On the Future of the Scientific Method

An introduction to the theory of microvita

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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 is concerned either with spiritual philosophy or social philosophy 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 social precedents. Sarkar lived and died in India and his spiritual philosophy is a significant development of the Indian tradition known as Tantra.[2] 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.

There are two previous papers in the academic literature concerning the theory of microvita – the first from the perspective of the natural sciences,[3] the second from the perspective of the social sciences.[4] The contribution of this essay is to better map Sarkar's terminology to concepts in Western physics and to better characterize the methodology required for a science of microvita. I conclude that, despite their difficulty, the microvita discourses introduce a scientific method informed by both East and West.

Structure of the essay

To motivate this essay, I begin with the mind-body problem, a problem as old as philosophy itself. Having set the conceptual stage, I then introduce some of the basic ideas in the microvita discourses and finally, in the light of these ideas, I explore possibilities for the future of the scientific method.

The Mind-Body Problem

Western science is founded on the assumption of materialism, the belief that only physical matter exists and therefore only physical matter can be known. Furthermore, matter is known to us only through the sense organs or indirectly through instruments. Consequently valid knowledge can only be derived from a logical interpretation of sensory experience.

The materialist assumption is faced with many problems. For example, 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 also has an internal life. In fact all the dimensions of human life, the physical, instinctual, intellectual, sentimental, social, aesthetic, moral, spiritual and so on have an internal component which is not adequately described by measuring their physical correlates. Let us define *sentience* as the attribute of being conscious of subtle internal experience. The mind-body problem seeks to explain how the human body made of apparently inert (dead) atoms and molecules comes to be sentient and how the inert and the sentient work together to make the whole.

There are many philosophical approaches to the mind-body problem, and more than one way to categorize them. Here we consider materialist monism, dualism, idealist monism and the mind-matter spectrum.[5] It is not intended to offer a comprehensive survey of the debates, let alone to pose a solution. The goal is to highlight a few ideas that help to situate Sarkar's theory.

Materialist monism

Materialist monism (henceforth materialism) asserts that only matter exists and that mind and consciousness are epiphenomena of matter. As noted above, materialism is the orthodoxy of Western science. 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."[6]

This definition also acknowledges a linguistic dimension to the mind-body problem. Humans experience the world in different ways; the mental way requiring one set of vocabulary, the biological another. Mixing the two vocabularies results in category errors.

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",[7] from which it is but a short step to the conviction that matter is the ultimate reality.

Materialism as a philosophy and as a social ideology has many problems.

- From a fundamental physics point of view, the old notion of *matter* as the bed-rock of reality is looking increasingly flimsy. The fundamental concepts in modern physics are space-time, energy, information and entropy, each of them abstract ideas rather than something material. Only some 5% of the calculated energy of the known universe is matter in the traditional sense and the nature of the remaining 95% (comprising 25% dark matter and 70% dark energy) is still debated.

- As already noted, everyday experience suggests there is something qualitatively different between our internal and external worlds. It would be preferable (although of course not obligatory) to have a theory that better accommodates ordinary understanding. Removing everything from experience that cannot be physically measured appears to remove most of what is important.
- Purpose has no place in the 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. An essential attribute of 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.
- Although materialism is presented as a self-evident truth, there is no experiment permitted by materialism that can justify it. Materialism is not a scientific fact but a prejudice which precedes observation. Even the neuro-philosopher Patricia Churchland admits, "We do our research as if materialism is a proven fact, but of course it isn't."[8] Despite Churchland's honesty, materialism has become a dogma, an idea beyond which one is not permitted to go.
- Materialism might be considered a harmless dogma if it did not have deleterious side effects on the practice of science and more disturbingly on Western culture. Western science works well when the phenomenon under investigation is obviously material. But when, as in the case of homeopathy to provide but one example, the phenomenon appears to have no easy material explanation then it is dismissed as impossible. As a consequence scientific investigation degenerates to theatre.[9] In the social sphere, the effect of materialism is to make the non-material invisible and irrelevant. If all social problems have a material cause then all social policy is directed to material solutions. But contemporary societies are accumulating social and psychological problems faster than they can cope with.[10]

Dualism

According to dualism, mind and body are distinct categories and the one cannot be reduced to the other. There are various versions of mind-body dualism – we note those which promote a *substantive theory of mind*, that is, mind is some kind of substance (or energy) but different from physical matter. Making a sharp distinction between mind and body may accommodate

common sense but it creates another kind of problem – how to explain the interaction between the two.

We must note another kind of dualism, the distinction between subject and object, observer and observed, knower and known. The attribute of being subject/observer/knower is *consciousness*. As defined by the physicist Penrose, human consciousness is the phenomenon whereby the very existence of the universe is made known. As defined by Sarkar, human consciousness is the 'I' which knows that 'I exist'.[11]

The subject-object distinction is an *epistemological dualism* because it is based on the relationship to *knowing*. The mind-body distinction is an *ontological dualism* because it is based on what categories are said to exist. Western philosophy tends to conflate all the attributes of mind and so the distinction between mental experience and consciousness (the knower of mental experience) is lost. When mind is equated to subject and body to object, the two dualisms become confused. However the difference between them is important for our later discussion.[12]

Idealist monism

According to idealist monism (henceforth idealism), mind and mental experience alone are real. Whatever the external world might be, it is known to us only indirectly. Strong versions of idealism have been promoted in Western philosophy by Hegel (who reduced all existence to absolute idea, a mental monism) and in the East by Shankaracarya (who rejected even the reality of thought and propounded an almost nihilistic doctrine of illusion).[13] A further elaboration of idealism is not necessary for this introduction to microvita.

The Mind-Matter Spectrum

According to this approach, mind and body are both parts of a spectrum of 'substance'. Furthermore we switch more generally to the 'substance' of the universe, hence the mind-matter spectrum. This can be understood as a *neutral monist* approach to the mind-body problem – the two do not differ intrinsically but only in the way that some common 'neutral substance' is arranged.[14]

Physical matter is at the crude, energetically dense end of the spectrum. Mind is at the subtle, energetically sparse end of the spectrum. Likewise human experience of the components of the spectrum ranges from crude to subtle, determined by how easily accessible the experience is to human consciousness. Sensory experience of the physical world is easily accessible to consciousness. Intellectual ideas range in difficulty and certain kinds of spiritual experience at the most subtle end of the spectrum are very difficult to grasp with ordinary consciousness. The difference in clarity of conscious experience over the spectrum is an important concept for our later argument.

The idea of a mind-matter spectrum found its way into the West along with the spreading influence of Eastern philosophy. It is a component of Tantra and also of Sarkar's cosmology[15] and it provides a useful scaffolding on which to build an understanding of Sarkar's theory of microvita.

The Theory of Microvita

We begin with some of the ideas introduced in the first microvita discourse.[16] Subsequent discourses elaborate these and add to them.

