The first phase of Evolution
-
Cosmology and Microvita

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"Knowledge
is not so much about knowing,
as about searching."[1]
Vincent Icke (1946)

"Never forget the Good,
and never forget the True,
and never forget the Beautiful,
for these are the faces of your deepest Self."
Ken Wilber (1949)

"Our duty is not to see what no one ever saw,
but: to think what no one else ever thought,
about things that everybody sees."
Schopenhauer (1788-1860)

"Dare to know!
Have the courage to know about
your own intelligence"
Immanuel Kant (1724-1804)

0 - Introduction

WE ARE LIVING IN an age of science.[2] Cosmology, the study of our universe[3], what it is made of and what it comes from, has fascinated human beings since earliest times.[4] In Amsterdam, Netherlands, tickets for the public lectures by Dr. Robbert Dijkgraaf, the previous president of the Dutch Academy of Sciences (NAW), are sold out in 15 minutes. A present fascination with authentic meaning, which at present is given by science rather than religion, is apparent.

With Michael Towsey, we can ask: "What is the substratum, the most fundamental material, of the universe?" But watch out, that very universe, or at least our world, is composed of physical, mental and emotional objects. This asks for a different and more detailed question: "What is the substance of chemical and biological, of physical and subtle objects?" It is generally assumed, that thoughts are abstract and because of that, don't have a substance. On the other hand, it's hard to deny that they are something. Although its nature may not yet be understood, something with an active effect cannot be based on nothing. So, be open to serendipity and at least for the time being, assume that also thoughts have a substance.

Thoughts are part of what is called 'mind', which in turn is connected to and takes part of a physical body. But also the word 'body' is vague, because every biological body is a composition of atoms, molecules, macromolecules, organelles, cells, tissues, organs and organ systems. All these physical and subtle elements have their own identity, but what manages their apparently intensive internal functioning and the cooperation of all elements? Which language do they speak, what do they have in common? Chemical elements in principle follow the laws of nature, but what about biological units? If all organic components, from the simplest to the most complex, have an identity and are able

to communicate, their physical and subtle components must be granular, rather than monolithic. Otherwise, there is no reason why they would not merge, like drops of water or ice cubes in water.

An overall mind, capable of managing the identity of all sub-minds of the structural network to which it is connected to, must also have a full-grown identity. Such full-grown identity does not drop from a clear sky; it must have developed in the course of a long learning and adaptation process, called evolution. How did mind emerge from matter? Biological organisms include the presence of molecules and atoms; they must have taken part in the evolution, with or without Beagle. The motto of biology "omnis cellula e cellula' (Latin for: every cell comes from a cell) does not bring clarity. Darwin's opinion in a letter to John Hooker is also not helpful: "It is merely rubbish thinking at present of the origin of life; one might as well think of the origin of matter." Unless we take resort to the direct intervention of God -in a creatio ex nihilio-[5], only abiogenesis, the emergence of life from non-living matter, seems appropriate to provide a reasonable answer.

1 - Ontologies

ONTOLOGIES are open philosophical assumptions that are used to design the basics of theories regarding 'realities'. Such realities can be sciences like computer science, physics, cosmogony or cosmology. For thousands of years, ontologies were dualistic and described all phenomena as both spiritual and physical. After the Middle Ages in Europe, new ontological principles entered developing Western sciences like e.g. astronomy, cosmology, chemistry and biology. In this essay an old, but not yet applied ontology will be used as a fundamental principle for a cosmogony, the science that describes the origin and substratum of all forms in the universe. It does not accept the materialist principles that underlie the Standard Model of Cosmology[6], but will critically accept its observations, rational analysis and conclusions.

Although cosmological ontologies and a number of religions still have some connection, such connections are not at all automatic: few religions take an interest in cosmology or physics. On the contrary, Teilhard de Chardin was banned to USA; he was not allowed to talk about his view on evolution and his book "The phenomenon of man" could only be printed after his death in 1955.

The ontology of materialism is an interesting case; it is atheistic, yet also based on philosophical Open-World Assumptions.[7] just like any other ontology. For materialistic science only matter, or better energy, is the single primitive, while consciousness is its derivative. On the other hand, a scientist like Stuart Hameroff only considers consciousness as something that truly matters. For him, it is '*the music of the universe*', has been in the universe all along and emerges from within microtubules, the scaffolding of eukaryotic and plant cells. "Inside these microtubules something happens and consciousness emerges." Tubulins, the small tubes of which microtubules are composed, are only stable in neurons. The definition of consciousness that both Hameroff and Penrose[8] handle is: *"Consciousness is a subjective experience of internal and external states. It may also imply a sense of self."* Whether this almost generally accepted definition does justice to consciousness or not, remains to be seen. David Chalmers appointed the so-called 'hard problem of consciousness': "What causes subjective experience to emerge from objective matter?" Because materialism has a poor understanding about the nature of consciousness, it is not able to discover what causes the coordination of cells, tissues and organs in organisms, let alone memory, intelligence, intuition and a feeling of identity.

Advaita Vedanta, a second and idealist ontology, only accepts consciousness and observation as real. This is not an inducement to investigate the nature of all components that contribute to suffering or wellbeing of our world and its inhabitants.

Dualism only considers the existence of body and mind. It does not ponder on the nature or substratum of body or mind or on a possible cooperation of the two.

An ontological option that not yet has been discussed and developed is bipolarity: the equivalence of consciousness and energy, the two fundamental principles that underly all phenomena of this universe. The Indian philosophers *Abhinavagupta* (950-1020) and *Gyaneshwar* (271-1296) lived this principle and described it in beautiful wordings. *P.R. Sarkar* also described it, but did this in a way that could accommodate a new ontology, as well as a new approach to evolution. It is the principle that underlies this essay.

2 - Definitions

2.1 Energy and Consciousness

THE WORDS 'consciousness' and 'energy' have been mentioned several times, without defining them. How can they ever be essential elements in a new episteme, if no effort is made to discover their complete nature?

To get an idea about the nature of energy, an accepted definition of mechanical energy can be used: 'The capacity of a system to work.' Energy can take many forms, like electrical, mechanical and nuclear energy. It works and always moves, but it is an unintelligent force and must be told what to do. Energy is attached to a system, so if its container is destroyed, it immediately moves in so many directions to find a new container.

A definition of consciousness is more problematic. In Western parlance, the word is understood to mean 'subjectivity, personal experience, observation (awareness)' or 'something that we lose when we fall in dreamless sleep and regain when we wake up'. These definitions reduce consciousness to a single property, observational capacity. Indian philosophical systems give it a wider and deeper content. Samkhya imparts 'knowledge'; *Advaita Vedanta* and *Advaita Siddhanta* assign 'bliss' to consciousness and see it as the material cause of all forms.

In the consequent pages, consciousness will be understood as 'The material and the first efficient cause of the universe.' It is not a blind force, but a substratum[9] with attributes like observational capacity, memory, intelligence, creativity, intuition and joy. A metaphor for this is the image of a potter and his clay. Clay is the material cause for a new pot, while the potter is its first efficient cause. If clay and potter stand next to each other, no new pot will ever appear, so the specific qualities and skills of the potter are essential for the form and production of the pot. Energy is the second efficient cause that connects the potter and his intention for a new pot. Still the picture is incomplete: if potter, clay and energy are available, nothing will appear unless a creative and intelligent potter designs a concept for the new pot. But the potter also needs to be skilled and creative during the procedure of actual production. This is the dual act of creativity that occurs both in the abstract, as well as in the material phase. Both phases need energy and the creativity of consciousness.

How to transfer this image to the nature of the universe? (See Figure 1.) Consider the potter for all activities as the subjective and the double-layered universe as the objective platform. Conceptual, generic, creativity is *Jina Purus'a* while procedural, specific creativity is *Krta Purus'a*[10]. This subjective platform is connected to an objective platform that is also double-layered and composed of specific, material units (wave-particles) and specific, subtle units (mind). Conceptual creativity *(Jina Purus'a)* guides the emergence of new and the maintenance of existing material forms while procedural creativity *(Krta Purus'a*) guides the rise and evolution of minds. Like the composition of minds by heterogeneous live components[11] is connected to material carriers, conceptual and procedural creativity are also included. As above so below: this procedure not only accounts for the different strata of the Macro level, but also for the strata of the Micro level.

