosmic level.¹⁸

The Expanding Universe

Measurements of the red-shift of light coming from distant galaxies tell us that the universe is expanding equally in all directions. This expansion is not as simple to visualise as one might expect. It is easy to visualise the galaxies

flying away from one another *within* space but that is not what is happening – space-time itself is expanding. But what is it expanding into?

Imagine an ant walking on the surface of a huge expanding balloon. Initially the ant thinks that it lives in a flat two dimensional world – it can only see along its two dimensional planar world. After some careful observations however, the ant discovers that its two dimensional world is slightly curved. It must now add a third dimension to its universe although without having direct experience of it.

We humans apparently live in a three dimensional universe but careful observation reveals that it is curved and expanding in four dimensions. This image also illustrates another paradox – the universe is finite but has no edge. Just as an ant can keep walking forever in a straight line and never fall off its balloon, humans will never find a physical edge where the universe ends.

Also somewhat paradoxical is that, on the cosmic scale, time is not a fourth dimension separate the three dimensions of space. Rather there are four similar dimensions each of which has a component of space and a component of time. Time and space are inextricably interwoven. Only on the scale of our ordinary human experience does time appear to be distinct from space.

M-brane theory

Recall that in string theory every fundamental physical entity can be described as a vibrating string. Over the last two decades, string theory has been greatly expanded. The strings may be of much greater length than the Planck length and the vibrating entity may not just be a string but a two dimensional membrane (think of a drum skin) or a three or higher dimensional entity (difficult to visualize). In one version called M-brane theory, space (on the cosmic scale) is described as a vibrating three-brane (a three-dimensional membrane). We have now taken a significant step beyond Einstein. In his equations, space-time was a purely theoretical or mathematical entity. In M-brane theory, space-time is now a physical substance.

If we are living within a three-brane – if our four dimensional space-time is nothing but the history swept out by a three-brane through time – then the venerable question of whether space-time is a something would be cast in a brilliant new light. Familiar four-dimensional space-time would arise from a real physical entity in string/M-theory, a three-brane, not from some vague or abstract idea. In this approach, the reality of our four dimensional space-time would be on a par with the reality of an electron or quark.

So we return to the ether as a physical entity, vibrating on a cosmic scale, and also capable of transmitting gravity (pressure) waves analogous to sound waves.

Aerial Factor

The spiral arms of some galaxies rotate in a manner which suggests they are under the influence of a gravitational force more powerful than can be accounted for by the visible star mass of the galaxy itself. Cosmologists are now agreed that the visible stars which were thought to be the sum total of a galaxy are actually embedded in a halo of another type of invisible matter termed *dark matter*. Dark matter exerts gravitational pull but does not interact with light photons – in other words it is invisible. Dark matter was a surprise because it had been assumed that all matter is visible, that is, capable of absorbing and emitting light photons. It is estimated that dark matter accounts for about 25% of the expected mass-energy in the universe whereas visible matter accounts for only 5%.

From the perspective of Tantric cosmology, dark matter is not hard to accommodate. It is aerial factor, matter which carries sound and touch tanmatras but not vision, taste and smell. The halo of dark matter that surrounds galaxies is a *standing wave* of aerial factor. Hence in Table 2 aerial factor is matched to galaxies in the hierarchy of structures. Galaxies are observed to cluster and we may assume that such clusters can be explained by bonds of dark matter, rather like molecules on the galactic scale.

Standing Waves

A standing wave is a sustained vibration about certain fixed, non-vibrating points known as *nodes*. When a guitar string is plucked, the string vibrates as a one-dimensional standing wave. The nodes for the fundamental vibration are the fixed points at either end of the string. When a drum is struck, the skin vibrates as a two-dimensional wave. Here the node is the circular rim of the skin and a point in the centre. An electron cloud may be visualized as a three-dimensional standing wave described mathematically by the Schrödinger Wave Function. Applying the *principle of self-similarity*, we may suppose that all structures in the universe are built up from nested clusters of standing waves.

What is the matter particle associated with the galactic halo? There is only one matter particle (currently known) which does not interact with light, the *neutrino*.¹⁹ Neutrinos are extremely difficult to detect but it is believed that they have a very small mass (less than a ten-thousandth of an electron mass) and travel close to the speed of light. The neutrino has spin and interacts with other matter only through the weak force and gravity. How could such an insignificant particle be considered so important on the galactic scale? Simply because there are huge numbers of them – an estimated 55 million per cubic meter of space.²⁰ However neutrinos are too fast and too light to account for the inferred halo of dark matter around galaxies. The search for other weakly interacting physical particles is currently an important field of research.

If aerial factor corresponds to dark-matter, then *touch* tanmatra carried by aerial factor corresponds to the weak force. Physicists have given the name *flavour* to the particle charge corresponding to the weak force. The relevance of touch as a metaphor for the weak force is not obvious. However of interest is that the attribute of *mass* first appears for particles at this level. Mass is a measure of the drag or friction experienced by an accelerating/decelerating particle. It endows particles with *momentum* which is passed from one particle to another during collisions. Touch is a suitable metaphor for the transfer of momentum.

Luminous Factor

Of the five fundamental factors, luminous factor presents the most difficulties when attempting a correspondence with the known particles of modern physics. There are five fundamental factors but only four known kinds of matter particle. A matter type equivalent to luminous factor appears to be missing. However the emerging pattern of the correspondence and the name of the factor itself suggest that luminous factor is connected with stars and light. In descending the scale from universe to galaxy, to star, to atom, to quark, the star is the first body in which the production of light is an integral consequence of its structure.

It might seem obvious to link luminous factor with light waves or its particle equivalent, the photon, but there is a problem with this approach. We have linked each of the other fundamental factors to a matter wave and its particle equivalent. The photon is however a force particle and the distinction between matter wave/particles and force wave/particles is fundamental in physics. We would like to preserve the symmetry of the correspondence outlined in Table 2 which matches the unseen fundamental factors to matter wave/particles and the sensory tanmatras to force wave/particles. In the remainder of this section we deal with a number of issues that apparently involve luminous factor but which we are presently unable to tie together into a coherent account.

Entanglement

According to traditional physics, two objects separated in space cannot influence one another unless some form of energy and information is exchanged between them. Furthermore the rate of exchange cannot exceed the speed of light. Einstein considered this behaviour to be a fundamental aspect of reality, that an object can only be influenced by its immediate surrounds. He famously argued against any form of “spooky action at a distance”. Since quantum mechanics appeared to allow such behaviour he believed it to be an incomplete description of reality.

It is now well established that Einstein was partly right and partly wrong. In a phenomenon known as *quantum entanglement*, it is possible to create two light photons in such a way that their properties remain linked as they fly apart. By measuring an attribute of one photon we instantly know the corresponding attribute of the other. This effect has been demonstrated on photons that are as much as 11 km apart. No energy or information is exchanged between distant entangled photons and thus nothing is transmitted faster than the speed of light

(Einstein was right about this). Therefore we must conclude that the photons remain different aspects of a single coordinated phenomenon and action at a distance is possible (Einstein was wrong about this).

Quantum entanglement is in some ways similar to the *collapse* of an electron wave function, the word used to describe how the process of measuring an electron instantaneously converts a probability distribution to an absolute location. We will link electron probability waves to liquid factor and the proposal here is that the underlying phenomenon that links two entangled photons is the luminous factor equivalent of a probability wave whose size scale is at least of the order of kilometres although there is no reason to suppose that it might not extend to millions of kilometres. Presumably a matter particle corresponding to a luminous probability wave has not been found because its energy would be very small, on the order of thousandths of an electron mass.

Magnetic Fields

Another approach to luminous factor is to consider it to be the matter field distorted by magnetism. Here we make an analogy with gravity which is presently understood to be a distortion of space. In this approach magnetic and electric fields are treated as different forces, associated with luminous factor and liquid factor respectively. Electromagnetism would be the result of an interaction between the two factors.

Magnetic fields are of interest because their size scale seems appropriate to the stellar scale of luminous factor. While space probes have not detected significant magnetic fields within our own solar system, it is believed that powerful magnetic fields traverse the huge molecular dust clouds where new stars are born and so influence the rotation and clustering of stars in their formative stages.²¹ Recent observations (by sun-orbiting satellites) of a massive solar eruption covering half the surface of the sun suggest that “solar activity is interconnected by magnetism over breathtaking distances”.²²

If luminous factor corresponds to magnetism, then a luminous matter particle would be the so-called *magnetic monopole* whose ‘charge’ is a single north or south magnetic pole (just as the electron has a unit of electric charge). Such a particle has never been found although superstring theories predict it would be millions of times more massive than a proton – not quite the more subtle particle that the proposed correspondence with luminous factor suggests!