1. The first discourse 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 *microvitum*) after the Latin, meaning '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'.
3. Microvita are the elementary building blocks of the universe although this is not made explicit until later discourses. A microvitum 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".[17] From this we conclude that a microvitum is point like, perhaps in the same way that an electron particle is point like.
4. Microvita are born and they die. We may interpret this metaphorically to mean that microvita are in a continual state of flux, that is, continually being created and destroyed. The reference to birth and death reinforces the notion that life somehow has its basis in the subatomic realm.
5. There is a spectrum of microvita ranging from the crude to the subtle. For convenience 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.
6. "…microvita move throughout the entire universe from one celestial body to another" undeterred by the extremes of temperature and pressure in space.[18] "Mobility means movement through a medium or media." Subsequently we learn that this medium in the case of crude

microvita is "aethereal space" and in case of subtle microvita is "psychic space".[19]

7. Microvita are responsible for the structural integrity of all physical entities, including living things. 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.[20]
8. Protoplasm is better understood as the collective activity of many different types of microvita.
9. Disease can be understood as an excess of inappropriate microvita in the human structure.

Microvita in the Physical Sciences

In making better sense of these proposals, it is first 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. To this author it appears certain that Sarkar's crude microvita correspond to the world of the quantum vacuum and its virtual particles. The vacuum of space might be considered an absence of any kind of particle or cosmic ray. However, according to quantum theory the vacuum of space is a *plenum*, a seething ocean of virtual particles.[21] Virtual particles are similar to real particles except that, due to the constraints of Heisenberg's Uncertainty principle, they exist only for the briefest instant of time, around 10^{-44} seconds, and consequently cannot be observed directly. They are continually created and destroyed, emerging out of and merging back into the background vacuum. Collectively they are described as *vacuum fluctuations* and they contribute to a vacuum energy known as the *zero-point energy field*. They continually interact with real particles, causing quantum jitters at the subatomic level.[22] Despite its virtual origins, the zero-point energy field gives rise to real effects such as the Casimir effect[23] and van der Waals forces.[24] 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.[25]

The physics of virtual particles and the quantum vacuum is beyond the scope of this essay and this author's expertise. But of particular note is that some theorists are beginning to understand the quantum vacuum as the ground state of the entire universe and as responsible for coordinating the whole. For example, Ervin Laszlo describes the quantum vacuum as an *akashic field*, the means by which every part of the universe is connected to every other part, through time and space, so enabling the whole to function as a single entity.[26]

In summary, a description of the subatomic world needs to acknowledge three categories of player: real matter particles, virtual particles and the quantum vacuum. They interact as follows:

physical particles ↔ virtual particles ↔ quantum vacuum.

A particle has discrete *attributes* which determine its interactions with other particles. For example, the electron has an electric charge which means it is a point in space that continually exchanges virtual photons (packets of energy) with other 'charged' particles and with the quantum vacuum.

According to this interpretation of Sarkar's discourses, a matter particle such as an electron or quark is not a singular entity but rather a point where innumerable microvita 'cohere'.[27] Furthermore there is a continual exchange of microvita between particle and vacuum state. "Microvita are the initial stage of matter… microvita are transmuted into matter and matter is transmuted into microvita."[28] Microvita are the "silver lining" between matter and pure idea. Given this flux of microvita, we can rewrite the above equation as follows:

physical particles ↔ microvita ↔ aetherial space,

where aetherial space is the abstract notion of a vacuum. In other words, a physical particle continually exchanges microvita (and energy) with other particles and with aetherial space. Sarkar uses the term *aether* to refer to the 'substance' of space-time.[29]

As above so below

Sarkar now takes a significant step – the relationships which exist between matter, microvita and aetherial 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. We may interpret this step as an invocation of the *principle of self-similarity*.[30]

We can express these ideas in two sets of interactions, one for each end of the spectrum:

physical structures ↔ crude microvita ↔ aetherial space.

psychic structures ↔ subtle microvita ↔ subtle space.

All these different psychic and physical structures must coordinate their activities resulting in a universe that displays *coherence*, that is, all waves and all particles coordinate their activities as if they are a single entity.[31]

The Vacuum of Space

We now need to consider in more detail the spaces in which all this activity occurs. In classical physics, space and time are continuous and indefinite in extent. Many physical quantities such as gravitation and magnetism extend

throughout space and are described as *fields*. In practice, the strength of every known field diminishes with increasing distance from its source, eventually becoming undetectable.[32] Deep space may be free of matter but theoretically it abounds with fields. We have already noted that the vacuum of space possesses energy and emits and reabsorbs virtual particles.

Physical space has three dimensions with time making a fourth dimension. In order to accommodate the physical force fields which permeate space, physicists must add new dimensions to space-time. We can imagine the result as one space having many dimensions or as multiple interpenetrating spaces. The implication in Sarkar's theory of microvita (although not explicitly stated) is that mind can be incorporated into this mathematical model of reality by adding additional dimensions representing stable psychic spaces.[33]

Wave-particle duality

A central concept in quantum theory is that all matter exhibits both wave-like and particle-like properties. Waves are energetic oscillations of a field and, mathematically, the wave is a non-local (i.e., global) entity that spreads throughout space. By contrast, particles are local point-like concentrations of energy. Light is both wave and particle, both global 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 reality might be, only its wave or particle aspect 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.[34] Very recently Shahriar Afshar performed an experiment which demonstrates that it *is* possible to observe the particle and wave attributes of light photons *simultaneously*, thereby challenging *complementarity*.[35] An alternative interpretation, proposed by David Bohm, is that wave *and* particle exist as separate elements of reality but there are limits to what we can know about them. The wave 'guides' the particle around.

Waves and particles are also fundamental categories in Eastern cosmology. They are the constituents of both mind and matter – separate but interacting components of reality. Microvita are clearly particle-like but they interact with waves, a proposition more like Bohm's.[36] However the debate about the reality behind wave-particle dualism involves very subtle arguments and is far from resolved.

Uncertainty

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 the term *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 appears to be intrinsic to the subatomic world rather than a product of ignorance. 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.[37] Einstein could not accept this state of affairs and believed that quantum theory was an incomplete account of the subatomic world. He once famously said, "I… am convinced that [God] does not throw dice".[38] Instead he and others, such as David Bohm,[39] proposed that the vacuum state must contain *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.[40]

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[41] 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."[42] 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 remainder are too subtle to observe physically but nevertheless have on influence on the outcome of observations. Clearly this is a reference to the hidden variables debate – quantum probabilities are a product of ignorance and not intrinsic to reality.[43] We will see later how Sarkar proposes to observe the more subtle hidden variables of the quantum world.

Consciousness

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. It is therefore entirely abstract and has only those theoretical properties required to support the origin and dissolution of observable phenomena. Mathematically the vacuum of deep space represents the fusion of many physical fields in a state of rest, and in microvita theory there is the additional fusion of many psychic fields.

A vacuum is therefore something subtler than the observable phenomena for which it acts as the ground state. This raises an interesting question – what is the ground state for the most subtle of all microvita? Here we invoke consciousness as the ultimate state of silence, beyond 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."[44]

The same idea persists in the Tantric tradition to the modern day. The manifest world arises from the *unmanifest* and subsequently merges back into it.[45] In the microvita discourses, Sarkar refers to this unmanifest state as the Supreme Universal Entity. Philosophically it is the undifferentiated state that gives rise to all attributional categories.[46]

Western science struggles with the concept of consciousness, but some physicists accept it as integral to any description of the universe. For example, 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 both observer and observed, conscious and introspective.[47]

The Origin of Life

One of the greatest of contemporary scientific mysteries is the origin of life. The machinery to replicate and manage the business of staying alive, even within the simplest of bacterial cells, is breath taking in its complexity. And the complexity appears to be irreducible.