If everything in this universe is a composition of consciousness and energy, all subatomic particles, atoms, molecules, but also unicellular and multicellular organisms -like human beings- must

be composed of consciousness and energy. *Gyaneshwar* already indicated that either of the two may be sleeping, while the other is actively awake. This means that either of the two may, or may not, have expression, but a full expression of both will not occur simultaneously. Since only either of the two can have full, i.e. 100% expression, both levels of expression are inversely proportional to each other. As an example, 30% expression of consciousness goes along with a 70% expression of energy. Human beings have the potential to be fully (i.e. 100%) conscious of consciousness.

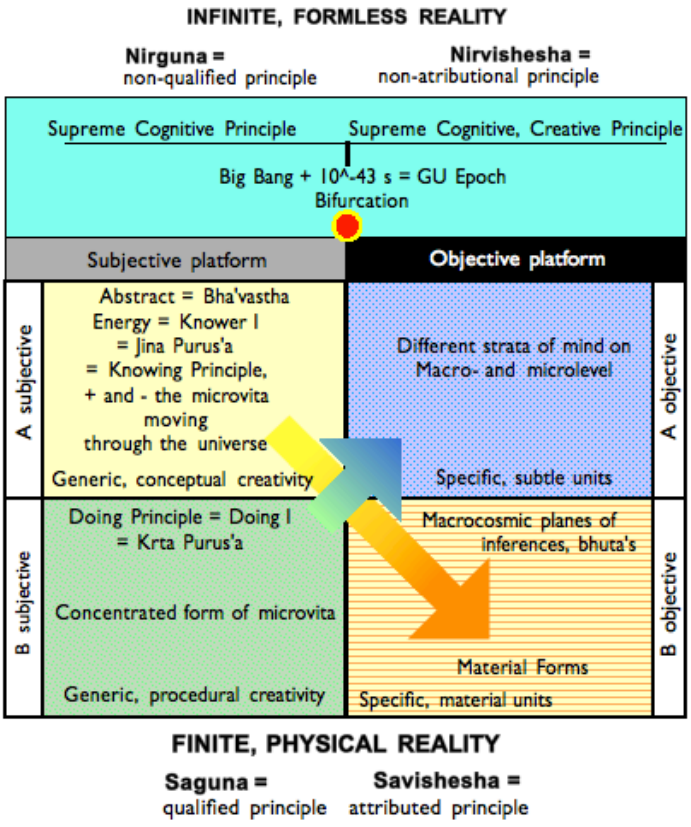

Figure 1.

The dynamic, creative principles that lead to the formation of (conscious) units on Macro and micro level.

The expression of both consciousness and energy is based on cooperation, rather than competition. This implies that the basic theme of evolution, is the expression of both energy and consciousness, Imagine a rod magnet as a metaphor. It has a north and a south pole, each with an attracting momentum that is maximal at the two poles. Note zenith for top and nadir for bottom. The zenith pole is a metaphor for its origin, Consciousness, and the ultimate unity of the individual and the Cosmic mind. The nadir hints at the ultimate expression of Energy in matter. (see Figure 8.)

2.2 Mass and Matter

If we are focussing on definitions, now the moment has come to define 'matter.' Matter and mass are closely related and since mass is an earlier phenomenon in evolution, some thoughts will be first dedicated to 'mass'. The closeness of the two rapidly results in circular definitions, like "Mass is a measure of how much matter is in an object"[12] or in "The mass of an object is a fundamental property of the object; a numerical measure of its inertia; a fundamental measure of the amount of matter in the object."[13] or "Mass is the quantity of matter in a body."[14] Mass is a fundamental property in physics and admittedly, fundamental elements are difficult to define.

Einstein was clear about *m* in his formula: $E = mc^2$. $M = E/c^2$, M means mass, not matter. It is striking that matter does not have a universal definition, but most definitions include inertia and the occupation of space. A confusing problem with this approach is that both fundamental particles and atoms include inertia and occupy space, and because of that, both are called 'matter.' (Also see Chapter 5.)

3 - A new symmetry

THE FUNDAMENTAL LAWS of physics have shown that no preference of matter over antimatter exists. An almost perfect mirror-symmetry between matter and antimatter is accepted; each particle has its antiparticle. Particle-antiparticle pairs exist, like quark-antiquark, electron-positron, proton-antiproton, neutron-antineutron or photon-antiphoton. Antiparticles have the same amount of mass and spin, but opposite charge. Photons have zero mass, neutral electric charge, are quanta of electromagnetic energy and their spin is potentially right-handed and left-handed.

As explained in a previous chapter, consciousness and energy form an inalienable concomitance. Subatomic particles have full expression of energy with only dormant consciousness.

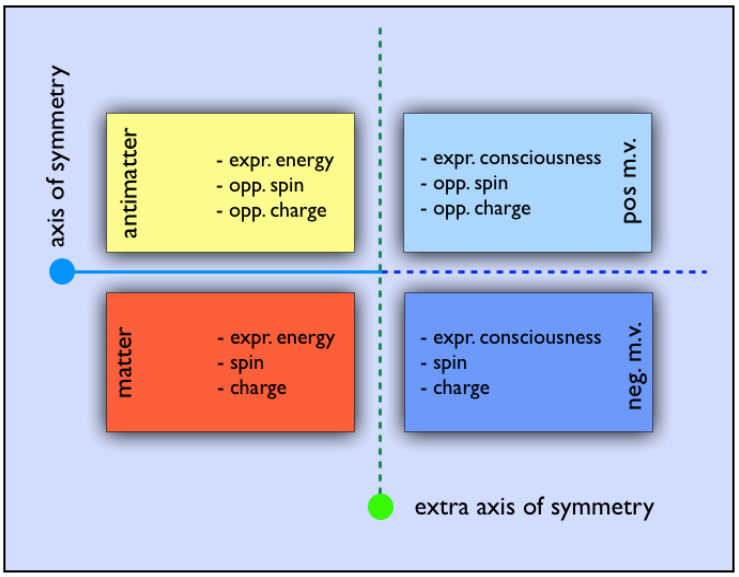

Figure 2.

In accordance with the above ideas, another symmetry can now be mentioned, a symmetry between physical particles with expressed energy, but dormant consciousness, and 'particles' with expressed consciousness, but relatively small levels of energy, in the next chapter called 'microvita', here only 'positive m.v.' and 'negative m.v.' (Figure 2.) In this universe, energy can never be absolutely zero, because in each realization of consciousness some amount of energy is included. Such 'particles', mainly consisting of expressed consciousness, are knowledgeable and creative; they 'know' what is proper and efficient, can make individual or cooperative decisions and consequently are more or less living units.

Elementary and composite particles of energy follow the laws of physics. 'Particles of consciousness' are different, they are intelligent, creative and active in the application of particles of energy. The two do not compete, but are complementary in all chemical and biological forms.

4 - Microvita

4.1 Size

IN DECEMBER 1986, the Indian philosopher P.R. Sarkar (1921-1990 AD) mentioned the existence of such creative units of consciousness for the first time, and called them 'microvita'[15]. The word 'microvitum' (singular) -microvita for plural- is a combination of 'micro' and 'vitum' 'Microvitum' merges the Greek word mikros, meaning 'small', and the Latin word 'vitum' meaning 'life'. They are called microvitum, not nanovitum, millivitum or macrovitum. The term 'micro' refers to a specific small size: the micrometer (µm), which is 10^-6 m. So a 'microvitum' is something that operates in forms with a size in the range of µm. Which organisms have a size between 1 and 1,000µm? The size of atoms is roughly 0,1-1nm (10^-9m). The smallest virus, poliovirus, is 0,03µm; a bacterium (a prokaryotic cell) is 0,5-2µm and an amoeba (eukaryotic cell) is 220-740µm. The word microvitum clearly hints at a vital field of action: microbiological life.

"Microvita come from outer space and the extended universe." They are living units with characteristics like memory, intellect and creativity and can be called 'the creative, catalysing agents of life.' The whole universe, so also our planet, is their field of activity. In this vast space they are the carriers of life, the matrix, and as such they unite matter and mind, the laws of physics and the principles of organic life.

4.2 Numbers

IF MICROVITA are present in this universe, how many of them, as an indication, are involved in an atom, a cell, a human body and our universe?