Form

Sarkar frequently uses the term *form* to describe vision tanmatra. We might interpret this simply to mean that the light emitted by an object reveals its shape. But I believe Sarkar uses the word *form* with much richer meaning. For example, in the context of biology form refers to the process by which organisms acquire gross structure during development.²³ According to orthodox reductionism, biological form emerges out of the complex interactions between biological molecules. Genes dictate the sequences of amino acids in proteins and proteins

self-assemble to construct cells and cells self-assemble to construct gross anatomy. This molecular model of life has dominated biology throughout the 20th century.

As described in *After Materialism* (in this volume), the reductionist molecular model of biology is giving way to *organicism*, a description of biological development that emphasizes the dynamic interaction of the whole with the parts and the role of morphogenetic fields (electromagnetic fields and chemical gradients). Electromagnetic phenomena play only a peripheral role in the molecular paradigm, but as far back as the 1940's, the distinguished embryologist and neuro-anatomist Professor Harold Burr argued that patterns of cell growth and extension in the human foetus follow lines of electromagnetic flux extending from and generated by the foetus.

In the materialist paradigm, morphogenetic fields are purely material, that is, they are electromagnetic fields and chemical gradients. However in the 1980s, Rupert Sheldrake took the bold step of proposing that morphogenetic fields may also be due to novel forms of information or subtle energy. While Sheldrake admits that his proposal is unusual, he offers an analogy.

Imagine an intelligent and curious person who knows nothing about electricity and electromagnetic radiation. He is shown a television set for the first time. He might at first suppose that the set actually contained little people, whose images he saw on the screen. But when he looked inside and found only wires, condensers, transistors, etc., he might adopt a more sophisticated hypothesis – that the images somehow arose from complicated interactions among the components of the set. This hypothesis would seem particularly plausible when he found that the images became distorted or disappeared when components were removed, and that the images were restored to normal when these components were put back.

If the suggestion were put to him that the images depended on invisible influences entering the set from far away, he might reject it on the grounds that it was unnecessary and obscurantist. His opinion that nothing came into the set from the outside would be reinforced by the discovery that the set weighed the same when switched on and switched off. While admitting that he could not explain in detail how the images were produced from complicated interactions within the set, and nothing more, he might well claim that such an explanation was possible in principle, and that it would in fact eventually be achieved after a great deal of further research.²⁴

Sheldrake does not deny the importance of known molecular mechanisms in his account of biological form – but he denies they are the *only* mechanism. Nor does he attempt to formalize the kind of energy and information responsible for morphogenetic fields. However in this essay we postulate that luminous factor is an appropriate candidate. Recall the biophysicists Sitko and Gizhko who believe the human body is coordinated by an “electromagnetic framework”.²⁵

One way to understand the relationship between morphogenetic fields and molecular biology is to visualize D'Arcy Thompson's grid transformations (four of which appear in Figure 2). Thompson, a mathematician and biologist, observed that related species which superficially look different could in some cases be represented as simple Cartesian grid transformations of one into the other. A

particularly interesting example is the transformation from the human skull to the monkey skull (Figure 2). In other words, a wide range of structures can be derived from the same template by differential growth and onset times. The proposal here is that gross biological structure is determined by a template of luminous factor but the transformations of it which produce biological diversity are a product of genetic and epigenetic mechanisms.

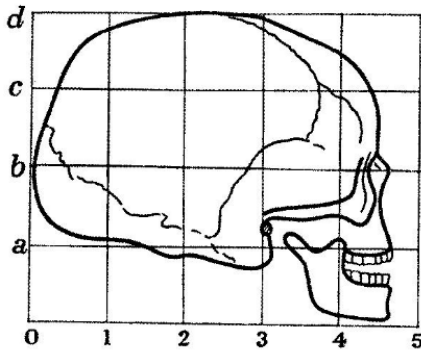


Fig. 177. Human skull.

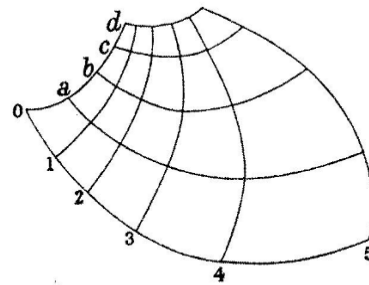


Fig. 178. Co-ordinates of chimpanzee's skull, as a projection of the Cartesian co-ordinates of Fig. 177.

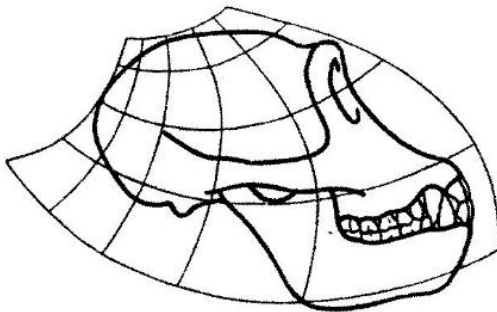


Fig. 179. Skull of chimpanzee.

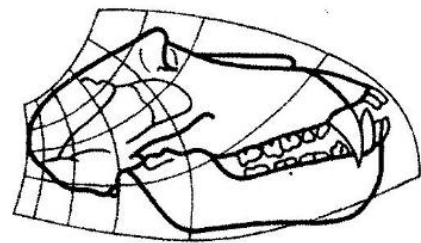


Fig. 180. Skull of baboon.

Figure 2: Four figures taken from D'Arcy Thompson's book *On Growth and Form* showing how grid transformations can reveal the relationship between apparently unrelated anatomical structures. Figure numbers and captions are from the original publication.²⁶

As stated by the biologist Bevan Reid,

We theorise that the building blocks of biological systems, nucleic acids, carbohydrates, proteins, fats and so forth, are insufficient in themselves to produce definitive form. We believe that the flux of electromagnetic and mechanical waveforms which flood biological systems during their formation and function, must play some part in their actual structuring, by supplying an invisible energy framework or scaffold, in much the same way as a welder will hold his pieces together with magnets before their eventual bonding. We believe also that when biological systems are formed in this

manner, there is created a relationship between the microscopic structure of an organ or organism and its definitive macroscopic form.²⁷

To conclude, we have discussed under the heading of *Luminous Factor* a range of phenomena that cover a huge scale, from millimetres for foetal morphogenesis to millions of kilometres for stellar morphogenesis. The common link between these phenomena would appear to be the electromagnetic field. However there is likely to be more to electromagnetism than has been discovered to date. As observed by Robert Becker, a medical practitioner with an interest in subtle kinds of biological energy:

... we may not know all there is to know about electromagnetism at this point in time. In this regard, I have the feeling that physics will eventually be expanded through the study of the energetic aspects of living organisms.²⁸

In a discourse on the shifting of the earth's magnetic poles (geo-scientists believe that the earth's magnetic poles are currently shifting²⁹), Sarkar states that changes in the Earth's magnetic field will have flow on effects to other bodies in our solar system, in addition to affecting "human thought waves".³⁰ He then adds that future progress in both the natural sciences and humanities will depend on advances in our understanding of electromagnetism.

Liquid Factor

The classical picture of an atom at the beginning of the 20th century was the 'plum pudding' model with negatively charged electrons embedded in a sphere of positively charged protons (like raisins in a plum pudding!). This model was scrapped in favour electrons revolving in fixed orbits about the nucleus, much as planets revolve around the sun. Later it was believed that electrons are not confined to orbits but move in spherical shells. Next it appeared as if the electron is not a discrete particle but a diffuse electron 'cloud'. Today the question of how to interpret the electron remains a matter of debate. In the orthodox view, an electron cloud is simply a probability distribution describing where an electron particle will be found if a trained observer chooses to look for one. An alternative interpretation says that the electron cloud is a pattern of energy in its own right and that the electron particle is derivative of the cloud rather than vice versa.³¹

According to the correspondence described here, the atomic electron cloud is a real entity, a localized pattern of energy or standing wave within liquid factor having a diameter of about 10^{-10} metres. Recall that liquid factor itself is known to us only indirectly through its interaction with other factors, such as those emitted by the probing instrument of an observing physicist. Thus the electron particle is better understood as an *interaction event* between two fundamental factors (waves). The point of interaction is said to have an electric charge and to be the focal point of an electromagnetic force field (the tanmatra as wave).

Liquid factor carries four sensory attributes; sound, touch, vision and taste. We have tentatively matched these tanmatras to physical forces as in Table 2. The electron interacts with gravity and with the weak, magnetic and electric fields. We

are not yet in a position to understand in what way taste is a relevant metaphor for electricity.

We should note that electron clouds are not limited to a single atomic nucleus. They surround groups of atoms binding them into molecules and macromolecules. A macromolecule, such as a protein, contains hundreds of electron orbitals and chemistry students are taught to think of them as individual entities. However Tantra understands all those electron probability clouds to be a single field of energy, liquid factor, vibrating in highly complex patterns. We take this idea one step further and propose but one liquid factor field distributed throughout the entire universe. In some places its energy is concentrated into complex vibrational patterns while in the vast reaches of space its energy is so sparse as to be considered absent.