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.[48]

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.[49]

After reviewing all these possibilities, physicist Paul Davies[50] concludes that the known laws of physics cannot explain the origin of life. "Real progress with the mystery of biogenesis will be made, I believe, not through exotic chemistry but from something conceptually new."[51] He then approaches the problem from another perspective, that of *information*. The secret of life, he says, "lies not in its chemical basis, but in the logical and informational rules it exploits".[52] The complex structure of life is partly specified by information in the genes. Davies postulates that new laws of information are required to explain how information is transferred from the environment into biological structure and genes. "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."

We have pursued this question because, if the mystery of life comes down to missing information, the theory of microvita may provide a clue. We shall learn subsequently that microvita can be understood as organizing principles measured as bits of information. Furthermore, since the microvita spectrum covers all scales, it bridges the gap between the molecular and astronomical.

Before finishing this discussion we need to note the difference between microvita or information as the causal mechanism of life and the old idea of *vitalism*. According to the latter theory, living beings arise due to organic matter becoming infused with a soul which somehow slides in from the outside and slides out at death. According to the ideas developed in this essay, the precursors of mind exist within all atoms and molecules. Human mind is an emergent property of the entire human structure. There is no separate non-physical entity that takes possession of an inert physical entity.

Morphic Fields

To explain biological structure, Rupert Sheldrake introduced the concept of *morphic fields*.[53] Sheldrake rejects the reductionist idea that information encoded in DNA determines large-scale morphological structure. He also rejects vitalism. Instead he supports *organicism*, the idea that living organisms can only be understood as wholes.[54] Morphology and function are organized by template-like morphic fields which both surround and permeate the organism. Physical structure accretes to a morphic field but the structure also moulds the field, so there is an evolving feed-back loop between the two. Controversially, if an organism's behaviour affects its field, then newly acquired behaviours could be subject to (Lamarckian-like) inheritance by subsequent generations.

According to Sheldrake, morphic fields act as a kind of universal memory or database for both organic (living) and abstract (mental) forms.[55] 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.

Sheldrake's proposals are of interest because they have many resonances with microvita theory, particularly the idea that non-visible fields determine biological and mental structure. In recent years Sheldrake has devoted himself to finding indirect evidence for morphic fields in the form of non-local behaviours that cannot be explained by reductionist materialism. Needless to say, his results and their interpretation are always fiercely debated.

Bifurcations

In his 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).[56] These distinctions impose a structure on the entirety of microvita theory. They represent *bifurcations* (Sarkar's word) on some undifferentiated substrate prior to any objective or mathematical description of reality.

Inferences and propensities

The planes of inferences and propensities refer to the *spaces* extending throughout the universe, filled with physical and psychic *fields* and these fields are the *media* through which microvita particles move.[57] Particles acquire attributes corresponding to the spaces through which they move. Since a particle may move through many spaces at a time, it may have many attributes, in the same way that a quark has electric charge, flavour, colour, spin, etc.

I suggest that the inference-propensity bifurcation corresponds in physics to the fundamental distinction between force fields/particles and matter fields/particles. In other words, microvita particles moving through inferential spaces acquire the attributes of force/messenger particles and those moving through propensity spaces acquire the attributes of matter particles. Physical inferences, such as photons, impinge on the sense organs and psychic inferences impinge on the mind. By contrast matter particles build the structures (atoms, molecules, stars and galaxies) that fill our universe and psychic particles build minds filled with ideas. Matter particles have *charges* and the attractions and repulsions between them are mediated by an exchange of force particles. 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.[58]

All this is of interest because it offers insights into the dynamics of the mental world. "There are different kinds of atoms which do not come within the physical arena or even within the realm of physical perception."[59] These structures we may assume are the psychic analogues of physical atoms and molecules – recall Sheldrake's abstract morphic fields that give shape to ideas. Put another way, ideas are structures of subtle microvita and, by analogy, they exchange psychic inferences. Sarkar describes a variety of psychic 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.

Microvita and energy

Microvita have no dynamism of their own – that role is played by 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 not inter-convertible.[60] A microvitum particle has discrete attributes corresponding to the planes through which it moves and those attributes switch abruptly when it moves from one plane 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.[61]

- An implication of the discourses is that the mass of a subatomic particle is proportional to the number of microvita that cohere in it. However Sarkar is explicit that mass is *not* "bottled-up energy". My interpretation is that energy and microvita are *not* inter-convertible – the number of microvita remains constant before and after the splitting of an atom or particle. 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.[62]

- "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."[63] This attribute relates to the distinction between positive and negative microvita – see the next section.

Finally it is worth making the link between microvita and information. Wheeler believed that information is fundamental to the physics of the universe. He coined the phrase "it from bit", meaning that all particles and fields in the universe are products of processing information bits.[64]

> 'It from bit' symbolizes the idea that every item of the physical world has at bottom – a very deep bottom, in most instances – an immaterial source and explanation; that which we call reality arises in the last analysis from the posing of yes-no questions and the registering of equipment-evoked responses; in short, that all things physical are information-theoretic in origin and that this is a participatory universe.[65]

Wheeler's *yes-no questions* remind one of Sarkar's *bifurcations*. Laszlo also considers information (or in his spelling, *in-formation*) to be "the fundamental nature of reality". It is "the cosmic template from which the manifest world derives its dynamics and form".[66] Sarkar does not draw an explicit parallel between microvita and information but it seems useful to do so. That is, the microvita-energy distinction is also an information-energy distinction. Given that mind is more of a microvita phenomenon than energetic, we begin to see that it can be approached as an informational or organizing principle which builds structure (order) in a universe otherwise dominated by the spontaneous tendency for increasing disorder (entropy). Mind consists of spatially-structured, time-evolving information held together by informational forces.

Positive and negative microvita

Matter particles have charges which come in pairs of opposites, positive and negative electric charges being the most familiar example. 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.

If we understand reality (defined as that which impinges directly or indirectly on human consciousness) to be a spectrum of wave-particle types that range from physical matter at the crude end of the spectrum to psychic phenomena at the subtle end of the spectrum, then the very existence of such a spectrum creates a polarity. Human consciousness can orient itself in one direction or the other – toward the crude or toward the subtle.

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."[67] Positive microvita are pro-mind and negative microvita are pro-materialistic.[68] "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."[69] There are equal numbers of positive and negative microvita in the universe and in its various "microcosmic" structures.[70] 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.

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*.[71] 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 positively and negatively charged particles having ideological implications. The same process in a matter plane creates oppositely charged particles that respond to physical forces.[72]

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. As another example, pertinent to debates about materialism, Sarkar ascribes the mentality "*not to recognize anything beyond the jurisdiction of the senses*" to the influence of negative microvita and the mentality "*not to recognize anything transitory or moving as absolute*" to the influence of positive microvita.[73]

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 new theory of disease in which an imbalance of microvita types can lead to sickness and death.