The number of crude, negative microvita in a carbon atom = ~10^10[16]. The number of atoms in a human cell is ~t 10^14.[17] This means that the number of crude, negative microvita in such a cell is roughly 10^14 x 10^10 = 10^24. The number of cells in a human body is ~ 10^13[18], which means that the number of crude, negative microvita in a human body is ~ 10^13 x 10^24 = 10^37. Although these numbers are already beyond imagination, they only include crude, negative microvita.

A human body not only has cells, but also 10^14 bacteria[19], which are also compositions of atoms, biological cells and microvita. The number of crude, negative microvita that is involved in these bacteria is ~: 10^24 x 10^14 = 10^38. This is even without the presence of subtle negative, as well as positive microvita that are present in organelles, cells, bacteria, human tissues, organs and their overall minds. Apart from that, the biological machine of human beings has a layered overall mind, also composed of molecules of mind, that are compositions of positive and subtle negative microvita.

To be very clear: all given numbers regarding microvita are only intended to give an order of magnitude. Anyone is able to extrapolate these numbers to the macro scale of the universe, its space and its 10^113 hydrogen atoms. Interesting numbers arise when the total amount of energy, included in space and atoms, is compared with the amount of presently known energy in the universe.

4.3 Denominations

THREE DENOMINATIONS of microvita exist: crude and subtle, negative microvita, as well as positive microvita[20] (See Figures 3. and 4.) and sub-denominations of clusters and superclusters in mind. If elementary physical particles and antiparticles meet, they annihilate each other and produce new particles, like photons. This will not happen if positive and negative microvita meet or if

microvita meet particles or antiparticles. If microvita and particles meet under proper conditions, the result will be constructive and form will emerge.

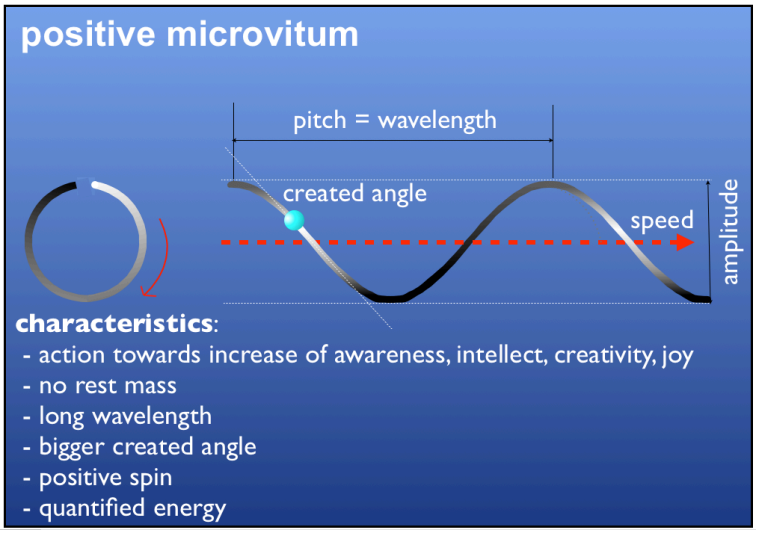

Figure 3.

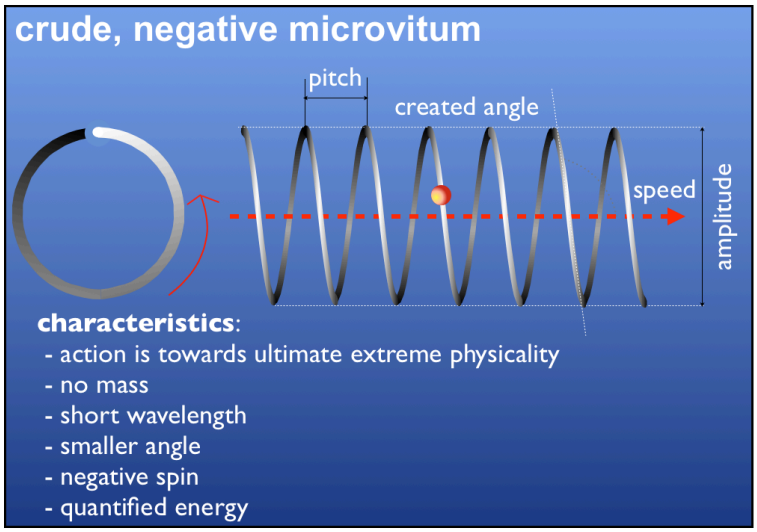

Figure 4.

In this paper I have left out neutral microvita, without spin, as a separate denomination. In the past years I understood neutral microvita to form atoms. The mission to form simple and complex molecules was for crude negative microvita. Now I don't see strong reasons why crude, negative microvita should only undertake the formation of atoms, without also being included in the formation of molecules, which in fact are similar chemical elements. It has to be admitted though, that the connection of atoms into molecules is quite different from the structure of atoms.

Ultimately two essentially different forms will result. First forms are chemical and only have a potential mind; later forms are biological and have an actual mind. Initially real minds can be incomplete and simple, but have the potential to evolve into complete and complex minds. Simplicity or complexity of mind depends on the state of their evolution.

Subatomic particles are particles of energy, microvita are units of mind. Atoms are composed of subatomic particles, kinetic energy and homogeneous, crude, negative microvita. Because of the single presence of this denomination of microvita, atoms only have mind in potential form. Also molecules contain only crude, negative microvita, while viruses contain crude (from the atoms and molecules included), as well as subtle, negative microvita in an overall mind. Since microvita have

expressed consciousness, they are knowledgeable and know what is the right thing to do under the given circumstances. This explains the skill of viruses to quickly adjust to new situations, despite the fact that they don't have a brain and even an incomplete, very simple mind. The simplest organisms with a simple, but complete mind, are organelles and microbes. A complete mind is a mind with heterogeneous molecules of mind, composed of subtle, negative as well as positive microvita.

It is worth mentioning here that H.J. Rudolph hinted at an essential characteristic of microvita: cooperation. He highlighted four aspects of Microvita network formation: clustering, representation, synchronization and coherency.[21]

4.4 Phases of inactivity

Microvita are sensitive to temperature and "*will undergo contraction and hibernation at freezing temperature and expansion and hibernation at boiling temperature.*"[22] All fundamental and composite subatomic particles were formed during the first 3 minutes after the BB at a temperature between 10^32K and 10^6K. During these years, all present denominations of microvita could only hibernate. It took another 377,000 years before the temperature of the universe had dropped till 3,700K. (See Attachment A.) This was the moment that photons no longer were bound to the plasma of matter and became free. [23] The Standard Model of Cosmology calls that event 'recombination.' After this, crude, negative microvita, electrons and nucleons could unite into the first atoms, Hydrogen, Helium, Lithium, Beryllium and Boron.[24] In the first phase of evolution, the physical foundation has been laid for the later inclusion and evolution of mind. All other natural atoms are the result of local explosions of stars, super and hyper novae (jadasphota). These events also need to be placed at the nadir, the very end of the first phase of the cycle. (See Figures 6, 7 and 13.)

Phases of hibernation are connected to high and low temperatures, but these situations are not limited to the first 377,000 years of the universe; they are of all times. A giant virus (containing only crude and subtle, negative microvita) more than 30,000 years old, has been discovered in Siberian permafrost[25]. After a further rise in global temperatures and the subsequent melting of tundra, more viruses will become active again. Another situation in which microvita hibernate, and even the atoms they are part of completely loose identity, is the so-called 'Bose-Einstein condensate' at a temperature of 0ºK.

5 - Matter is (not) bottled-up energy and more

P.R. SARKAR coined the word 'microvita' and mentioned their presence in atoms. He also spoke about the relation between matter and energy. In 1956[26] he said: "*matter is nothing but bottled-up energy*." In 1956 and 1979: "*matter is bottled-up energy,*" but in 1989 he expressed a concept that was conceived as a dramatic opposite: *"No, matter is not bottled-up energy.*" In his discourses from 31 December 1986, he spoke about microvita, which explains the seeming change of perspective. Here it is important to realize that physics uses the word 'matter' for both 'subatomic particles with rest mass' and 'atoms.' In 1965 and 1979, P.R. Sarkar used the word 'matter' in accordance with the usual understanding of matter as also 'subatomic particles with rest mass'. In 1989, after having spoken for about 2,5 years about microvita, he indicated that mass is a collection of energy, while 'matter" -'atoms-' includes both energy and 'microvita.' Matter has mass, like a body has a skeleton, but it is much more than mass, also microvita are included.