Liquid factor turns out to be very well known to us – it is the world explored by chemistry, the everyday world of chemical compounds. Historically, liquid factor was the first to be explored by science simply because the energies involved in manipulating it were accessible with traditional technologies. By splitting liquid factor into smaller and smaller standing waves, chemists eventually arrived at the atom, the smallest standing wave of liquid factor. Hence they believed they had found the fundamental particle of nature. But by employing larger energies and probing at smaller scales, another level of matter was discovered, solid factor.

Solid Factor

We have equated solid factor with the particle family of quarks, the smallest unit of nuclear matter thus far known. The quark probability cloud has a very small but nevertheless measureable diameter of approximately 10^{-15} metres. Put another way, the wavelength of a quark is 100,000 times smaller than that of an electron wave. In the language of Tantra solid factor is the crudest and densest of the five fundamental factors. An isolated quark wave has not yet been discovered – rather they occur bound in groups of two or three as protons, neutrons and mesons. And, just as hundreds of atoms can be bound into hierarchical groups to form macromolecules, so too hundreds of quarks can be bound into larger atomic nuclei, the equivalent of quark molecules and macromolecules.

In short, solid factor is the world explored by nuclear physics. Interestingly, nuclear matter can exist in three phases that mirror the gaseous, liquid and solid phases of atomic matter.³² Quarks can be bound in a crystalline or solid state; their normal condition is liquid state; and they can be ‘boiled’ to a gaseous state in high energy collisions. Here is a very clear example of the self-similarity principle. Nuclear matter behaves like atomic matter but on a much smaller size-scale and a correspondingly greater energy-scale.

The force which binds quarks into large groupings is the *strong nuclear* force whose particle manifestation is the *gluon*. The release of the energy holding quarks together is responsible for the devastating power of nuclear explosions. In addition to having mass, spin, flavour charge and electric charge, quarks have an

additional attribute unique to them, *colour* charge. Thus in the correspondence scheme proposed in this essay we match smell tanmatra to the strong nuclear force and the gluon. It is not possible to understand the significance of this correspondence at the present time. The strong nuclear force does not 'leak' far beyond the nucleus and therefore it would not be expected to influence atomic or molecular structure, the scale at which our olfactory sense is believed to operate.

Is the quark the final fundamental particle or does it also have a sub-structure suggesting some more fundamental particle? If another layer of matter exists, perhaps some 100,000 times smaller and more energetic than nuclear matter, then it may become apparent in future generations of atom smashers. However it is incorrect to suppose that matter can be split indefinitely into smaller and smaller particles becoming correspondingly more massive. Both physics and Tantra have something to say about this.

According to quantum mechanics the smaller the diameter of a standing wave, the more energy is required to confine it within that smaller volume. But measurements imply there is a limit to the amount of energy available from the vacuum state to achieve that confinement. While the quark is a long way from the limit, a limit nevertheless exists. In Tantra the same idea is expressed by saying that there is a limit to which Consciousness, the common substance of the five fundamental factors, can be compressed and solid factor is that limit. Here is a nice correspondence between quantum mechanics and Tantra.

The Nested Universe

Standing waves of the 5FF are nested one within the other and are responsible for building all the structures, large and small, in the universe. Numerous standing waves of solid factor (quarks) are nested within liquid factor waves (electron clouds) and the two wave types collectively construct atoms and molecules. Numerous atoms are nested within luminous factor to become a great range of structures from biological organisms to stellar bodies. Numerous stars and solar systems are nested within aerial factor to become galaxies and galactic clusters. Finally numerous galaxies are nested within ethereal factor (space-time) to constitute our physical universe. It is entirely probable that multiple universes exist – various versions of string theory point in this direction.³³ Tantra would add that these multiple universes are nested within the Cosmic Mind.

This nested structure is a hierarchy and constitutes another point of correspondence between Tantra and physics. However we must take care not to equate aerial factor with a galaxy or luminous factor with a star. Galaxies, stars and atoms are all composite structures involving all of the 5FF. But it appears as if structure at any particular scale is determined by some 'invisible' template, one of the 5FF at the appropriate scale. For example, galactic structure is determined by a template of aerial factor and atomic structure by a template of liquid factor.

Having stated that the 5FF are nested one within the other in a hierarchical fashion, we now state an apparently contradictory truth, that each of the 5FF is spread throughout the universe. For instance light waves travel between galaxies

(otherwise we wouldn't see them) and the empty reaches of space contain traces of hydrogen, helium and dust particles. In other words, all five factors penetrate deep space – they are both hierarchical *and* interpenetrating. We can clarify this apparent contradiction by turning to an important idea in quantum mechanics.

The probability wave which defines the shape of an apparently single electron cloud does not actually have a definite boundary. It extends to infinity in all directions. Of course there are certain places within the wave where one is most likely to find the electron particle but nevertheless it remains theoretically possible to find it anywhere in the universe albeit with extremely small probability. The size attributed to a particular atomic electron cloud is really an arbitrary region of space within whose bounds there is some fixed probability (say 99.9%) of finding an electron particle if one looks. There is no strict boundary between one electron cloud and the next because they all spread out through the infinity of space. Furthermore it is possible to write a mathematical expression for a wave function consisting of two, three or more electron particles in which the electrons become indistinguishable and cannot be assigned to one particular atom or another.

This idea is known as the *quantum principle of absolute indistinguishability* and it leads to an unexpected conclusion. All the electron clouds within the entire universe are but one total electron cloud and all the supposed individual electron particles within it lose their individuality and 'merge' in a collectivity of electrons.³⁴ We may arbitrarily draw boundaries within this universal electron cloud depending on the discussion at hand, the atom being one such boundary, the human body another, the stars and galaxies yet others.

Tantra presents a similar understanding. Sarkar describes the fundamental factors within a human body or planet or star as singular entities. One of the initial difficulties this author experienced in establishing a correspondence between liquid factor and electron clouds, for example, was to overcome an attachment to Western reductionism which splits singular entities into innumerable parts because those smaller parts are supposedly more fundamental. Tantra on the other hand decides its fundamental categories by different criteria. Bridging the gap between Western reductionism and Tantric holism is eased by thinking of multiple electron clouds as a joint probability distribution in which the individual electrons are indistinguishable.

Because subtler factors pervade cruder factors, subtler factors are also involved in events at the cruder levels. For example the neutrino participates in radioactive decay at the subatomic level as well as having some likely role at the galactic level. In Tantra and more specifically in Eastern medicine, all the 5FF participate in the structure and function of the human body and each of them is relevant in treating illness. From the Tantric viewpoint, Western medicine is concerned purely with liquid and solid factors and, in keeping with its reductionist approach, treats them atomically.

The question arises as to which description of the universe is correct or which approach to medicine is the more beneficial. With regard to the second question, Sarkar's approach is that both schools of medicine can be useful depending on the

problem at hand. Likewise concerning cosmology we might say that both the holistic Tantric approach and the Western reductionist approach are valid descriptions of the Cosmos but neither of them is complete. Problems arise when one school claims to be the whole and only truth.

This essay was motivated by a belief that the Tantric description of the physical universe cannot be dismissed as naïve mythology. Tantra tells some kind of truth about the world in which we live and the challenge is to find the correspondence between two very different accounts of the same world. An entirely satisfactory correspondence between the 5FF and modern physics remains impossible for the time being. However the author believes that the correspondence described in this essay points in the right direction and that the key is to search for symmetries between the two accounts. Clearly our understanding of luminous factor presents the greatest challenge. But the connections made thus far by pursuing this approach are too numerous to be coincidental and deserve further investigation.

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Endnotes

- ¹ Sarkar, (I&I).
- ² The term *ether* can also be spelled as *aether*. In this essay the former is used.
- ³ Greene, (FoC), pp. 350-.
- ⁴ Sarkar, (I&I), p. 23.
- ⁵ Sarkar, (I&I), chapter 3, p. 24.
- ⁶ Sarkar, (I&I), p. 20.
- ⁷ This is the so-called Copenhagen Interpretation of wave-particle dualism. The Copenhagen Interpretation side-steps the wave-particle puzzle but thereby introduces another puzzle – the *measurement problem*.
- ⁸ See http://en.wikipedia.org/wiki/David_Bohm.
- ⁹ This correspondence between the 5FF and the known particles of physics first came to my attention in an article, *Panchatattva: an advanced hypothesis*, by Chakreshvar in a magazine published in the United States. It was reprinted in a 1983 edition of *Pranam* (a magazine published by Ananda Marga Pracaraka Samgha, Sydney) under the title, *Stimulating Thoughts on Brahma Cakra*. In Chakreshvar's proposal, aerial factor is linked to virtual particles – at that time the existence of dark matter and dark energy was not

appreciated. I attribute my initial inspiration to look for links between Tantric cosmology and modern physics to Cakreshvar's article – it was for me an 'eye-opener'.