Unusual Consequences

Atom has mind

An unusual consequence of microvita theory is that atoms have a mind. This idea is not new, even in the West – see, for example, the mathematician Alfred

Whitehead[74] and the evolutionist Sewell Wright.[75] More recently Charles Birch, former professor of biology at the University of New South Wales, has 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.[76]

In other words, subatomic particles have psychic propensities which are the antecedents of mind, feelings and sentiments. Just as an electron has electric charge, it also has various psychic propensities that aggregate and contribute to mind. As Sarkar puts it, atoms have a crude part and a subtle part. The subtle part is the antecedent of human mind. If we wish to understand the subtle part then we have to understand those parts of the human psychology to which it contributes.[77]

If atoms have mind, why do we not recognize it in, for example, a rock? Here we can invoke the metaphor of a magnetised iron bar. Although each iron atom produces a small magnetic field, it is not until all the iron atoms orient in the same direction that a macroscopic field is 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.[78]

Astro-psychology

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.[79] *Astro-psychology* is the natural extension of astrobiology. 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 perhaps one day be characterized by their constituent psychic elements. Furthermore the psychic stuff radiated through space is perhaps harvested by photosynthetic like mechanisms on planets (Sheldrake's morphic fields) and incorporated into life forms to become the substance of mind. Of course all this is necessarily speculative, but is justified here to drive home the point that if we postulate the universe as having some kind of mind, that mind must have a subtle structure and it must be linked to the minds of individual life forms inhabiting planets spread throughout the universe.

The Future of Science

From Philosophy to Science

Science has many motivations: to liberate humanity from drudgery and hard labour; to provide increasingly diverse sources of pleasure; to satisfy curiosity; and so on. Using disciplined observation and measurement, scientists discover patterns of association and cause and effect, thereby reducing uncertainty in our interactions with Nature. Since the physical world lends itself easily to this approach, the success of Western science encourages a belief in materialism. 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:

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

Is it possible to extend the discipline of science to embrace the intangible world of mind and yet preserve rigour? And can a science of microvita satisfy these requirements? The answer to both questions is, in my opinion, 'eventually but not yet'. Why not yet and why eventually? Let us approach these questions by a consideration of the above three principles of experience.

Experience must take precedence over theory

Scientists like to claim that they arrive at theories through observation and experimentation. Experience precedes theory. In practice the process is more cyclical, with theory stimulating 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 a suitable process of observation.

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? Presently we have little idea (a serious obstacle to developing a science of microvita) but Sarkar offered some suggestions. Here are four of them:

> "…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".[80]
>
> "Microvita research can be done in physical, chemical, medical and psychological laboratories. For microvita research, you will have to study human psychology thoroughly."[81]
>
> "With the help of non-carbonic pabula they [human beings] will sharpen their psychic penetration within inter- and intra-atomic and molecular space."[82] (*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."[83]

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*.[84]

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. Second, it appears to emerge from beyond the conscious mind as though it is a power expressed through us but not by us.[85] Third, intuitional insights emerge best in a still mind. Empathy, being one form of intuition, does not blossom in an agitated or fearful mind. Everyone has the capacity for intuition but usually it is suppressed by incessant demands on time and the senses. Meditation is a well known way to focus attention and to strengthen intuition.

Another feature of the "power of conceiving" is its seeming detachment from any obvious underlying physiology. Speed reading provides a pertinent metaphor. Julius Caesar was apparently not able 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-vocalisation slow one down – fast reading requires a purely mental process that can be learned.[86] Likewise intuition requires a disentangling of understanding from immediate sensory-motor processes.

The development of an enhanced intuition will 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 Jayne (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 than identifying thoughts with self, they interpreted them as voices of the gods. Today we might say their behaviour was directed by auditory hallucinations. Jayne argued that the change from this mode of consciousness (which he called the *bicameral mind*) to what we consider 'normal' consciousness (self-identification with internal mental states) occurred over a period of centuries about three thousand years ago and was catalysed by the emergence of metaphorical language and writing.[87]

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 operates externally. I suggest that the development of microvita science will require a breaking down of our modern bicameral mind and will require a new way of engaging intuitively with the world. If language and writing brought about the previous transition in consciousness, what might be the trigger for the next transition? Climate change? Or perhaps the rapidly evolving parallel universe known as the internet.

Experience must be measureable

It is difficult to imagine how a scientific method whose purpose is to elucidate patterns of cause and effect can succeed without counting. Without counting, mathematics is impossible; without mathematics, statistics is impossible; without statistics, induction is impossible; and without induction how can there be any law describing cause and effect? A science of microvita offers the possibility of counting because all experience is mediated by microvita which are particulate and therefore countable.

Mathematically, mind will be dealt with as a multi-dimensional space, just as the material universe is described as a multi-dimensional space. Sarkar makes a curious statement: "The day is sure to come when the omega of mathematics will coincide with the omega of biochemistry."[88] It is surely significant that he places that *omega* in the chemistry of life and not, as we might have expected, in fundamental physics.

Experience must be validated

Patterns in the natural world are not self-evident. They hide behind the relativity of time, space and person. Events appear to be different depending on how, when and where we look at them. Scientific method has developed sophisticated ways to circumvent the relativities of time and space but the

relativity of person remains problematic and is the focus of the post-modernist critique of Western science. Events look very different depending on the observer – ask any police officer at a traffic accident! Science attempts to circumvent the relativity of person using *consensual validation*, that is, by multiple persons independently repeating 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.[89]

Despite its shortcomings, the scientific method is for the most part consistent with human welfare. It protects against dogma and assertions of divine revelation, both of which are invariably detrimental to welfare. (Western science is currently trapped in its own dogma of materialism, but the increasingly paradoxical observations of the fundamental sciences are slowly but surely breaking that dogma.)

The success of consensual validation requires that scientists be well trained in their chosen discipline. Students at university currently pursue two strands of study. They learn the theory of their discipline in books and lecture halls. In laboratories they learn the sensory-motor skills necessary to obtain the relevant experiences. Both strands of training are essential.

However in future this will not be enough. A third strand will be required in order to develop intuition or the power of conceiving. Meditation will be indispensible. Students will likely sit in meditation halls dedicated to the purpose of learning the visualisations 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. Perhaps 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 be keen to learn how to dispose their minds to obtain the same experience. Such techniques will be useful not only in physics. Sarkar predicts applications in chemistry, engineering, medicine and agriculture.[90]

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 Neohumanism[91] and the eight practices of Astaunga yoga.[92] These include ethics, regulation of breath, body postures, withdrawal of mind from the senses, concentration and meditation.

Intuition in indigenous culture

The proposal that humans can develop another mode of knowing, a "power of conceiving" is the most radical component of microvita theory. Sheldrake, Laszlo, Bohm and others have proposed the existence of hidden fields that structure the universe (morphic, akashic and implicate fields, respectively), but Sarkar ties his theory *and* the future of science to a new cognitive faculty. Furthermore he describes the means to obtain it.

Unusual psychic abilities are common enough themes in science fiction and the social ramifications make for a fascinating story.[93] But for examples in the real world, we can best turn to indigenous societies. A defining characteristic of indigenous societies the world over, according to Knudtson and Suzuki, is a distinctive culture "in which, at least traditionally, they have a profound and deeply rooted sense of place and relationship with the entirety of the natural world".[94] That relationship is partly founded on shamanistic modes of knowing that are rejected by Western culture. Indeed the cultural clash between Western imperialism and indigenous societies has both ontological and epistemological roots. The former revolve around mind and spirit as legitimate components of reality. The latter revolve around intuition as a legitimate mode of knowing.