This understanding is closely connected to a hotly debated text from the first discourse by P.R. Sarkar about microvita in December 1986: *"Here we should again remember the fact that these*

microvita are [[a]] creation in the internal phase, rather in the returning phase of cosmic expression"[27]. The consequence of this sentence is that, if microvita only become active in the second phase of cosmic evolution, they cannot take part in the emergence of sub-atomic particles during the first phase. Recently someone wrote me an e-mail and mentioned "a misunderstanding about microvita that was spread at a microvita seminar in India in the 90's, '*that millions of microvita compose an electron*', when in fact P.R. Sarkar apparently never said that".

However, two particular quotes still call for an explanation: *"The mass of matter has got nothing to do with energy.*[28] *"*If a previous conclusion (i.e. microvita are involved in atoms, but not in subatomic particles) is accepted, subatomic particles are nothing but energy. Does the last sentence deny this? Not, if we look for a deeper understanding: "*Energy is consciousness, under the bondage of Prakrti*", or "*Energy is knower-I or Jina Purus'a*". (See Figure 10.)

The previous conclusion that microvita are not intrinsic elements of subatomic elementary and composed particles, is based on the authority of P.R. Sarkar. In my opinion authority can be accepted, as long as it is also supported by additional observation, analysis and proper conclusions. (see Attachment A.) Blindly following authority kills own responsibility and initiative.

After these reflections it has become necessary to make additions to the previous (Chapter 2.2) definitions of mass and matter. My proposal is to include perception: "Mass is a quantity of energy in a particle, with a form that, in principle, cannot be perceived by the senses." The inclusion of microvita in 'Matter' could result in: 'Matter is a substance, composed of mass and crude, negative microvita, that occupies space and can be perceived by the senses.'

6 - Evolution

6.1 A first, philosophical, model

PHYSICS IS CONSIDERED to explain so-called non-living matter, as well as biological organisms. The Standard Model of Physics considers the universe as a meaningless space, ruled by mechanical laws, ultimate ending like its beginning in a Big Crunch or in symmetry with it, in a Big Freeze. Entropy and syntropy[29] are not seen as complementary but as a struggle with only one outcome, the death of everything and all. That may be true for dogmatic science, but not all scientists are dogmatic. Many, like Elisabet Sahtouris, long for a new model of physics that includes organic principles.[30]

How different form the linear approach of physics is the view of P.R. Sarkar. His model does not consider evolution as a meaningless and linear event, but as a dance between two lovers, where the full expression of one unfolds the essence of the other. He considers evolution as a cyclical process in which beginning and end, Alpha and Omega are connected. Because of that, the name of this process is *Brahmacakra*[31] or the Wheel of Creation (WoC). At this moment at least three models of creation and evolution exist. The first, philosophical, model is based on the ideas of P.R. Sarkar and does not actually include insights from cosmology, astrophysics, physics or the impact of microvita. The second model is the Standard Model of Cosmology, closely connected to the Standard Model of particle physics. A third model, unfolding in this essay, accepts both philosophical thoughts and Cosmological research.

The first model is represented by Ac. *Vedaprajinananda* Avt[32]. (See Figure 5.) Evolution starts from one of the vertices of the equilateral triangle.[33] Before any physical elements emerge, the three consequent elements of the Macro Mind, *Mahat* (existential I), *Aham* (Internal active I) and *Citta* (stored internal forms) appear.

A first inconsistency is the suggestion that *Citta* is separate from the next five fundamental factors and later forms of life, while in reality all gradually evolved and still evolving elements,

without or with form, are components of that very *Citta.* [34] The first model does bring that question up and consequently no answer is suggested.

A second point of attention is the position of unicellular life at the nadir of the cycle -at the end of the first part of evolution- *Saincara*, which is the very first beginning of the second phase, *Pratisaincara*. If the zenith of the cycle represents the optimal expression of Consciousness, the nadir must represent the optimal expression of Energy, solid factor.

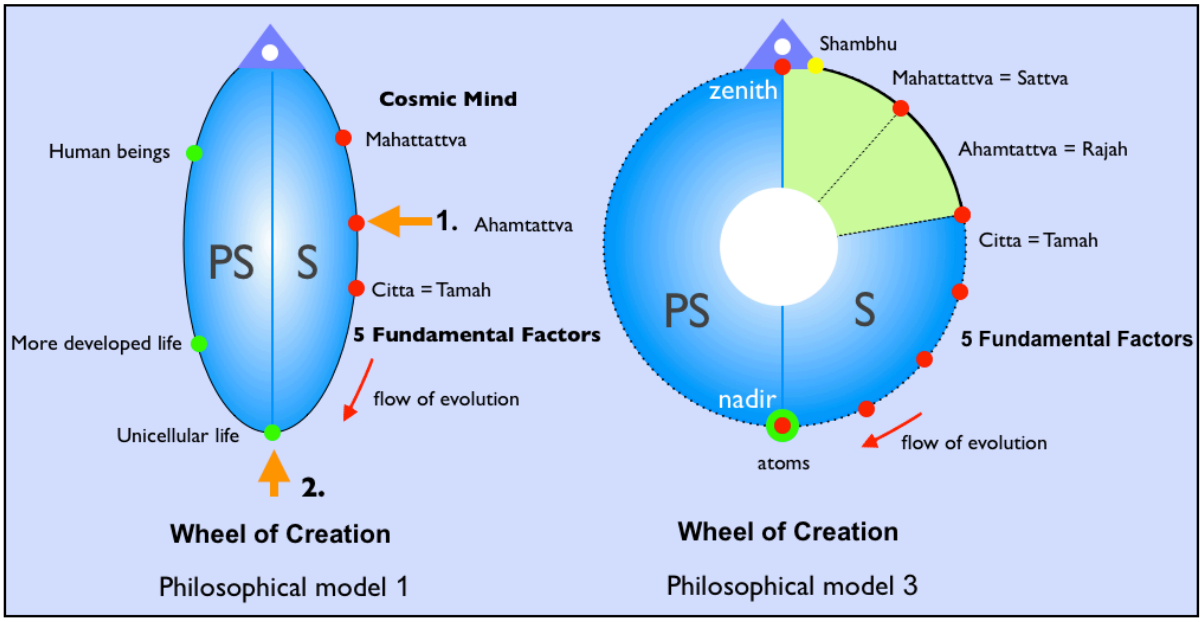

Figure 5. Figure 6.

In a way the suggestion of the first model makes sense: single celled organisms are indeed simple forms of life. But the question is: are these simple organisms the very beginning of life or does solid factor have that potential? If unicellular life is the very start of the animated phase, it should be there,[35] but the nadir is also a metaphor for the final stage of *Saincara*[36]. It seems that two candidates apply for the same position but are they really two candidates? Life that emerges in the second phase, does not do so immediately and in full grown form, but very gradually in quantum-like steps. In that case, crudest matter is not the first stage of life but it can be its very first stage. So, crudest matter, the very first stage of life, should be given seat at the nadir of the Wheel of Creation. This suggestion only seems to replace one conflict by another, but no, in a later chapter, atoms will be suggested as the crudest form of matter, as well as the very start of the animated stage. (See already Figure 6.)

6.2 A second, material, model

WHETHER the objective world is essential or not, we receive and interpret information from it. Eventually all objects with which we have contact, are made up of atoms, which in turn are compositions of fundamental particles. When we see an object, we see electrons moving like the propeller of an airplane and conclude that what we see is solid. All our senses have a specific construction and methodology to contact external objects and transform such contact into understandable information. Do the various specific senses also contact various specific subatomic wavelike particles of the external atoms? In order to get an answer it will be helpful to have a look at recent views from the Standard Model of Cosmology. (See Attachment A. and Figure 7.)

Cosmology researches the consequent emergence and characteristics of elementary and composite particles of the universe. Physics researches and describes these particles, as both waves and particles at the same time. These waves can be dipole, quadrupole or higher order waves. If it is

true that ultimately the universe is only spacetime[37] and a sea of vacuum fluctuations, all elementary particles will ultimately be described as dipole waves, that possess quantized angular momentum. In other words, at this moment in 2015, it remains increasingly doubtful whether particles of space will ever be detected. Spacetime seems to be too subtle for such elements. Astronomers are already excited about a possible detection of gravity waves in the next years. A loud 'chirp' sound that arises after the merging of two neutron stars, for less than a tenth of a second, will confirm their existence. The observation of that event will confirm general relativity and will rise above the indirect proof of those waves in 1993.