- ¹⁰ The concept of spatial particles arises from an understanding that space-time has an "atomized structure". (Greene, (FoC), p. 490) The size of these particles would be extraordinarily small, the so-called Planck distance and Planck time.
- ¹¹ Sarkar, (MVINS), p. 69.
- ¹² See for example *Subhasita Samgraha*, part IV, 1st edition p. 35.
- ¹³ Greene, (FoC), pp. 305-310.
- ¹⁴ Guth was a key figure in the development of the theory of inflationary expansion of the early universe. See http://en.wikipedia.org/wiki/Alan_Guth
- ¹⁵ Greene, (FoC), p. 350.
- ¹⁶ Sarkar, (I&I), p. 20.
- ¹⁷ Greene, (FoC), p. 300.
- ¹⁸ Greene, (FoC), see p. 523, footnote 23.
- ¹⁹ Actually there is a family of neutrino type particles just as there is a family of electron like particles but this complexity need not concern us.
- ²⁰ Greene, (FoC), p. 433.
- ²¹ "Young Stars Line Up in Magnetic Fields", *New Scientist*, 26, June 1986, p. 36.
- ²² The solar eruption happened on 1st August 2010. See a report on the NASA website: www.nasa.gov/topics/solarsystem/sunearthsystem/main/News080210-cme.html
- ²³ Here gross structure refers to anatomical structure on the scale of millimeters to meters as opposed to cellular structure on the scale of microns.
- ²⁴ Sheldrake, Rupert. "A New Science of Life", *New Scientist*, 18 June 1981.
- ²⁵ See *The Cycle of Creation* in this volume and www.sergiysitko.org.ua/2004_01e.htm .
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- ²⁸ Becker, Robert. "An Interview with Robert O. Becker, MD", *Newsletter of the International Society for the Study of Subtle Energies and Energy Medicine*, Volume 1 (3) Winter 1980.
- ²⁹ Vastag, Brian. "North Magnetic Pole is Shifting Rapidly Toward Russia", *National Geographic News*, 28 October, 2010.
http://news.nationalgeographic.com/news/2005/12/1215_051215_north_pole.html
- ³⁰ Sarkar, Prabhat Ranjan. "The Poles Shift Their Respective Positions", 31 May 1986. Kolkata, India: AM Publications, published in *A Few Problems Solved*, Part 7.
- ³¹ The physicist David Bohm promoted this interpretation.

³² www.lbl.gov/abc/wallchart/chapters/09/0.html. See also an article in *Scientific American*, May-June 1985.

³³ Greene, (FoC), chapter 13.

³⁴ Kothari, Dr. D. S. *Atom and Self*. Mumbai, India: Bharatiya Vidya Bhavan, 1983, p. 41.

The Theory of Microvita

Michael Towsey

Introduction

This essay is an introduction to the theory of *microvita* as described by Prabhat Ranjan Sarkar (1921-1990) in a series of discourses from 1986 to 1990.¹ Most of Sarkar's output was concerned with spiritual philosophy, social philosophy and linguistics but his microvita discourses, by contrast, address issues of fundamental science.

Usually a philosopher is best approached historically by tracing his or her intellectual and cultural antecedents. Sarkar lived and died in India and his spiritual philosophy is a significant development of the Indian tradition known as Tantra. His social philosophy is reasonably interpreted as a synthesis of East and West. The microvita discourses on the other hand are not so easily characterized. They deal with issues of interest to contemporary science, such as the structure of matter and the origin of life, but the ideas are difficult and not presented in a way designed to appeal to a Western scientific audience.

The theory of microvita was introduced in an earlier essay in this volume, *After Materialism*, with further comments in *The Cycle of Creation*. There is some overlap in content between those essays and this. You are urged to read those essays first because the former situates microvita theory within contemporary problems confronting Western science, while the latter situates microvita theory within the context of Eastern philosophy. This essay addresses the theory of microvita in more detail. There are two previous papers in the academic literature concerning the theory of microvita – the first published in 1995 from the perspective of the natural sciences,² the second from the perspective of the social sciences.³

The Basic Ideas

1. The first microvita discourse⁴ opens with the proposition that there may be in the subatomic realm many objects “smaller and subtler than atoms, electrons and protons” that are beyond the limits of our senses and instruments. We infer their existence and describe them as electrons and protons even though they are neither pure matter nor pure idea but something in between. Sarkar calls such entities microvita (singular *microvita*) after the Latin, ‘small life’.
2. Despite the nomenclature microvita are not protoplasmic, viral, organic or even molecular but they are nevertheless responsible for the spread of life around the universe, hence the term *microvita*. In fact, microvita are the elementary building blocks of the universe although this is not made explicit until later discourses. A microvita is “the minutest entity”. It has

no internal structure. It is “a singular entity” which “requires space in theory but not in the realm of physicality”.⁵ From this we conclude that a microvita is a point-like, indivisible entity.

3. Microvita are an “emanation” from “cosmic factor” but they also “die”. At this point, we interpret these words to mean that microvita are always in a state of flux – they are continually created and destroyed. The use of the word “die” in this context is significant. In the microvita discourses, Sarkar frequently uses the language of biology where contemporary science would use the language of physics. It is as if he wishes to imply that the subatomic world is somehow alive.
4. There is a spectrum of microvita ranging from crude to subtle. Sarkar divides the spectrum into three parts: at one end, crude microvita associated with the physical world; in the middle, subtle microvita associated with internal sensory-motor experience; and at the other end of the spectrum even more subtle microvita associated with the world of pure idea. Clearly this spectrum alludes to the matter-mind spectrum of traditional Eastern philosophy (see *The Cycle of Creation*).
5. “... microvita move throughout the entire universe from one celestial body to another” undeterred by the extremes of temperature and pressure in space.⁶ “Mobility means movement through a medium or media.” Subsequently we learn that this medium for crude microvita is “ethereal space” and for subtle microvita is “psychic space”.⁷
6. Microvita are responsible for the structural integrity of all physical entities and life forms. Carbon atoms, for example, and “all other kinds of atoms are the creation of microvita”; “... when billions of microvita get solidified, a carbon atom is formed”. Differences between atoms are due to differences in number, denomination and arrangement of the constituent microvita.⁸ Organic molecules and protoplasm will in future be interpreted in terms of their constituent microvita and not in terms of their chemistry which will be considered a higher level of description.

Microvita in the physical sciences

To make better sense of these proposals, it is necessary to locate crude microvita in the world of contemporary physics. Sarkar’s reference to various subatomic particles suggests that it is appropriate to do so. The approach taken by this author is to link crude microvita to virtual particles and the world of the quantum vacuum. According to quantum theory, the vacuum of space is a ‘seething ocean’ of virtual particles that are continually created and destroyed. They ‘exist’ only for an instant of time, emerging out of and merging back into the background vacuum. Virtual particles also interact with real particles, causing quantum ‘jitters’ at the subatomic level. We can describe these processes as follows:

quantum vacuum ↔ virtual particles ↔ physical particles.

Despite their not-quite-real status, virtual particles play a hugely important role in shaping the tangible world about us. Indeed, it might be said that they help to create the real world and determine its dynamics.

The Virtual creates the Real

Collectively, virtual particle processes are described as *vacuum fluctuations*⁹ and they contribute to a vacuum energy known as the *zero-point energy field*.¹⁰ The interaction of virtual particles with real particles gives rise to *quantum jitters* which produce observable effects, such as the Casimir effect and van der Waals forces. The Casimir effect is an attractive force that arises between two uncharged metallic plates placed a few micrometres apart. The effect is explained in Quantum Field theory by the difference in vacuum energy or virtual particle behaviour between the plates compared to outside the plates. Many of the puzzling properties of the quantum world can be attributed to the interaction of real particles with virtual particles in the quantum vacuum.

In relativity theory, space-time is a field but it is not a substance having mechanical properties. However in quantum theory the vacuum state is both energetic and particulate in order to account for phenomena such as virtual particles and zero-point energy. In this sense the vacuum of space-time is an ether-like *substance*.

The ubiquitous presence of virtual particles means that the so-called vacuum state is not an 'absolute' vacuum, not pure 'nothingness'. Differences in vacuum energy (quantum fluctuations) between one location and another create effects similar to 'pressure' differences. The 'attraction' between two Casimir plates, for example, is due to a greater quantum pressure outside the plates than between them because the close proximity of the plates excludes some virtual processes thereby lowering the 'pressure' between the plates.

Physicist H. E. Puthof believes that gravity and Van Der Waals forces (weak intermolecular forces) are both variants of the Casimir effect. In other words the gravitational attraction between two celestial bodies is due to an external 'pushing' pressure caused by the partial exclusion of virtual processes between them.¹¹ According to this interpretation, virtual particle processes or quantum fluctuations are responsible for structure on the cosmic scale (which we attribute to gravity) and for structure on the macromolecular scale (which we attribute to Van Der Waals forces).

Recall that Sarkar also treats gravity as an externally applied pressure or *bala* (see *The Cycle of Creation* in this volume). Indeed, the role of the quantum vacuum in creating Casimir-like effects may be quite general and contribute to the formation of structure on many different scales.