Psychic practices appear to have been integrated into Australian indigenous culture to a remarkable degree, perhaps because the original inhabitants remained isolated from the West for so long. The anthropologist Elkin (1891-1979) reported observing hypnotism, clairvoyance, telepathy, telaesthesia and the conquest of space and time. While such abilities were particularly developed in 'medicine men' or shamans, most adults possessed them to some degree.

> …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.[95]

While descriptions of Aboriginal psychic powers and spirituality are varied and contested,[96] there are reasonable grounds to believe that indigenous Australians possessed, at least in their traditional culture, some cognitive abilities that are exceptional from a Western perspective. The question arises as to their relationship with Sarkar's proposal for a "power of conceiving".

On the time scale of millions of years, the evolution of primates into modern humans was clearly accompanied by a gradual expansion of cognitive abilities. We might imagine some progression from the primate mind, to Jayne's bicameral mind, to the modern rational mind, to a future mind having intuitional faculty. But this is a very Western perspective. Evolution is seldom so linear – rather it explores many branched paths. On the timescale of the last 60,000 years (that is, since the emergence of modern humans from Africa), it is

more reasonable to suppose that human evolution explored multiple cognitive pathways in different parts of the world due to differing environmental and social pressures. In Europe and West Asia, the discovery of farming, the aggregation of people into cities and a propensity for imperialism were dominant influences to shape Western psychology. In this context, 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, the population remained decentralized and the imperialist propensity did not manifest as strongly. This facilitated development along a different cognitive pathway – let us broadly describe it as *intuitional*. We cannot assume this faculty just appeared – more likely it developed over many thousand years, encouraged, as Elkin believed, by the stillness of large open spaces, by a lack of attention to time and by the simplicity of material life – all of which encouraged an openness to subtle experience.[97] Likewise in the Indian sub-continent the earliest Vedic hymns indicate that even at the dawn of the historic era, the peoples in that part of the world were consciously exploring different cognitive faculties and developing the language to go with it.[98]

The philosophers of science Shiv Visvanathan and Boaventura de Sousa Santos (a founder of the world social forum) argue that economic and social justice in the modern world is predicated upon *cognitive justice*, the recognition that there are multiple ways of knowing the world, each having a deserving place.[99] Likewise justice demands the preservation of indigenous languages because each provides a unique cognitive window onto the world. No one language provides all views.

From the perspective of microvita theory, human beings have the potential to develop many cognitive faculties, each of them grounded in a distinct category of microvita. Indeed what we have until now referred to as intuition is better understood as a multiplicity of faculties. Having any one of them depends on developing receptivity to the microvita concerned, which in turn depends on the coordination of the relevant microvita in the trillions of cells in the human body. In other words each and every faculty is an emergent property of mind – recall the metaphor of the magnetised iron bar. 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.

Two Cultures – Science and the Humanities

In 1959, scientist and novelist C. P. Snow delivered the annual Rede Lecture, *Two Cultures*,[100] in which he argued that modern intellectual life had split into two camps or cultures, one informed by the sciences and the other by the

humanities. A breakdown in communication between them was a major impediment to solving the problems of modern society. A decade later when I was a university student, *Two Cultures* still generated much discussion.

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. Forty years later I recognize the divide as both fundamental and dysfunctional. It is not just the divide between the hard sciences and the soft humanities – it has metamorphosed into an ideological divide between crass materialism versus a subtle culture; between neo-liberal economics and community; and between a mechanistic universe and a living one.

The theory of microvita offers a single theoretical framework to span the material, psychological, social, ethical and psycho-spiritual lives of human beings. Which raises the question – can a science of microvita dissolve Snow's divide and bring about an integrated or holistic culture?

Before considering this question we must first return to the two dualisms introduced earlier, the mind-body and subject-object dualisms. If we consider reality to be arrayed on a wave-particle spectrum from subtle to crude, it is possible to divide the spectrum at two places, one marking the divide between mind and matter, the other between subject and object. As noted earlier, at the present stage of human evolution these two divides appear to be close, implying that mind is subject and matter is object. To better understand what follows, we note that the subject-object divide concerns the divide between the subtle unconscious and conscious minds respectively. Object is that part of the spectrum (on the crude side of the divide) of which a person is conscious. Subject is that subtler part of the mind spectrum of which a person is not conscious but which contributes to the structure of self.

Now we come to a pivotal concept in Sarkar's philosophy – the subject-object divide is not fixed. Over the course of human evolution it has shifted progressively from crude to subtle. We have already noted that this is the basis for Sarkar's definition of progress. In small steps, the light of consciousness shines into the 'near' part of the subject spectrum so that a small part of the proximal subtle mind which was previously subject now becomes object. Sarkar describes this process as Supreme Synthetic Subjective Appropriation. It is his ideological response to materialism (whether dialectical or positivist), but it is also pertinent to our discussion of Western science.

> 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.[101]

Each step of the divide is a cognitive metamorphosis – the domain of mind expands, cognitive abilities become more powerful and the world is seen in a different way.[102]

The transition in human consciousness postulated by Jayne as having occurred around 3,000 years ago can be interpreted as one such step. But the divided or bicameral mind did not become unicameral – it only appears so to the modern mind. And the divide will shift again such that future humans will perceive our 20th century mind as bicameral. How is the modern mind bicameral? We have already noted the faculty of intuition as one which is not properly integrated into the modern psyche. But more obviously, the two cultures recognized by Snow are also the consequence of a divided mind – one part looking back to the certain world of the material sciences, the other looking towards the subtle but less well differentiated world of subject. Indeed we may suppose that each cognitive metamorphosis is preceded by an unstable period where the mind is dangerously divided. Perhaps some temporary resolution is achieved but eventually the divide reappears to presage another step.

When one puts Sarkar's theory of microvita beside his theory of Supreme Synthetic Subjective Appropriation, it is clear that he believes science has played and will continue to play a pivotal role in human biological and cultural evolution. As already stated, science provides the tools to liberate humans from hard labour, thereby freeing time for subtle pursuits. It liberates the mind from dogmas which otherwise trap society and hinder its progress. But Sarkar goes further. Science accelerates the evolution of the human species – there is a co-evolution of humans and their scientific practice. The material sciences, he says, have wrought psychic and biological changes in humans, bringing about an increased interest in psycho-spiritual practices and thereby preparing the way for the emergence of microvita science.[103]

So returning to the question: can a science of microvita dissolve Snow's cultural divide? The answer must surely be a qualified yes and no. The development of a microvita science will not dissolve the subject-object divide but relocate it. However the very existence of a divide creates two tensions which will continue to exist no matter where it is located.

The first tension is ideological. Humans will always be attracted to the subtle but uncertain world of subject, drawn irresistibly by intellectual, aesthetic, ethical, egalitarian and Neohumanist impulses.[104] The tension between the already-known and the subtle yet-to-be-known will persist. The mystery and the spiritual promise of the subtle unknown will continue to attract the attention of artists, poets, musicians and novelists who will continue to express ever more subtle experiences that elude the analytical eye of science.