After the Planck Epoch (10^-43sec aBB), the temperature in the Grand Unification Epoch (See Figure 8.) was extremely high (T = 10^32K). (See Attachment A) Because of this, the included amount of energy per volume was also extremely high and its wavelength extremely short. The associated fundamental, very short range, force particles were Higgs bosons. Born under such conditions, they should contain a lot of mass, and yes they do: 126 GeV/c2 compared to electrons with 0.511 MeV/c2 and neutrino's with a mere 2.2 eV/c2. Despite the plasmic state of the universe they could exhibit their specific identity. That cannot be said of the other force particles, photons with 0 mass, photons. Energy in the form of photons did exist in abundance, but remained in the plasmic state and behaved like a dense, non-local field. (see Figure 9.) Spacetime, as pure waves and or as wave-particles, is the first element with identity. (1)

The three pairs of quarks appeared in the next Quark-antiquark Epoch and ultimately united into single protons (u-u-d) and neutrons (u-d-d), (baryons). Under the then occurring circumstances they were able to express their identity at a temperature of 10^13K. (2)

Also in the Photon Epoch photons keep their theoretical rest-mass 0 at a temperature of 10^6K. In the plasmic state they remained hidden and behaved like nonlocal particles. Before Recombination (with a temperature of 3,000K), they detached from the other mass particles, by which their characteristics got exposed. (3)

Leptons, of which electrons are the most well known, emerged during the Lepton Epoch, and could express their identity at temperatures between 10^13K and 10^9K. (4)

Atoms have mass and contain all four elementary particles: spacetime, quarks, photons and electrons. They emerge and developed their identity at Recombination, at a temperature of 3,000K. (5)

6.3 A third, synthetical, model

RECENTLY SOMEONE e-mailed me: "I cannot believe that anyone who studied P.R. Sarkar's ideology, would consider the Big Bang to be "scientific." This is close to Michael Towsey's statement that "The universe started with the initial creation of the 5FF[38] from Cosmic *Citta*". It ignores the integration of the Macro Cosmic Mind, the phenomenal universe and the BB. Why would anyone reject the theory of the BB, although it has quite many unanswered questions? Until now the BB is the best we have. It should only be replaced after a theory with better answers has developed and been accepted. (New theories are already being developed: 'Plasma Cosmology' and a variant 'The Electric Universe') If it is so easy to reject the BB, it should not be difficult to design a new one. Then, why not also design new physics, astrophysics, biology, chemistry, sociology and philosophy? It would be quite irresponsible to even suppose that all research of the past was completely wrong. Even rejections should be constructive and contain answers or at least the very start of answers.

As already hinted at in Chapter 6.1, this third model is based on suggestions of P.R. Sarkar, as well as on the findings that have been accepted in the Standard Models of Cosmology and Physics. The Big Bang is an integrated element in Cosmology and an accepted element in the third Model. (See Figure 7.) Not accepted in the Standard Model of Cosmology is the primary emergence of a

Cosmic Mind and its relation to the physical universe. The third Model is based on the idea that the physical universe is a metamorphosed form, *Citta*, of the Macro Cosmic Mind. The first two, abstract, components of that Macro Cosmic Mind, are *Mahattattva* (pure existential-I) and *Ahamtattva* (Internally active-I), while the third component is the objectivated-I, called *Citta* or universe. But Mind cannot emerge if not first a desire for objectivation would exist. This very first, seed or motionless presence is called *Shambhu*.

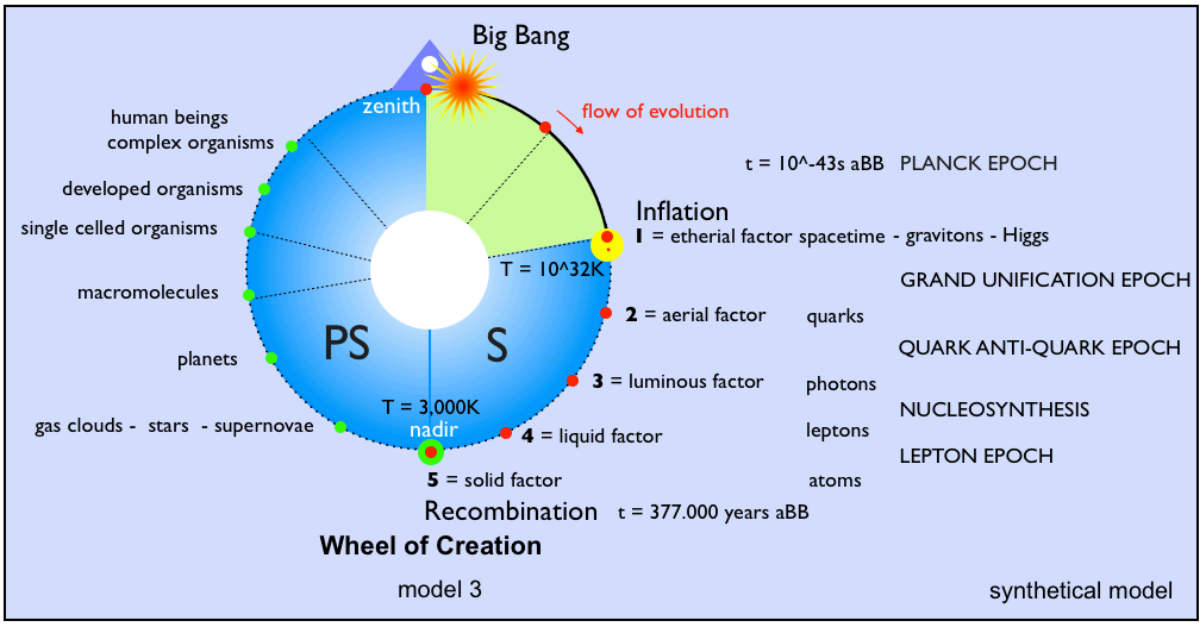

Figure 7.

Both *Vedaprajinanda* and Michael Towsey made a split between *Citta* and the rest of the universe that is composed of the five fundamental factors (elementary particles in bulk quantities) and their transformations. In other words, *Citta* is suggested as separate from the physical universe. Both suggest that neither the five fundamental factors in *Saincara* (Sanskrit for the first phase of evolution), nor *Pratisaincara* (the second part of evolution), in fact the complete universe, are objectivated parts of the Cosmic Mind. This is in conflict with the idea that the universe is a thought projection of the Macro Cosmic Mind.

Just like these three models may have built-in contradictions and white spots, the theory of the BB may also have white spots. If this is the case, additional interpretations may be added, without stepping out of the Wheel of Creation (WoC) or the BB model. Another matter is whether the BB model has an approach that allows all questions to arise and get answers that do justice to the nature of the questions. At the same time the philosophical approach of the WoC does not include observations of relevant phenomena. In order to promote relevant questions and answers, the BB model and the WoC have been united. One of the first consequences is that the very start (t = 0) of the BB and the philosophical momentum of *Shambhu* have been included in the third model. Not only that, the BB model is also equipped with an Alpha and an Omega that moreover, at least potentially, unite.

This means that the course of evolution no longer is random and linear, but needs to be drawn as a circle with a zenith and a nadir. Maximum expression of Consciousness occurs near or in the zenith, while maximum expression of Energy will be in the nadir. (See Figure 8.)

It was in the vertex of the triangle of forces[39] -called *iccha'biija*, the 'seed of desire'-, where the static force burst out, that Consciousness (*Shambhu*) was laying, in complete silence and without any movement. Yet, this silence is the bursting point, the noumenal cause of the phenomenal universe. It is the first stage of evolution outside the triangle of forces and has only one desire: to create sound in its deep silence. The outcome was the pure existential feeling of Cosmic *Mahattattva*. All it created

was a straight line and this linear movement is called *náda*[40]. (see Figure 10.) In the next phase, the flow of creation was characterized by curvatures, but the potentiality of sound was still in its primordial phase and is called *kalá*.