Sarkar describes crude microvita as an intermediate form, a "silver lining", between matter and pure idea. "Microvita are the initial stage of matter... microvita are transmuted into matter and matter is transmuted into microvita."¹² Furthermore, as noted above, there is a continual creation and death of microvita which we interpret as an exchange of microvita with the vacuum state. We can write this two-way flux as follows:

ethereal space ↔ microvita ↔ physical particles.

The parallel with virtual particles in the previous equation is apparent. Physical particles continually exchange microvita (and energy) with other particles and with the vacuum state. Sarkar uses the term *ether* to refer to the substance of space-time or the vacuum state. According to this interpretation, a matter particle such as an electron or quark is not a singular entity but rather a “collective body of microvita” apparently located at a point.

Three Theories of Matter

The theory of microvita is a theory of fundamental substances and we would like to compare it with two other theories of matter, those of Western physics and Tantra (Brahma Cakra). Sarkar makes some links between the three theories. For example, atoms (of Western physics) are composed of innumerable microvita particles. Microvita move through the tanmatras or inferential waves (of Tantra). Applying the principle of Ockham’s Razor (that an ontology should include only the minimum number of categories required to explain what is validly observed), one would hope that the three contrasting theories nevertheless recognize similar fundamental categories but use different terminology and/or give them different emphasis.

A promising starting point is that all three theories describe their fundamental entities as waves and particles. The dual wave-particle nature of matter is one of the major puzzles of modern physics. Three ways to interpret the puzzle were outlined in *The Structure of Matter* (in this volume). According to the orthodox *Copenhagen interpretation*, there is no point asking what the nature of matter really is. It takes the appearance of wave or particle depending on how we choose to observe it. According to the *ocean wave* metaphor, matter is continuous on the large scale, behaving like a body of water through which waves pass. However at some lower level of description, water becomes a collection of discrete water particles and the wave description becomes irrelevant. In this interpretation, wave and particle are separate elements of reality operating on different scales. A third interpretation is to consider matter particles as the product of some underlying order of waves (the *implicate order*), just as white foam caps dance above turbulent ocean waters.

A Synthesis

Unfortunately it is not clear how to achieve a parsimonious synthesis of the three theories of matter. The following proposal attempts parsimony at the expense of consistency.¹³ Let us begin with the idea in Brahma Cakra that the physical universe consists of an ocean of waves, the *five fundamental factors*. (A correspondence between the five fundamental factors and the categories of modern physics was proposed in *The Structure of Matter*.) The five fundamental factors do not feature prominently in the microvita discourses but they are mentioned in passing as if they are an assumed background to the theory. This ocean of waves *appears* to have a granular structure when appropriately probed. In physics this lowest level of particle description corresponds to the Planck dimension (10^{-35} m) and the granular structure of space-time. In Brahma Cakra this is the level of the “minutest” tanmatra particles. In the synthesis proposed

here, microvita belong to and operate at this lowest level of description. Note that in this proposal the wave-particle relationship is ambiguous. It might appear to be that of ocean and water molecule but the fundamental factors only appear particulate when they are probed with another wave emitted by the apparatus of an observing human. Thus realism remains in doubt at this lowest level of description because the observer appears to participate in the creation of what he/she observes.

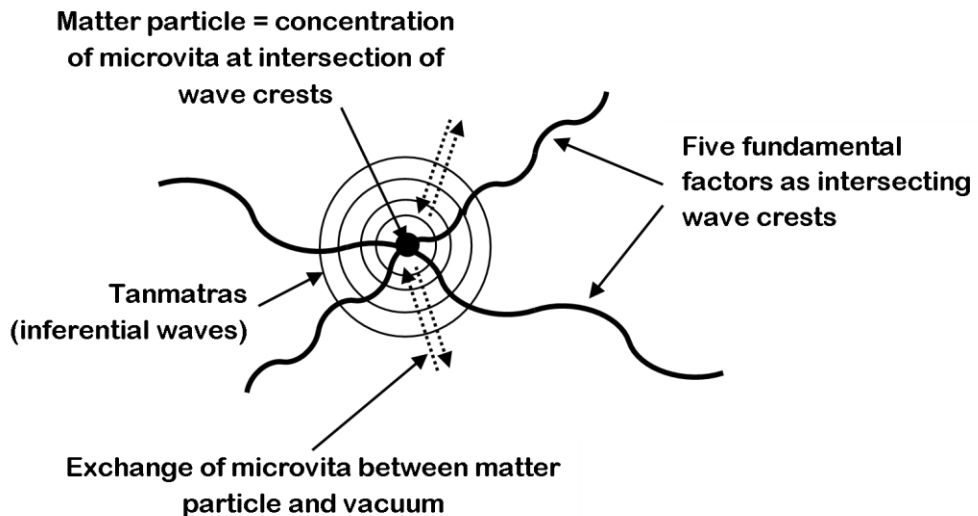


Figure 1: The intersection of two fundamental waves gives rise to a matter particle surrounded by inferential waves. The fundamental waves are known only indirectly through the inferential waves. The matter particle is a concentration of more fundamental particles, microvita, which are exchanged with the surrounding vacuum. This figure should be compared with Figure 1 in *The Structure of Matter*.

Pushing the synthesis further, the *matter particles* of Western physics (e.g. nucleons, electrons and neutrinos) arise at the point of interaction of two fundamental waves. Here the wave-particle relationship is more like the implicate-explicate order relationship according to physicist David Bohm. The explicate order of matter particles emerges from the implicate order of fundamental factors (Figure 1). The energy resulting from the interaction of two fundamental waves is additive. Thus the coincidence of two waves crests supplies the energy necessary to condense many microvita (the particulate structure of the waves) into a matter particle. Alternatively, we might think of the 'condensation' as a 'gathering up' or 'pulling inwards' of some portion of particulate space. When Sarkar uses the phrase, "billions of microvita get solidified" to describe the formation of a matter particle, he does so in the context of the formation of an atomic nucleus. We may assume that all matter particles (including electrons and neutrinos) are also the result of some kind of 'condensation' of microvita.

Recall that in Brahma Cakra, tanmatras are not only particles. They are also described as *inferential waves* which arise through the interaction of two fundamental factors – "as a result of reflection of the subtler *bhuta* [fundamental factor] on the cruder ones."¹⁴ Inferential waves are "carried by" (superimposed on

or added to) the fundamental waves (like ripples on the ocean surface, see Figure 1). Thus a matter particle appears to be a source of inferential waves or force fields and is said to have *charges* (sensory attributes) corresponding to its fields. The presence of a 'charged' matter particle is betrayed by its force fields. In addition, matter particles (being a composite of 'condensed' microvita) exchange microvita with their environment. In Sarkar's description, microvita appear to move through inferential waves. In the interpretation proposed here, tanmatra waves supply the energy for exchange of microvita between matter particles and between matter particle and vacuum.

There is more that might be included in the above attempt at a parsimonious synthesis of the three theories of matter but each addition raises as many problems as it solves. In some respects the theory of microvita is a traditional (pre-20th century) atomic theory in which objective entities are subdivided down to the point of elementary particles having no measurable internal structure but having fixed attributes by which they can be denominated. On the other hand, microvita are a theoretical construct. Their existence is only implied by, but not entirely captured by, observation. In this respect, the concept of microvita is as elusive as the Western concept of matter. The more physicists probe the structure of matter, the more it appears to become a mathematical construct. Indeed Bertrand Russell defined matter as that which "satisfies the equations of physics".¹⁵ Sarkar also notes the link between mathematics and our understanding of matter:

A day is sure to come when an omega of mathematics will coincide with an omega of biochemistry.¹⁶

Once again it is not accidental that Sarkar uses the language of biology to describe a realm which is normally the province of physics.

Mind - as above so below

We now take a significant step in our interpretation of microvita theory and invoke two principles, *self-similarity* and *coherence*. Self-similarity describes systems whose patterns on the smallest size scale are similar to those at the largest scale and *vice versa*. Fractal images serve as a well-known example. The concept is sometimes expressed as: *as above, so below*. In microvita theory, the principle implies that the relationships which exist between matter, microvita and ethereal space in the physical arena (as shown in Figure 1) also extend to the psychic arena, the world of mind. In fact, they apply to the entire spectrum of energy and substance, from the crudest to the most subtle, as expressed in the following equations for the two ends of the spectrum:

ethereal space ↔ crude microvita ↔ physical structures

psychic space ↔ subtle microvita ↔ psychic structures.

There is an obvious symmetry between these two equations.