The second tension is methodological. The divide between the 'hard' and 'soft' sciences will persist because it arises not from the divide of matter and mind but rather the divide of knower and known. The methodology of microvita science will expose the near-subjective mental world to disciplined observation and a mathematic will surely develop to describe that world, whereby it becomes object. But many phenomena in the objective world which we would like to explain have their indirect origins in the far-subjective, that is, at the far-subtle end of the spectrum. Concepts such as *zeitgeist*, to give a possible example, will continue to be of interest to sociologists long before they can be assimilated into the discipline of a microvita science. In short, scientists studying events whose indirect origins lie in the far-subjective will continue to find themselves criticized by mathematical scientists for a lack of rigour and mathematical scientists will continue to be criticized for missing the human meaning of what they observe. The debates will of course be different to those of today, but the underlying tensions will be similar.[105]

If the above tensions persist, one may well ask: what will be achieved by a science of microvita? There is a positive answer. In Sarkar's cosmology, as in many others, the universe is understood to be a living entity. Life in all its forms, plant, animal, human, individual and social, is engaged in an epic journey from crude to subtle, whereby individual consciousness gradually expands to become one with universal consciousness.[106] Science plays an important role in this journey. At the present time, life on earth is threatened by humanity's many social problems and, as Sarkar puts it, without the development of a science of microvita "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]".[107] "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."[108]

In conclusion, we may 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 contribution of 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 many years for the scientific method to reach its current state of development and it may be many more years before the synthesis of East and West settles into a comfortable integrated methodology. But this is surely the future of science – its cutting edge will be more psychic than physical.

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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] Tantra is a spiritual tradition which originated in India in prehistoric times and was first systematized by Shiva. It encourages the all-round development of human beings through the practice of specific physical, mental and spiritual disciplines. A particular characteristic of Tantra is its emphasis on developing vigour, both through meditation and through confrontation of difficult situations, to overcome all fears and weaknesses.

3 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.

[4] Bussey, Marcus. *Microvita and Transformative Information*, To be published in The Open Information Science Journal, Bentham Science Publishers, 2010.

[5] Monism is the philosophical view that various apparently distinct categories can be reduced to one category. Dualism is the view that they can or should only be reduced to two.

[6] Rose, Steven. *The Conscious Brain*, Penguin Books/Pelican, 1976.

[7] Pinker, S. *How the Mind Works*, 1997. ISBN 88-04-49908-7.

[8] 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".

[9] The 'scientific' campaign against homeopathy is led by a world famous magician, Randi. Like all materialists, he considers homeopathy to be bogus because homeopaths use remedies diluted beyond Avogadro's constant and they should therefore be devoid of biological effect. The point here is not the efficacy of homeopathy but the vehemence of the opposition to it, which makes rational investigation almost impossible. See http://www.naturalnews.com/025627.html, link valid 17 March 2010.

[10] From a historical perspective, the rise of materialism as a scientific ideology is linked with the rise of capitalism and colonial imperialism. One cannot entirely dissociate the first from the horrors of the other two: the enclosures, slavery, indigenous genocide and mass poverty during the industrial revolution.

[11] Sarkar, (I&I). The term consciousness will be used in several senses in this essay. 1) As used by Penrose and Sarkar in this context, consciousness refers to the role of witnessing entity. 2) 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 and a person's social or political consciousness. 3) We also refer to collective consciousness meaning the way a large group of people view the world and how that view changes over time. 4) Finally, in Sarkar's philosophy (and many others) the universe is understood to be a conscious living entity. Thus a distinction is made between the unit consciousness (witnessing entity) of a human being and the Infinite Consciousness (witnessing entity) of the universe. The reader must construe the intended meaning from context.

[12] This treatment of the subject-object relationship stems from Sarkar's discourse *The Existential Value of Ideology* (see subsequent footnote). Strictly speaking the subject-object divide concerns the *subtle unconscious* and *conscious* minds respectively. Object is that of which a person is conscious and subject is that subtle part of the mind spectrum of which a person is *not* conscious but which contributes to the structure of self. As we shall see later, the subject-object divide is not fixed.

[13] Many of these debates go back to the Greeks. Plato promoted the dualism of body and soul. Parmenidies however was a monist – the only true being is 'the One' which is infinite and indivisible. See Russell, Bertrand. *History of Western Philosophy*, (HWP) 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 Shrii Shrii Anandamurti, *Namami Krsnasundarum*, AM Publications, 1st Edition 1981. (Note: Shrii Shrii Anandamurti is the name used by Sarkar for publishing his spiritual philosophy.)

[14] *A Dictionary of Philosophy*, ed. Anthony Flew, Pan Books, 1984.

[15] Sarkar, P. R. (I&I) While many of the schools of eastern philosophy share the concept of a mind-matter spectrum, they take quite different approaches to the epistemological dualism of knower and known. For example Buddhism rejects, but Tantra accepts, the concept of an Atman, that is, an eternal, unchanging, witnessing entity beyond the ever-changing universe.

[16] The first discourse was *Microvitum – the Mysterious Emanation of Cosmic Factor* delivered December 1986.

[17] Sarkar, P. R. MVINS, p58. 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.

[18] Sarkar, P. R. MVINS, p3 and p78.

[19] Sarkar, P. R. MVINS, p52.

[20] Sarkar, P. R. MVINS, pp44-45.

[21] A plenum is a background substructure filled with things – see McTaggart, *The Field* p 22. See chapter 2 of *The Field* for an introduction to virtual particles.

[22] Greene, p330.

[23] The Casimir effect is a force that arises between two uncharged metallic plates placed a few micrometers apart. The effect is explained in Quantum Field theory by the partial exclusion of virtual photons between the plates.

[24] Van der Waals forces, named after a Dutch scientist, are the attractive or repulsive forces between molecules other than those due to covalent bonds and electrostatics. They are relatively weak compared to covalent and electrostatic bonds but sufficiently numerous to have major structural consequences.

[25] See McTaggert, *The Field* Chapter 2, for a non-mathematical account of the zero-point energy field. However, Greene in *The Fabric of the Cosmos* does not use the term.

[26] Laszlo, *CosMos*, pp61-65. See also http://en.wikipedia.org/wiki/Ervin_Laszlo and MacTaggert, *The Field*, p121.

[27] The word 'cohere' is mine and not Sarkar's. Here lies an unresolved issue – Sarkar does not describe what mechanism keeps so many microvita 'bound' together as a subatomic particle, if indeed this is what he means to imply. If an electron particle, for instance, is the result of packing many microvita into a 'solid ball', this could be achieved by an attractive force between them (but this would invoke a new force of Nature) or by so-called Bose-Einstein condensation. The latter would treat microvita particles as having wave-like attributes and indeed, as we shall learn later, Sarkar describes microvita as being accompanied by waves. According to quantum field theory a matter particle is the local excitation of an underlying matter field (See Greene, p256). In microvita theory, we might imagine a particle to be a point where the wave peaks of many microvita cohere. *Coherence* is an important concept to explain structure in a universe composed of innumerable waves of difference wavelength – the many waves adjust such that their troughs and peaks coincide. (See Ervin Laszlo's cosmology, for example.)