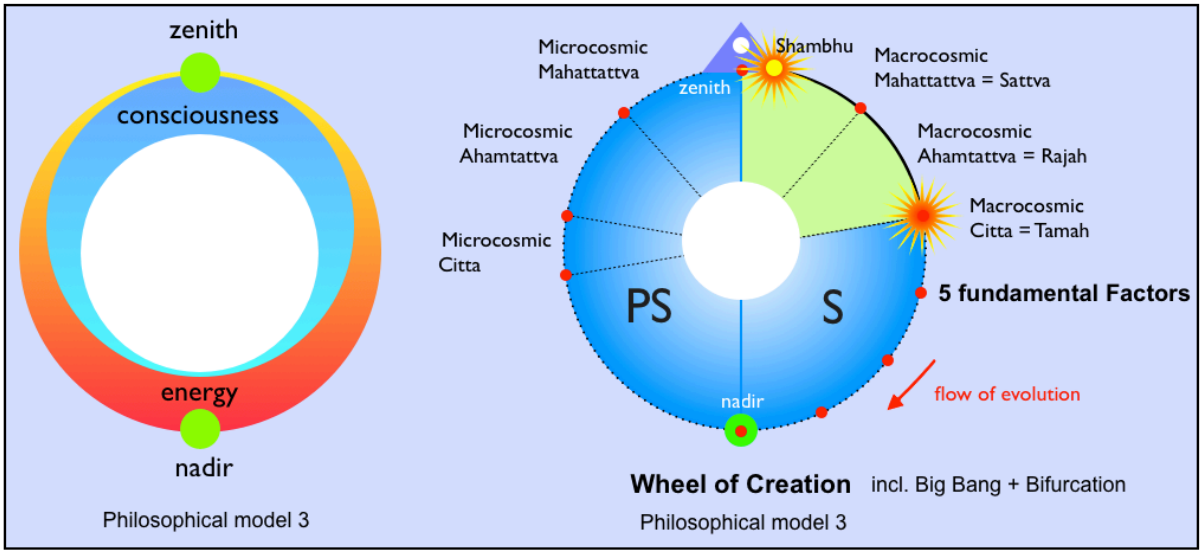

Figure 8. Figure 9.

"*Kalá is followed by further formation of curvatures one after another, but each succeeding curve is not necessarily of the same wavelength as the preceding one. In fact, the difference goes on increasing as the wavelength continues to decrease.*"[41] This stage is called *bhava* ('to become', 'idea' or 'psycho-spiritual parallelism'). In this stage the Supreme Consciousness is gradually becoming the universe or Cosmic *Citta*.[42]

"The seed point represents will force, náda cognitive force and kalá represents actional force."[43]

Kalá is first followed by homogeneous and then by heterogeneous waves. According to P.R. Sarkar,: *"Kalá is followed by further formation of curvatures one after another, but each succeeding curve is not necessarily of the same wavelength as the preceding one. In fact, the difference goes on increasing as the wavelength continues to decrease."* The Standard Model of Cosmology -and in fact common understanding- concludes the opposite.[44] Initially the temperature in the early Universe was extremely high and gradually lowered, which can only mean that the wavelength of particles gradually increased. This could mean a conflict with the previous text of P.R. Sarkar, because Inflation is calculated to have happened and if it happened, what was the cause of it? It could be assumed here that the wavelengths of the first waves decreased until inflation and after inflation increased in accordance with the decreasing temperature and continuing expansion of the universe.

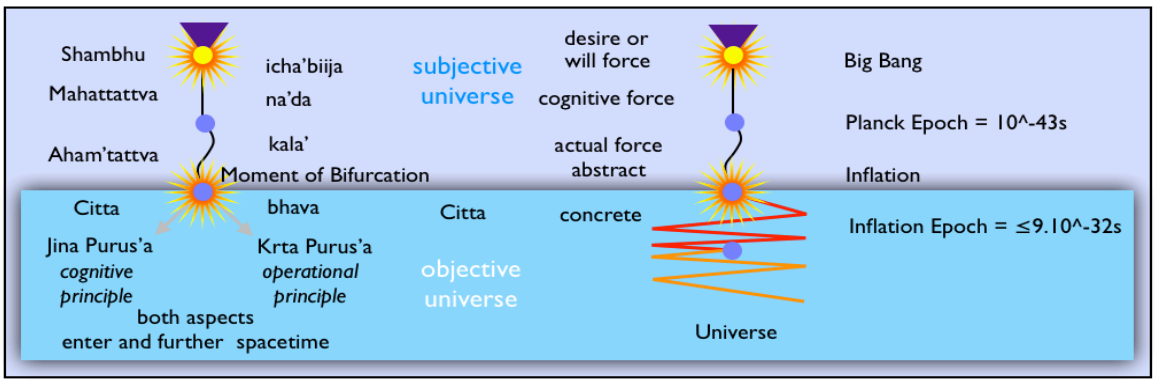

Figure 10.

6.4 Shambhu, Bifurcation and the Big Bang

Figure 10. shows a new, not yet explained term, 'Bifurcation,' as well as the integration of *'Shambhu'* and the Big Bang. Without at least some analysis, these two events cannot be understood or accepted. First the term 'Bifurcation' will be approached.

The phenomenal world that we perceive, appears both objective and subjective, concrete and abstract, linear and organic, and to contain both particles of energy (fundamental particles) and units of consciousness (microvita). The objective platform is based on subatomic particles that blindly and linearly follow the forces of nature.The subjective platform with its particles of consciousness looks for opportunities to contact the complementary particles of energy. (See Figure 1.) Although both platforms have their own identity, they are complementary. The subjective platform is founded on microvita and their procedural creativity (*Krta Purus'a*), which is guided by the conceptual creativity of the knowing principle (*Jina Purus'a*).

Although these two platforms are separate, they are strongly connected. The conceptual creativity of the subjective platform is also a guiding principle for the evolution of material forms.The generic, procedural creativity of microvita is causative for the transformation and evolution of the different strata of mind on Macro and Micro level. If all activities take place on the path of evolution from one into many, a moment in time must have existed when the two platforms were still one and not yet bifurcated. As soon as *Aham* was ready to transform into objectivity, the bifurcation of *Aham,* into a Knowing and a Doing principle, occurred. This moment is also the birth of space and the entrance of microvita in it. One could say, they are intertwined.[45] P.R. Sarkar suggested "microvita come from outer space[46], from the extended universe."[47] If the different denominations of microvita also control the emergence, transformation and evolution of Macro Cosmic *Citta*, this bifurcation must have occurred at the very first stage of it. The first stage of *Citta* is spacetime, which means that, from the very first existence of spacetime, microvita were enetering the expanding universe. This also means that, with the expansion of the universe, the number of microvita will continue to increase, rather than gradually decrease.

The next question that needs an answer is, 'Did the philosophical moments of '*Shambhu'* and the BB of Cosmology occur simultaneously, before the emergence of the two abstract parts of the Macro Mind?" or 'Did the BB, apart from the moment of *Shambhu*, occur after the emergence of the two abstract parts of the Macro Mind?' (See Figure 11-A, resp. 11-B.)

Cosmology hardly understands anything about consciousness, let alone about its involvement in chemical compounds and biological organisms. It denies the existence of mind and, because of that, will not be able, nor willing, to choose between option A and option B.

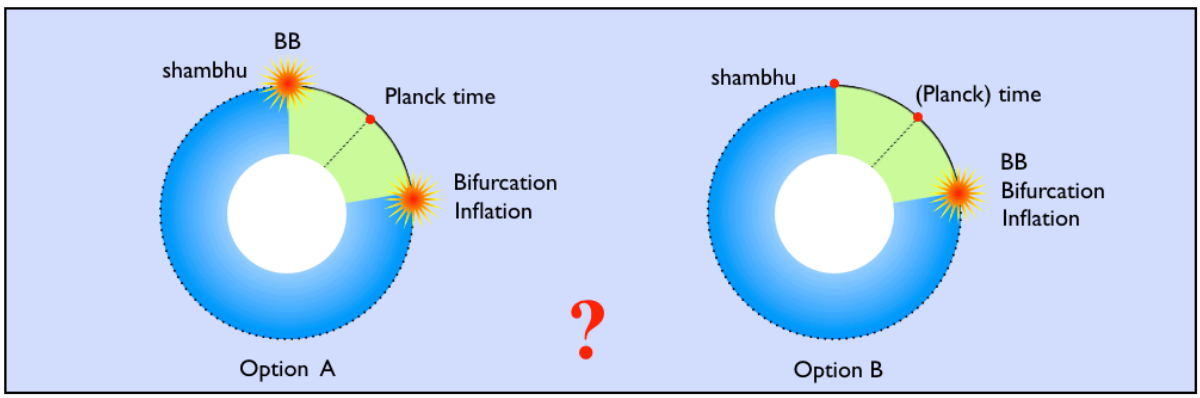

Figure 11.