We have now laid the foundations for a *substantive theory of mind*. Mind is some kind of substance different from matter but having similar dynamics or patterns of behaviour. Matter interacts with mind because both behave as waves and waves display coherence. That is, waves having different wavelengths (from crude to

subtle) adjust their activities so that there is a coincidence of nodes.¹⁷ Sarkar does not use the term *coherence* but it is implied in the following passage:

A wave [fundamental factor] can move freely only when it is in harmony with previous [more subtle] waves and their curvatures. A wave can pass through an object where there is no physical obstruction or hindrance of a subtler wave, i.e. subtler waves can pass through cruder waves; and under such circumstances there is always an adjustment of wavelengths resulting in the creation of diversities.¹⁸

Laszlo considers the principles of self-similarity and coherence essential for any understanding of the universe. Both are implicit in microvita theory.¹⁹

The matter-mind spectrum is a spectrum of energy and wave but divided into a set of discrete spaces in which the wave-particles possess discrete attributes. Tantra recognises seven such discrete spaces (*lokas* in Sanskrit) as was described in *The Cycle of Creation*, but finer subdivisions exist. Attributes become more subtle in the progression from matter to crude mind to subtle mind.

A logical consequence of the substantive theory of mind is that ideas (the content of mind) are also substantive structures. Complex ideas can be understood as structured wholes, psychic molecules and macromolecules that occupy psychic space.

Atom has mind

An atom is a physical structure but according to Sarkar the billions of microvita which compose an atom (most of which reside in the nucleus) are not all of the physical kind. Some certainly have physical attributes (charge, spin etc.) and can therefore be detected using physical instruments. But some have psychic propensities and these constitute the subtle part of an atom, its mind. The idea that an atom has mind is not new and is indeed a continuing strand in the philosophies of organicists such as the mathematician Alfred Whitehead²⁰ and the evolutionist Sewell Wright:

The only satisfactory solution ... would seem to be that mind is universal, present not only in all organisms and in their cells but in their molecules, atoms and elementary particles.²¹

More recently Charles Birch, former professor of biology at the University of New South Wales, summed up the idea:

There is but one theory, known to me, that casts any positive light on the ability of brain cells to furnish us with feelings. It is that brain cells can feel! What gives brain cells feelings? It is by the same logic that we may say – their molecules. And so on down the line to those individuals we call electrons, protons and the like. The theory is that things that feel are made of things that feel.²²

In other words, subatomic particles have psychic propensities which are the antecedents of feelings and sentiments in biological organisms. Just as an electron has electric charge, it also has psychic ‘charges’ or propensities that, in aggregate, contribute to mind. As Sarkar puts it, an atom has a crude part and a subtle part –

the subtle part being the antecedent of human mind. If we wish to understand the subtle parts of an atom then we have to study those aspects of human psychology to which the subtle parts contribute.²³

Astro-psychology

Astro-psychology is a natural extension of the new science of *astro-biology*.²⁴ It arises out of the realization that wherever there is matter in space there is also mind. The elemental particles of mind cohere with the physical particles that make up stars, gas clouds and cosmic dust. Stars like our sun spew out an endless stream of radiation and cosmic particles and likewise an endless stream of elemental psychic particles. The universe is streaming with the antecedents of ideas. Just as stars can be characterized by the proportions of their constituent chemical elements, so too, they will be characterized by their constituent psychic elements. Furthermore the psychic ‘stuff’ radiated through space may be harvested by photosynthetic-like mechanisms on planets (Sheldrake’s morphic fields) and incorporated into many life-forms.

Sarkar notes that, due to accelerated motion, celestial bodies emanate many kinds of radiation both visible and invisible.²⁵ This radiation is absorbed by (“blended with”) other celestial bodies, including human beings. He then implies that many kinds of microvita accompany the radiation traversing space and the end result of these “blendings” can be both beneficial and detrimental for human beings. These effects are mediated by our glandular and nervous systems and require humans to make constant adjustments.²⁶

A New Philosophy

In the final microvita discourse, Sarkar divides the phenomenal universe into four categories, two objective categories (the planes of inferences and the planes of propensities) and two subjective categories (microvita and energy).²⁷ These distinctions impose a structure on the entirety of microvita theory. They represent *bifurcations* (Sarkar’s word) on some undifferentiated category prior to any objective description of reality.

Sarkar describes this as “a new philosophical approach” to cosmology and warns that its categories do not necessarily correspond to the long established categories of Tantric and Vedic cosmology.²⁸ If we draw a tree representation of this new cosmology (Figure 2) and compare it with the trees in Figures 6 and 7 of *After Materialism* (in this volume), it is not hard to understand why the microvita discourses present such difficulties. The essential feature of Tantra remains, that of a non-dual, non-attributional category prior to all other attributional categories. The familiar divide between subject and object remains but now these categories have quite different child-nodes. Energy which would normally be considered objective in Tantra (Figure 7, *After Materialism*) is now on the subjective side. Furthermore microvita, despite being particulate and countable, are also on the subjective side. The remainder of this essay attempts to elucidate the categories illustrated in Figure 2.

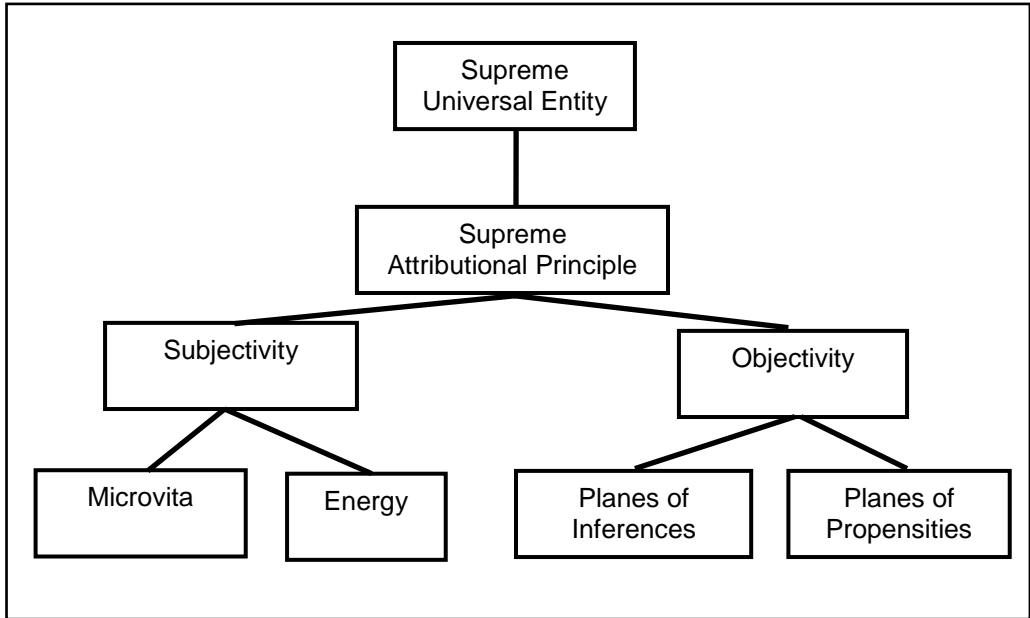


Figure 2: A concept tree representing the top level categories in the theory of microvita.

The Supreme Entity

Tantra places Cosmic Consciousness prior to all other states or categories. The English word ‘Consciousness’ (in the sense of Cosmic or Supreme Consciousness) is used only once in the microvita discourses in the following sentence:

These *siddha* microvita [those that help in the domain of spirituality] convey the clarion call of the vast ocean of Supreme Consciousness deep into the minds of ordinary human beings who gaze at their tiny plots of land, and lead them towards the Supreme Entity.²⁹

We may conclude that the Supreme Universal Entity (the trunk node in Figure 2) is Cosmic Consciousness (*Parama Purusa*) as understood in Brahma Cakra. Cosmic Consciousness resides in two states, the non-attributional and the attributional. The latter is the manifest Cosmos which emerges from the former and subsequently merges back to complete the *cycle of creation*. Microvita theory allows us to approach this large-scale cosmological description from the perspective of the vanishingly small. By definition, the vacuum state of any space, physical or psychic, is the state of stillness and silence. It is the state before something happens and the state after something happens – the state before quantum fluctuations, virtual particles and zero-point-energy and the state after them. It is therefore entirely abstract and has only those theoretical properties required to support the origin and dissolution of observable phenomena.

A true vacuum is therefore something subtler than the phenomena (real or virtual) for which it acts as the ground state. Which raises an interesting question: what is the ultimate ground state beyond the subtlest of all phenomena? Here we invoke Cosmic Consciousness, a state of stillness, beyond and transcending any physical

or mental experience. This gives a modern context to an ancient idea expressed in the *Upanishads*:

Let the spirit of life surrender itself into what is called *turiya* [the non-dual state beyond all distinctions of knower and known], the fourth condition of consciousness. For it has been said: There is something beyond our mind which abides in silence within our mind. It is the supreme mystery beyond thought.³⁰

The second category in Sarkar's schema is the *Supreme Attributional Principle*. We may approach this category by way of Sarkar's response to a question about what fills "the gaps" between microvita. "... these gaps are not vacua. They are filled with macropsychic conation".³¹ *Conation* is a term used in psychology to refer to a mental impulse, desire, volition or striving. Recall that devolution and evolution in *Brahma Cakra* are activities *of* and *within* the Cosmic Mind. In the language of psychology, Brahma Cakra is a consequence of *macropsychic conation*. In the microvita discourses, Sarkar introduces an additional concept. Macropsychic conation fills the vacuum state and can be understood (objectively) as a fluctuating field potential that "emanates" microvita. By this mechanism, Cosmic Mind orchestrates devolution (*saincara*) and evolution (*pratisaincara*).³² We may now write another equation that complements previous equations:

Macropsychic conation ↔ microvita ↔ cycle of devolution and evolution

In pursuing chains of cause and effect, microvita are as far as science can go because they reside at the boundary between subjectivity and objectivity. It is in this sense that Sarkar describes microvita as a "mysterious emanation of Cosmic Factor".