[28] Sarkar, P. R. MVINS, p67.

[29] 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 aether-like substance.

[30] *Self-similarity* is the idea that 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*. Ervin Laszlo considers *self-similarity* and *coherence* to be two fundamental organising principles in the universe. See Laszlo, pp22-23. The Taoist aphorism, *as above so below*, expresses the same idea.

[31] MacTaggert, Lynne. *The Field*. p 121

[32] A field may become undetectable but is not without influence. Physicist David Ruelle describes a fascinating thought experiment which provides some insight into just how sensitively interconnected our universe is. Consider a closed litre container of air. Suppose that we measure the trajectories and collisions of all molecules for a period of time. Now let us remove a single electron from the edge of the known universe and consider the effect of the changed gravitational field on the one litre of air. We rerun the experiment from the same starting point measuring the trajectories and collisions of all molecules. After how many collisions will the (average) molecule miss another molecule that it would otherwise have hit were it not for the minuscule change in gravitational field? Answer: just 50 collisions! See, David Ruelle, *Chance and Chaos*, Princeton University Press, 1st Published 1991; Penguin, 1993; chapter 12.

[33] In Sarkar's cosmology, a stable space must have three dimensions representing the stable triangulation of three forces – hence the three dimensions of physical space. Likewise a stable psychic space would also have three dimensions. It is interesting to note that physicists require three dimensions to incorporate the strong nuclear forces and another three to incorporate the electro-weak forces. The result is a universe with nine spatial dimensions and one of time. However various versions of string theory add more dimensions.

[34] This so-called Copenhagen Interpretation of wave-particle dualism introduces another puzzle – the *measurement problem*. A physical measurement is not complete until it is registered in the mind of a conscious observer. That is, the observer is not just a passive witness but has a causal role in determining what is observed. See Brian Greene, *The Fabric of the Cosmos*, pp91-95 and pp201 for a discussion of these and associated questions.

[35] Marcus Chown (2004). "Quantum rebel", *New Scientist* **183** (2457): pp30–35. For more on the controversy about this experiment see, http://en.wikipedia.org/wiki/Afshar_experiment

[36] See Chapters 1 and 2 of Sarkar, (I&I). Actually Sarkar distinguishes two types of wave in microvita theory, major (or controlling) waves and secondary waves. In my interpretation of the relevant passage, (Sarkar, MVINS, p69) the dynamics of major waves is independent of microvita whereas secondary waves are created by the movement of microvita through the major wave. To employ a naïve metaphor, a seabird (microvitum) swimming over an ocean wave (major wave, medium, field, space) will leave a ripple (secondary wave) in its wake. Using the photon as an example, the secondary wave determines the wavelength of the light, whereas the major wave determines that the particle is a photon and not some other particle such as a gluon. In *which-way double-slit* and *quantum entanglement* experiments with photons, the major wave acts as the unitary underlying phenomenon that ensures that distant photons remain entangled as a single entity. The major wave represents David Bohm's pilot wave which guides or pushes the particle around. A consequence of Bohm's theory is that interactions between wave and particle are non-local (faster than light).

[37] 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.

[38] To which Niels Bohr replied, "Einstein, stop telling God what to do!" Isaacson, p 326.

[39] See http://en.wikipedia.org/wiki/David_Bohm.

[40] See, Brian Greene, 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.

[41] This strange terminology may be due to a mistranslation or mis-transcription but the reference to quantum uncertainty appears clear.

[42] Sarkar, P. R. MVINS, p133.

[43] With this argument Sarkar is promoting *determinism*. Elsewhere he says: "…there is no such thing as an accident. Behind every event that takes place in the universe there is the law of causation. Kárańabhávát káryabháva – there is no effect without a cause. Truly speaking, whatever we take to be an accident is nothing but an incident whose preceding cause we are unable to see or understand properly. So the word 'accident' is meaningless and to call this universe an accidental creation is simply to camouflage one's ignorance." (Sarkar, "The Primordial Cause of Creation", in *Subháśita Saḿgraha Part 4*, AM Publications.)

[44] Patrick Olivelle (translator), *The Upanishads*, (Oxford World's Classics), OUP, 1998, ISBN-10: 0192835769. For further commentary see Sarkar, *The Intuitional Science of the Vedas – 5*, 1956. Official source *Subháśita Saḿgraha Part 2*, AM Publications. When asked if he was religious, Einstein responded, "Try and penetrate with our limited means the secrets of nature and you will find that, behind all the discernible laws and connections, there remains something subtle, intangible and inexplicable. Veneration for this force beyond anything that we can comprehend is my religion." (Isaacson, p384)

[45] Kashmiri Tantra of the 14th century described the universe as a cyclical phenomenon oscillating between expressed and unexpressed states. Likewise Sarkar's cosmology, known as *Brahmacakra*, describes a *cycle of creation.* See Sarkar, P. R. (I&I). The Sufi's have given this idea a beautifully poetic expression: "Just as a wave breaks on the shore and ebbs back to the ocean; just as a spark leaps from the fire and falls back into the flames, so too all things come from God and all things return to God."

[46] Sarkar, P. R. "Microvita and Cosmology", in (MVINS), p155. The title of the first microvita discourse, "Microvitum – the Mysterious Emanation of Cosmic Factor", also expresses the idea that microvita have their origins in a place beyond attributes.

[47] 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 http://en.wikipedia.org/wiki/Digital_physics. See also McTaggart, *The Field* p35. Another physicist to explore the connection between modern physics, mind and consciousness is Fred Alan Wolf (http://en.wikipedia.org/wiki/Fred_Alan_Wolf).

[48] Davies, (5thM).

[49] This speculation is attributed by Davies in (5thM), p65 to the well-known physicist Roger Penrose.

[50] Davies.

[51] Davies, p 260.

[52] Davies, p 256.

[53] Sheldrake, Rupert. *A New Science of Life: The Hypothesis of Morphic Resonance*, Park Street Press, 1995.

[54] *Organicism* is usually associated with Alfred Whitehead and is closely related to the doctrine of *holism*. Holism states that the whole has emergent properties which are more than the sum of its parts. As a consequence of holism, organicism asserts that the universe and all the structures in it cannot be understood by a dissection of their parts (the reductionist approach of materialism) but can only be understood as organic wholes. Organicism is also a biological doctrine that stresses the organization of biological structure rather than its chemical composition. See, http://www.answers.com/topic/organicism

[55] The discovery of *biophotons* suggests that light photons play a significant role in shaping morphological structure. See http://en.wikipedia.org/wiki/Fritz-Albert_Popp for more on the work of biophysicist Fritz-Albert Popp. In Sarkar's cosmology, the major waves through which photons move are described as *luminous factor*. (See I&I and previous footnotes) Luminous factor give rise to *form*, that is, structure. Thus, concerning biological structure, there is a connection between Sheldrake's biological morphic fields, Sarkar's luminous factor and Popp's biophotons.

[56] Sarkar, P. R. "Microvita and Cosmology", in (MVINS). Sarkar points out that the concepts involved in this discourse are a departure from traditional Tantric cosmology. I believe his use of the terms *subjective* and *objective* in this context is also different from how they are used elsewhere in this essay. This is an issue requiring further work.