The first, purely philosophical and the third, synthetical model, both accept the seed of creation, S*hambhu* as a philosophical, as well as an ultimate, first material initiative.

Option A (See figure 11-A) sees *Shambhu* and the BB as one and the same event, with *Shambhu* as an abstract, at t=0 of BB, and mystical component of the origin of the universe. If evolution is understood as a dance between two partners, -consciousness and energy- it started as an abstract 'period' beyond spacetime, with the unfolding of *Mahat* and *Aham* of the Macro Cosmic Mind. This very abstract period coincides with the calculated period of the Planck Epoch of 10^-43 s, as integrated in the Standard Model of Cosmology. During this epoch the laws of physics didn't apply and all thoughts about it are speculative. It is thought to be a period of great turmoil and fluctuations, in which the four forces of nature did not yet have their own identity, did not yet exist or were united. The opposite may very well be true: it was an epoch of mystical silence.

A split second after the end of Planck Epoch, (at t= 10^-33s aBB), so, also after Bifurcation, a tremendous expansion of space, called Inflation, took place. Within a period of ~ 10^-33 sec, the scale of the then universe increased by a factor 10^50. It looks as if Bifurcation and the flow of microvita initiated this Inflation. While using Model 3, no big conflicts seem to exist between the philosophical concept of Model A and the Standard Model of Cosmology.

Also Option B (see also Chapter 7, Figures 7., 11-B and 13.) views *Shambhu* as the very first moment of creation, but has a different view on the integration of the BB and the Wheel of Creation. The abstract event of *Shambhu* was the initiative for the emergence of both Cosmic *Mahat* and *Aham*. When *Aham* was at the point of becoming metamorphosed into an objective reality, many things happened at the same time: Bifurcation of *Aham*, with the opening of space and entrance of microvita, but also the occurrence of the BB. Here the BB is caused by the readiness of *Aham* to become objective. After this development, Planck Epoch of 10^-43 s occurred and was followed by Inflation.

Which of the two is most probable? Both options have the impetus, the very first moment of philosophical creation, *Shambhu,* in common. The same accounts for the transformation of Cosmic *Ahamtattva* into the objective universe. They feel with *Abhinavagupta*, that the Macro Cosmic Mind was so eager to share the state of bliss, that it acted quickly. The two models also understand that a cause, even if it is intimately connected to its effect, can never depend on it. On the contrary, if the Macro Cosmic Mind will loose its focus for only a split second, the universe will vanish, not in empty space, but in its origin. Both options see evolution as a circular, rather than a linear event and agree that first particles of mass arise from the Macro Cosmic Mind, after which Micro Minds arises from matter. Option A or B are rather theoretical issues.

In option A the flow of abstract, linear waves with a $\lambda = \infty$ m, changed gradually and uninterrupted into consequent homogeneous and heterogeneous waves. A negative point for option B is a lack of argument for Inflation. One might say that this is also the problem of the Big Bang model and will be solved in future. That reply is not very convincing, but may be true. A next, but positive point for option B, is the idea that the first two stages of the Macro Cosmic Mind are abstract stages, in which no random expression of energy can be included. On the other hand, the complete evolution of Cosmic Mind is broken by the event of the Big Bang. Moreover, the basic idea of option B seems to be in conflict with *"The point at which the resultant force bursts out, is known as biija- in Tantra*"[48]. The fact that the first two stages are sentient does not exclude the involvement of a huge force. In option A, the evolution of the abstract Mind into the concrete universe is preceded by one specific event that is described in philosophy as a point called *Shambhu* and in Cosmology as the BB. Different from option B, the development of Macro Cosmic and micro cosmic minds in option A, occur in one uninterrupted flow. Option B has four moments of essential events: *Shambhu*, Big Bang, Bifurcation and Inflation. William of Occam (1288-1346) already explained, yes, with his razor blade, that three is better than four. Since in option A *Shambhu* and the Big Bang are united, it only knows three of such events.

At this moment in 2015, it is understood that the number of hydrogen and helium atoms that emerged during recombination, is final. All new atoms that have been, are being and will be produced in the universe, are the result of new combinations of these already present Hydrogen and Helium atoms. The flow of microvita into the universe seems different; they came, and continue to enter, into an expanding universe. This is an indication that the number of microvita per volume does not decrease in the course of an expanding universe.

7. Upcoming questions

A NUMBER OF QUESTIONS is coming up now. A first one is: Is the presence of photons in Figure 12. appropriate? All elementary (or 'fundamental' if you prefer) particles have mass, except photons. Moreover, they are force particles and, like all elementary particles are complex wave forms, photons are no exception. They are elementary particles, the quanta of light, gauge bosons for the electromagnetic force and exhibit wave-particle dualism, all at the same time. The question of rest mass or no rest mass is no longer a theoretical, but an experimental one. At the moment, the question is, 'If a rest mass exists, what is the upper limit?" *"The new limit is 7 × 10^{-17} eV. Studies of galactic magnetic fields suggest a much better limit of less than 3 × 10^{-27} eV,"*[49] However, whether they have little, very little or zero rest mass, they are elementary particles and as such fit in the list of five.

A second question related to photons is rather primary. If photons are the first fundamental particles, how can they be the third fundamental factor in model 3, before electrons? Michael Towsey[50] has chosen 1. spacetime, 2. neutrinos, 3. photons, 4. electrons and 5. quarks. Although he observed that, according to "that -a previous- interpretation" "atoms contain all the 5FF" he put quarks at position 5, for solid factor. Not only that, how can neutrinos, with their almost complete lack of interaction with matter, be chosen for position 2?

I have followed the birth of identity according to the Standard Model of Cosmology, concluded that atoms contain all 5FF and put them at position 5, for solid. My choice for the position of photons at number 3, rather than number 1, is more evident than it seems at first sight. Before a mammal is born, it has names in accordance with its stages of development. First its name is 'seed', then 'cell', after which it is called 'embryo' and 'fetus'. Only after the young being is born, it is able to cry, to use all its senses and move in the new situation. All young mammals expose qualities in accordance with their specific conditions, whether they are polar bears, monkeys, elephants or human beings. Something similar applies to elementary particles. In accordance with the particular characteristics of their identity, either Higgs bosons, electrons, gluons or photons emerge in the most befitting conditions for each. Photons have zero mass, so conditions with mass limit their expression. They may join but hide. After the temperature of the universe reached 3,700K, photons decoupled from matter. Once they were free, ~ 23% of the neutrons joined with protons into nucleons and a tiny number of neutrons and protons united into slightly more complex nucleons. After that another binding occurred, electrons united with the nucleons. At a temperature between 3,700K and 3,000K, the photons became free from matter and because of that became third in the row to gain fundamental identity. With this in mind, the sequence of wave-particles is 1. spacetime (and in it Higgs bosons), 2. quarks, 3. photons, 4. leptons and 5. atoms.

A third and more fundamental question is why the elementary particles of energy that we now know, were born inside specific densities, at specific temperatures and what caused their specific identity? Why did nonlocal, ubiquitous energy transform into so many various and uncountable local forms? No misunderstanding: the same applies to 'particles' of consciousness. Why did nonlocal, ubiquitous consciousness transform into so many various and uncountable local forms?At this

moment, no one can tell. Science accepts observed situations as they are found and does not ask why they are found and exist.

A fourth question is connected to the relation of nucleons, electrons and microvita. As I suggested before, crude, negative microvita were the first ones to wake up after their entrance into the universe in evolution. These microvita united with the present nucleons and electrons. What exactly is the contribution of crude, negative microvita to the formation of atoms?

I can imagine two possible answers:

1 - Billions of microvita simple step on board of the already atoms formed. After that, they are ready to contact other microvita and create new forms, as soon as external conditions are appropriate for such development. In other words, the fact that they step on board makes atoms complete.

2 - A completely different answer is that they wake up and immediately become active in the formation of big numbers of Hydrogen and Helium and small numbers of Beryllium, Lithium and Boron. If this is true: what do they do, how do they do it and for how long? Three sentences by P.R. Sarkar in 'Microvitum in a Nutshell' refer to both questions.