Inferences and propensities

The Sanskrit terms for inference and propensity are *tanmatra* and *vritii* respectively. A *vritii* is a preoccupation of the mind. At times Sarkar appears to use the term *tanmatra* only with reference to the physical universe and *vritii* only with reference to mind. However, motivated by the principle of self-similarity, I suggest that the terms are more general³³ and that all levels of the matter-mind spectrum have two kinds of plane, space, stratum or field – a plane of inferences and a plane of propensities. These planes are the *media* through which microvita move.³⁴ Microvita acquire attributes corresponding to the spaces through which they move. Since a particle (whether physical or psychic) may move through many spaces at a time, it may have many attributes, in the same way that a physical quark has electric charge, flavour, colour, spin, etc.

Force fields and Matter fields

Do we find categories corresponding to inferences and propensities in Western physics? I suggest that the inference-propensity bifurcation corresponds in physics to the distinction between force fields and matter fields or, using particle language, the distinction between *bosons* (force particles) and *fermions* (matter particles). Fermions cannot be squeezed closely together (cannot occupy the same quantum state) and therefore they construct spatially and temporally extended structures.

By contrast, bosons can be superimposed – the laser beam is a well-known example of superimposed, coherent photons. Fermions interact by exchanging bosons.³⁵

The proposal is that these notions can be generalized to all levels of mind. In other words, microvita which move through psychic inferential spaces acquire boson-like attributes and those which move through psychic propensitive spaces acquire fermion-like attributes. Physical inferences, such as photons, impinge on the sense organs and psychic inferences impinge on the mind. Matter particles build the physical structures (atoms, molecules, stars and galaxies) that fill our universe and psychic particles build individual minds filled with ideas. Fermions (both physical and psychic) have *charges* and the mutual attraction/repulsion of fermions is mediated by an exchange of bosons (physical or psychic). For example, electrically charged particles exchange photons and quarks exchange gluons. A particle charge describes the propensity for that particle to move in a defined way under the influence of a force field. According to this interpretation, for every force there is a corresponding particle charge – for every inference there is a corresponding propensity.

Implications for psychology

There are different kinds of atoms which do not come within the physical arena or even within the realm of physical perception.³⁶

Here we may assume Sarkar is talking about the psychic analogues of physical atoms and molecules – recall Sheldrake’s abstract morphic fields that give shape to ideas. Put another way, *ideas are psychic structures* composed of subtle microvita and by analogy, they exchange psychic inferences. Sarkar describes a variety of non-material structures whose inferences arouse in human beings the corresponding propensities. For example, there are structures that arouse the propensity to accumulate more and more wealth (a particular problem, says Sarkar, in capitalist societies), and structures that arouse the propensity to cultivate the fine arts, and so on.

Sarkar describes microvita as the “seed of the actional principle, ready for being sprouted”.³⁷ This is the language he uses elsewhere to describe *samskara* or action in potential. Samskara is a fundamental concept in Eastern psychology which refers to internal volitions and intentions (morally good, bad, or neutral) and their contribution to behaviour patterns and character traits.

A samskara “sprouts” when its potential is converted to actuality (in physics we would say its potential energy is converted to kinetic energy). Thus the planes of propensities contain all kinds of physical and psychic structures that are stores of potential energy (samskaras) and bound microvita. The play of microvita within those structures and the exchange of microvita between them determine how and when their potential energy is released.

Microvita and energy

Sarkar makes much of the distinction between energy and microvita.

- Energy is transmutable into many different forms, for example, electrical energy, heat energy, etc. Microvita on the other hand are discrete entities and are not inter-convertible.³⁸ I suggest that a microvita has discrete attributes corresponding to the planes through which it moves and those attributes switch abruptly when it moves from one plane or stratum to another.
- Energy and microvita are inseparable and both are active in all the various planes of inferences and propensities. However, their relative importance changes gradually from one end of the wave-particle spectrum to the other. At the crude physical end, energy has the dominant influence. At the subtle end, microvita have the dominant influence and energy becomes insignificant.³⁹
- An implication of the microvita discourses is that the mass of a subatomic particle is proportional to the number of microvita condensed within it. However Sarkar is explicit that mass is *not* “bottled-up energy”. We may interpret this to mean that energy and microvita are separate categories and *not* inter-convertible. The number of microvita remains constant before and after the splitting of an atom. The energy released by so doing is not due to the destruction of matter or microvita but to the release of the “packaged” (potential) energy required to keep them intact as a unit structure. This idea appears similar to a proposal of physicist Hal Puthoff that mass is not an innate property of matter but a measure of inertia (under particle acceleration) due to virtual particle interactions with the zero-point energy field.⁴⁰
- “Energy is a blind force. It has got no conscience – what is to be done or what should not be done, this sort of conscience is lacking in energy. But microvita are not like that... They have the support of conscience behind them. This is another fundamental difference between energy and microvita.”⁴¹ This attribute relates to the distinction between positive and negative microvita to which we now turn.

Table 1 attempts to summarize some of the above ideas.

Positive and negative microvita

Matter particles have charges which come in pairs of opposites – the most familiar example being positive and negative electric charges. Pairs of opposite attributes appear in microvita theory but Sarkar introduces the idea in an intriguing way, such that one does not recognize it immediately.

In Sarkar’s cosmology the evolution of life is interpreted as the crude metamorphosing step by step into the subtle. Likewise, human development from baby to adult and human history from stone age to modern age, all represent the struggle to express ever more subtle forms of life. Progress is from crude to subtle – regress is from subtle to crude. In this context Sarkar makes a distinction between positive and negative microvita. Positive microvita promote the movement from crude to subtle while negative microvita have the opposite effect.

“In principle, positive and negative microvita are the same but their field of activity is different.”⁴² Positive microvita are pro-mind and negative microvita are pro-materialistic.⁴³ “The favourite fields of positive microvita are the psychic and

psycho-spiritual strata and the favourite fields of negative microvita are the physical and physico-psychic strata.”⁴⁴ There are equal numbers of positive and negative microvita in the universe and in its various “microcosmic” structures.⁴⁵ The integrity of any structure or organism requires a balance of positive and negative microvita. Any imbalance due to local surplus or deficit promotes disintegration of the structure.

Table 1

<i>Context</i>	<i>Planes of propensities</i>	<i>Planes of inferences</i>
Brahma Cakra Cosmology	<p>All celestial and living bodies are hierarchical structures of nested kosas.</p> <p>A kosa is a standing wave whose stored energy is inversely proportional to its wavelength.</p>	<p>Tanmatras are sensory inferences that manifest as both wave and particle.</p> <p>All structures emit and absorb tanmatras.</p>
Western physics	<p>Matter fields</p> <p>Fermions are matter particles that build extended physical structures.</p>	<p>Force fields and radiation</p> <p>Bosons are force particles that are exchanged between matter particles. They do not build structures.</p>
Theory of Microvita	<p>Matter particles and their psychic equivalents (fermions in the broader sense) are condensations of microvita.</p> <p>The structures (physical and psychic) made by condensed microvita are “containers” of potential energy.</p>	<p>Microvita are exchanged between matter particles through tanmatras – that is, as radiation or ‘virtual’ force particles.</p> <p>Radiated energy and emanated microvita always “search” for a “container”.</p>
Eastern Psychology	<p>The many forms of potential energy (physical and psychic) stored by a structure are samskaras that determine the structure’s propensities.</p> <p>Microvita are seeds of the actional principle – they influence the “sprouting” of samskaras.</p>	<p>The absorption and emission of microvita through tanmatras is <i>karma</i> – the expression of samskara.</p> <p>Microvita received through tanmatras either activate or retard the expression of samskaras.</p>

Much of this reminds one of positive and negative electric charge. The intriguing difference concerns the ethical and ideological dimension which we do not associate with electric charge. Let us suppose that positive and negative microvita are created in pairs by *charge-splitting* – or *bifurcation*.⁴⁶ The most subtle planes of propensities are concerned with psycho-spiritual phenomena, such as ethics, egalitarianism, aesthetics and spirituality. Charge splitting in these planes creates particles having ‘positive and negative ethical charges’. The same process in a matter plane creates oppositely charged matter particles that respond to physical forces.⁴⁷

In human beings, positive microvita encourage magnanimity, empathy and the other virtues. They expand intellect and consciousness. By contrast, negative microvita encourage selfishness and fearfulness – the mind becomes narrow, the intellect less acute. Each type of subtle microvitum is responsible for a particular psychological trait. Consider, for example, *indifference*. The negative trait manifests as indifference to the suffering of others, the positive trait as indifference to self-aggrandizement, name and fame. Another example, pertinent to debates about materialism: Sarkar ascribes the dogma of materialism (“*not to recognize anything beyond the jurisdiction of the senses*”) to the influence of negative microvita and spiritual realization (“*not to recognize anything transitory or moving as absolute*”) to the influence of positive microvita.⁴⁸

A large part of the microvita discourses is concerned with the practical use of positive and negative microvita in managing human affairs. The discourses introduce a theory of disease in which an imbalance of microvita types leads to sickness and death.