[57] See, McTaggert, p22, 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.

[58] From a particle perspective, the distinction we wish to make is between *bosons* and *fermions*. Bosons (force particles) can be densely superimposed (for example photons in a laser beam) whereas fermions (matter particles) can be linked but not superimposed. Consequently they build extended structures such as atoms, molecules, crystals and bio-molecules. There are force and matter fields corresponding to their particle equivalents. (See Greene, p 256. Note that Greene refers to force particles as *messenger particles*.) In Sarkar's cosmology, the planes of inferences correspond to the *lokas* and the planes of propensities to the *kosas*. See (I&I). A different but related interpretation is that the inference-propensity bifurcation corresponds to *super-symmetry*, the theory that every matter particle has a partner force particle and vice-versa. See Greene, p 427.

[59] Sarkar, P. R. (MVINS), p134

[60] Sarkar, P. R. (MVINS), p138.

[61] Sarkar, P. R. (MVINS), p140.

[62] This appears to be consistent with the proposal of physicist Hal Puthoff that particle mass is not a fundamental attribute but just a measure of the resistance or friction experienced by an accelerated particle due to the exchange of virtual particles with the zero-point energy field. For a more detailed but non-mathematical explanation see, *The Field*, pp32-33.

[63] Sarkar, P. R. (MVINS), p140.

[64] Information is measured in *bits*.

[65] Wheeler, John. See, http://en.wikipedia.org/wiki/Digital_physics

[66] Laszlo, p80.

[67] Sarkar, P. R. (MVINS), p41

[68] Sarkar, P. R. (MVINS), p58.

[69] Sarkar, P. R. (MVINS), p140.

[70] Sarkar, P. R. (MVINS), p154.

[71] Sarkar, P. R. (MVINS), p156. 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.

[72] 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 microvitum that resides only in the subtlest spheres has ideological attributes only.

[73] Sarkar, P. R. (MVINS), p72.

[74] Whitehead, Alfred. *Modes of Thought*, NY Free Press, 1966. Recall that Whitehead promoted the doctrine of *organicism* (see a previous footnote) to which Rupert Sheldrake also subscribes.

[75] Wright, Sewell. "Gene and Organism", in *American Naturalist* **87**, pp5-18, 1953. Wright did not believe that consciousness was an emergent property of the complexity of biological organisms, but rather that it was an inherent property of the most elementary particles. See http://www.harvardsquarelibrary.org/unitarians/wright-sewall.html.

[76] Birch, Charles. *On Purpose*, NSW University Press, Sydney, 1990, p32.

[77] Sarkar, P. R. (MVINS), p133

[78] For other metaphors to illustrate mind as an emergent property see, Towsey and Ghista, *Towards a Science of Consciousness*, Op. Cit.

[79] See for example the Cardiff Centre for Astrobiology, http://www.astrobiology.cf.ac.uk/

[80] Sarkar, P. R. (MVINS), p132.

[81] Sarkar, P. R. (MVINS), p133.

[82] Sarkar, P. R. (MVINS), p23.

[83] Sarkar, P. R. (MVINS), p5.

[84] Sarkar, P. R. "The Intuitional Science of the Vedas", in *Subashita Samgraha*, Part 2, AM Publications.

[85] 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*, http://www.behavior.net/forums/gestalt/1998/16_5.htm

[86] http://www.wikihow.com/Learn-Speed-Reading

[87] 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, Julian. *The Origin of Consciousness in the Breakdown of the Bicameral Mind*, 1st Edition 1976. Houghton Mifflin, New edition Nov 1990. ISBN-10: 0395564727. See also http://en.wikipedia.org/wiki/Julian_Jaynes.

[88] Sarkar, P. R. (MVINS), p19.

[89] 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.

[90] Sarkar, P. R. (MVINS), pp135-136.

[91] Sarkar, P. R. (LIN)

[92] Sarkar, P. R. (MVINS), p51. Concerning the incorporation of Astaunga Yoga into the education curriculum see, Bussey, Marcus. "Education for Liberation" in *Understanding Prout*, *Volume 1*, 2010.

[93] See for example; Isobelle Carmody, *The Obernewtyn Chronicles*, Penguin 1897; and John Wyndham, *Chocky*, Michael Joseph, 1968.

[94] Knudtson, Peter and Suzuki, David. *Wisdom of the Elders*, Bantam, 1999. ISBN-10: 0553372637.

[95] Elkin, A. P. *Aboriginal Men of High Degree*. First published 1944; Inner Traditions, 1993.

[96] For a description of Aboriginal spirituality in the Kimberleys read, David Mowaljarlai & Jutta Malnic, *Yorro Yorro: everything standing up alive*, Inner traditions, 1993. For another description by an elder of the Yuin tribe read "Listening to the Land – an interview with Max Dulumunmun Harrison", *Nova Magazine*, May 2010, novamagazine.com.au. Compare with the quite different concerns of Mitchell Rolls who argues that the appropriation of Aboriginal non-material cultural property is exploitative (Mitchell Rolls, "New Age, New Orthodoxy – The institutional authorising of balderdash", in *Journal of Aboriginal Studies*, 2002:1 p22, Aboriginal Studies Assoc.).

[97] See also Randall Collins, *Sociology of Philosophies: A Global Theory of Intellectual Change*, (Harvard University Press, 1998) who argues that mysticism is more likely to flourish in decentralised societies. Sarkar links Aboriginal spirituality to the pre-Shiva Tantra of the Indian Austrics.

[98] 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.

[99] Boaventura de Sousa Santos. *Cognitive Justice in a Global World*, Lexington Books, 2007. http://www.ces.uc.pt/publicacoes/outras/200321/01.php

[100] The *Rede Lecture* is an annual event at the 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*.

[101] Sarkar, P. R. *The Existential Value of Ideology*, in *Prout in a Nutshell Part 15*, 1988.

[102] The succession of subjects exposed by the shifting subject-object divide is actually a hierarchy of subjects, hence the synthetic nature of each step. Sarkar illustrates the idea using the hierarchy 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 culmination of this process, says Sarkar, is the Supreme Subjective State.

[103] Sarkar, P.R. "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." (http://www.timesonline.co.uk/tol/news/science/article7149095.ece)

[104] Towsey, Michael. "The Biopsychology of Cooperation" in *Understanding Prout – Essays on Sustainability and Transformation, Volume 1*. Proutist Universal, Australia, 2010.

[105] For example, a day will come when materialism is no longer viable as a philosophy – psychic reality will simply obliterate it in just the same way that photographs of the earth from space have cast the doctrine of a flat earth into the dustbin of history. But we may suppose that humans, as they are wont to do, will develop some new theory of crude mind that refuses to recognize a more subtle mind.

[106] From the perspective of Causal Layered Analysis, this view of life in the universe occupies the top or mythic level of CLA. See Inayatullah S, editor. *The Causal Layered Analysis (CLA) Reader: Theory and Case Studies of an Integrative and Transformative Methodology*. Tamsui, Taiwan: Tamkang University Press; 2004.

[107] Sarkar, P. R. (MVINS), p52.

[108] Sarkar, P. R. (MVINS), p42.