Conclusion

Any theory of science must address two philosophical questions, one ontological (what are the fundamental constituents of the world under investigation?) and the other epistemological (what are the valid means by which those constituents become known?). The theory of microvita, being a contribution to philosophy of science, necessarily responds to both these questions.

In this article we have dealt only with ontological issues. The epistemological question was discussed in *After Materialism* where it was suggested that microvita theory is actually a proposal for a new way of doing science requiring a synthesis of the methodologies of both East and West. Despite the difficulties in approaching microvita theory, the message is clear enough. Western science must move beyond its current dogmatic adherence to materialism if it is not to become irrelevant in solving the problems of modern society.

Acknowledgements

The author wishes to thank Jake Karlyle, Firdaus Ghista, and Toby Kirk for reviewing earlier manuscripts.

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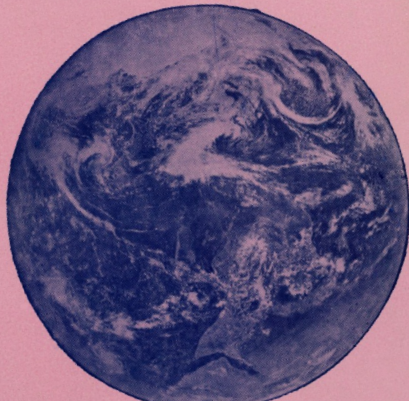
Endnotes

- ¹ Much of Sarkar's work was originally presented in discourses. The existing book on microvita (MVINS) is actually a compilation of transcriptions of talks, both formal and informal. Audio recordings exist for the former and therefore the transcriptions are reliable. For the latter, there now exist only notes taken by persons present and thus the record of these talks must be considered less reliable.
- ² Towsey, Michael and Ghista, Dhanjoo N. *Towards a Science of Consciousness*. In: Ghista D.N., editor. *Proceedings of the Second Gauss Symposium: Biomedical and Life Physics*. Munich, Germany: Verlag Viewveg; 1995. p. 417-28.
- ³ Bussey, Marcus. "Microvita and Transformative Information", *The Open Information Science Journal*, volume 3, pp. 28-39. Bentham Science Publishers, 2011.
- ⁴ The first discourse was Microvitum – the Mysterious Emanation of Cosmic Factor delivered December 1986.
- ⁵ Sarkar, (MVINS), p. 58.
- ⁶ Sarkar, (MVINS), p. 3 and p. 78.
- ⁷ Sarkar, (MVINS), p. 52.
- ⁸ Sarkar, (MVINS), pp. 44-45.
- ⁹ Greene, (FC), p. 330
- ¹⁰ See McTaggart, (TF) Chapter 2, for a non-mathematical account of the zero-point energy field. However, Greene in *The Fabric of the Cosmos* pointedly avoids the term.
- ¹¹ Idolphin.org/zpe.html and keelynet.com/gravity/putnasa.htm. Also McTaggart, (TF) Chapter 2.

- ¹² Sarkar, (MVINS), p. 67.
- ¹³ It should be remembered that not all 41 sections in the current English compilation of the microvita discourses (3rd edition, 1991) are of similar provenance. Some are transcriptions of recordings and thus are able to be authenticated, but others are derived from notes taken at informal gatherings. Much scholarship is required to determine the reliability of the latter transcriptions.
- ¹⁴ Sarkar, (I&I), p. 20.
- ¹⁵ Russell, Bertrand. History of Western Philosophy, Unwin University Books, New Edition, 1961, p. 633.
- ¹⁶ Sarkar, (MVINS), p. 19.
- ¹⁷ A node is a point or region in space where the amplitude of an oscillating system (i.e. a wave) is zero or close to zero.
- ¹⁸ Sarkar, (I&I), p. 24.
- ¹⁹ MacTaggart, (TF), p. 121.
- ²⁰ Whitehead, Alfred. Modes of Thought, NY Free Press, 1966.
- ²¹ Sewell Wright as quoted by Birch (OP), p. 24. See also: Wright, Sewell. "Gene and Organism", in American Naturalist **87**, pp5-18, 1953. See www.harvardsquarelibrary.org/unitarians/wright-sewall.html.
- ²² Birch, Charles. On Purpose, Sydney, Australia: NSW University Press, 1990, p. 32.
- ²³ Sarkar, (MVINS), p. 133.
- ²⁴ www.astrobiology.cf.ac.uk/. See also en.wikipedia.org/wiki/Astrobiology.
- ²⁵ See "Sidereal Year", in Sarkar, (MVINS), p. 76. This is a reference to the well-known physical phenomenon that an accelerating or decelerating charged particle emits radiation. Since all celestial bodies rotate both on their axis and about some other body, they are always accelerating and therefore constantly emitting radiation – not just electromagnetic but presumably many kinds of more subtle radiation.
- ²⁶ See "Microvita and their influence on micropsychic and macropsychic corporeal structures", in Sarkar, (MVINS). In the next chapter, "Plexii and Microvita", Sarkar discusses the same ideas using the language of Tantra and *cakras*.
- ²⁷ Sarkar, "Microvita and Cosmology", in (MVINS).
- ²⁸ Sarkar, (MVINS), p. 156.
- ²⁹ Sarkar, (MVINS), p. 16.
- ³⁰ Patrick Olivelle (translator), *The Upanishads*, (Oxford World's Classics), OUP, 1998, ISBN-10: 0192835769. For further commentary see Sarkar, *The Intuition Science of the Vedas* – 5, 1956. Official source *Subhāṣita Saṁgraha Part 2*, Kolkata, India: AM Publications.
- ³¹ See Question 10, Sarkar, (MVINS), p. 56.
- ³² See "Four Dimensions of Micropsychic Longing" and "Mobility and Movement of Microvita", in (MVINS) for references to macropsychic conation.
- ³³ The following two examples suggest that that notion of an inference or tanmatra is more broadly applicable than just to the physical world. 1. In *Namami Kṛṣṇa Sundarum* (Discourse 27), Sarkar refers to tanmatras emanating from the psychic world. 2. In the discourse *Microvita and Cosmology* (MVINS, p. 153) Sarkar states: "The inferences of sound, touch, form, taste and smell all operate on different planes and their effects are also different."

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- ³⁴ McTaggart, (TF), p. 22, who defines a field as “a matrix or medium which connects two or more points in space, usually via a force, like gravity or electromagnetism”. Sarkar sometimes substitutes the word *strata* for planes.
- ³⁵ Greene, (FoC) p. 256. Note that Greene refers to force particles as *messenger particles*. According to the theory of *super-symmetry*, every matter particle has a partner force particle and vice-versa. Greene, (FoC), p. 427.
- ³⁶ Sarkar, (MVINS), p. 134.
- ³⁷ Sarkar, (MVINS), p. 155. The concept of a *samskara* (reactive momentum) is understood quite generally in these essays. In Eastern psychology, a *samskara* is said to be located in the Atimanasa level of the human mind. However genes and chromosomes can also be understood as physical *samskaras* and indeed all levels of the matter-mind hierarchy store *samskaras* and express *karma*.
- ³⁸ Sarkar, (MVINS), p. 138.
- ³⁹ Sarkar, (MVINS), p. 140.
- ⁴⁰ MacTaggart, (TF), pp. 32-33.
- ⁴¹ Sarkar, (MVINS), p. 140.
- ⁴² Sarkar, (MVINS), p. 41.
- ⁴³ Sarkar, (MVINS), p. 58.
- ⁴⁴ Sarkar, (MVINS), p. 140.
- ⁴⁵ Sarkar, (MVINS), p. 154.
- ⁴⁶ Sarkar, (MVINS), p. 156. Given a neutral substrate (that is, one of the planes of propensities), charge-splitting creates a particle pair with equal and opposite attributes. The implication is that re-union would annihilate the pair and the substrate would return to rest.
- ⁴⁷ The planes of propensities are best visualised as a set of nested concentric spheres. The densest physical sphere is in the centre, enveloped by successively more subtle spheres. So a physical particle is necessarily *also* in the most subtle sphere and consequently has all charge attributes from ‘ideological’ to physical. A microvita that resides only in the subtlest spheres has ideological attributes only.
- ⁴⁸ Sarkar, (MVINS), p. 72.

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