2.1 - *"To him or her a carbon atom is nothing but billions of microvita getting solidified."*[51]

This sentence seems to hint at the inactive variant.

2.2 - *"A single microvitum is insufficient to form one carbon atom, but when billions of microvita get solidified, a carbon atom is formed*."[52]

What strikes here is: "they *form* one carbon atom" instead of "they *unite (or transform) to become* one carbon atom."

One interpretation almost needs to imply that they actively form an atom, but after that do not take part in it. Another interpretation could imply that they actively take part in the formation of the atom and join. Also special is the word 'solidified' in sentence 1 and 2, hinting at getting 'solid' or 'solid factor', a possible hint at the idea that atoms could be interpreted as 'solid factor'. So: a carbon atom is what it is, after microvita have entered the empty almost-atoms.

2.3 - *"Billions of microvita produce a single carbon atom.*"[53]

Again: "they *produce* a single atom" rather than "they *become* a single atom." This sentence seems to a imply a more active role by microvita.

One thing is clear: none of these three sentences from 'Microvitum in a nutshell' even hints at subatomic particles. Only empirical research will give clear answers to the above questions. Maybe a deep, intuitive approach will also contribute to their answers, but even then research needs to confirm, redirect or bring new answers.

8 - Media, sensations and perception

8.1 States of matter and transport media

When discussing matter, solid matter, so atoms, it looks at first sight as if it only has one perceivable form, while in reality at least three different states of matter (See Figure 12.) exist. These three are: gas, liquid and solid. Here 'matter' means 'atoms in bulk quantities'. All three have their own specific identity, characteristics and are subject to spacetime and can be heard, touched, seen, tasted and smelled.

Gas[54]	- is the subtle state of matter	- only light elements with few quarks - minimal chemical bonding[55]
liquid[56]	- is the dynamic state of matter	- molecules with moderate amounts of quarks - moderate chemical bonding
solid[57]	- is the crude state of matter	- elements with many quarks - optimal chemical bonding

In reality not three, but at least five states of matter exist. The first of the extra two is plasma, a gas with a sufficient amount of ionized atoms. Extremely high temperatures, like in the first 377,000 years aBB, separate in the then extreme density all electrons from nucleons. A fifth state of matter is the Bose-Einstein condensate, where atoms completely loose their identity and merge into one substratum. It is interesting to realize that both a hot plasma and the Bose-Einstein condensate, are systems in which the present crude, negative microvita will hibernate.

The three everyday states of matter exist in spacetime and can be perceived. In order to be perceived, mere existence does not suffice, also means of communication, a number of postmen, need to be available. Nature has provided two long-range means of transport: light and sound, one short-range mediator, touch, and two internal mediators, taste and smell.

Light is an electromagnetic wave and does not need a medium, except space, for transport. In a vacuum its speed is 300,000 km/sec, 3*10^8 m/sec. All other media do not increase, but lower the speed of light, e.g., in air its speed is ~ 0.03% lower than in a vacuum. The speed of light also depends on its wavelengths and the temperature of its environment on its path of traveling. At absolute 0ºK, its speed is 0 m/sec. The hindrance of solid matter, in bulk quantities, is such that light is mainly absorbed and reflected, without transmission, with for instance glass as an exception. (See Chapter 8.3.)

Sound, on the other hand, is a mechanical wave and does need a medium for transport. The higher the elasticity of the medium and the lower its density,[58] the higher the speed of sound. In air its speed is about 330m/sec; in water 1500m/sec and in steel 5000m/sec.

Relation between physical and philosophical approach							
Nr.	**wave-particle**	**elementary or composite?**	**amount of mass**	**state of matter**	**philosophical term**	**Bhu'ta (subtle) -initial amount-**	**Tanma'tra -reflected bit- = sensation**
1.	spacetime Higgs boson	elementary elementary	? Hb = 125 GeV/c2	(plasma in cosmology)	etherial	sound **akasha/vyoma**	sound **shabda**
2.	quark	elementary	top =171 GeV/c2 bottom = 4,2 GeV/c2 up = 2,4 MeV/c2 down = 4,8 MeV/c2	gas	aerial	touch **vayu/marut**	touch **sparsha**
3.	photon	elementary	0 eV/c2	NA	luminous	form and temperature **agni/tejas**	sight **ru'pa**
4.	lepton	elementary	0,51 MeV/c2	liquid	liquid	taste **apa/jala**	flavor **ra'sa**
5.	atom	composite	H = 938 MeV/c2 C12 = 11,8 MeV/c2 U238 = 222 GeV/c2	solid (BE condensate)	solid	**smell** **ks'iti**	odor **gandha**

Figure 12. (See Attachment A)

8.2 Elementary Particles[59] and Sensations

What is the relation between all five sensations, including the above two media, and the wave-particles as mentioned in Chapter 6.2 concerning the Standard Model of Cosmology?

1 **Spacetime** is the mother of all wave-particles, which could not exist without her. Since spacetime has no medium, sound-waves cannot arise in it, but it can transport them, provided the involved spaces are open and connected. (See Figure 12.)

2 The origin of a sound-wave lies with a mechanical impetus. This kinetic energy ultimately works on the mass of atoms that is mainly contained inside the **quarks** of their nuclei. Sound works

both as a long range and a short range sensation, depending on the intensity of the impetus and the density of the medium. All three everyday states of matter can be touched and felt.Touch is a complicated form of conception. Mind tells us that we touch the floor when we walk and touch the chair when we sit on it, while in reality those convictions are false concepts. All atoms are composed of nucleons with a cloud of electrons around them. Electrons have a negative electric charge and like charges repel. The more pressure is exerted, the bigger the force between the two objects, while the distance between the two does not decrease.

3 The sensation of form, color and temperature is transmitted by **photons**, the quanta of energy. All three everyday states of matter, and light itself, can be seen and, within limits, their temperature can be felt. The intensity, color and temperature of fire can be experienced. In principle gases can be seen; but in reality only some. Light can be reflected, absorbed and transmitted by the electrons and quarks of all three states of matter. In solid matter the atoms are so close to each other, and so tightly fixed in a grid, that photons cannot pass, but are partly reflected and partly absorbed. Even glass reflects light (in single glass, ~5%), absorbed (~10%) and transmitted (~85%). The reason why glass transmits so much light rather than reflects it, can be explained by quantum physics. If a photon touches an electron, it is absorbed but, and this is both exciting and mysterious, only if its incoming quantum of light fits exactly with the wavelength of the bound electron. Otherwise, a new photon will be sent out in return, on exactly the same wavelength as the previous one that entered.

4 How do the various flavors arise in the mouth? Subtle chemicals are dissolved by the saliva that is slightly alkaline.[60] [61] The reduced chemicals spread in the mouth and connect to the 10,000 taste buds, each with 100-200 cells. This procedure results in the different basic flavors and their many combinations.Boys of about ten years of age like to do experiments. I wanted to know what was the taste of electricity in a 4.5 Volt battery. So I put my tongue between the two copper strips. I still remember, apart from the tingling sensation, a sour and bitter taste. For me it is clear that for flavor, the liquid state of matter is involved and with it, **electrons** are the media.

5 The sensations of odors and flavor are closely connected. The word ‘olfaction’ refers to that connection. Smell is carried by the mass of **nucleons** but, different from touch, only atoms and molecules with small amounts of mass are involved. Substances that easily take over to the gaseous state of matter, called volatile elements,[62] are included. Elements like iron, that are heavy and integrated in a tense grid of atoms are nonvolatile, cannot be taken by an airflow and cannot be smelt. Like sound, odors are transported on large scale flows of air molecules. However, these mechanical movements are longitudinal, rather than vibrational waves. Odorous molecules hit the olfactory epithelium. The skin of that epithelium is covered with mucus, that helps to dissolve the incoming odorants. The odorants then attach to hair-like structures, called cilia, on the knob-shaped tips of neurons. This movement causes an electric impulse (**photons**) between the **electrons** of the incoming molecules and the electrons of the cilia, which is transported through the cilia towards the axon of the neuron.

According to biophysicist Luca Turin[63], the vibrational frequency at quantum level of odorants play a significant role in the recognition by the receptors. This is not only because it does more justice to the vibrational nature of atoms and molecules, but also explains why two atoms of the same element, of which one with too many or too few neutrons -an isotope-, smell differently.

8.3 Perception

Five different media of information are present in the universe, to inform organisms about objects and other organisms that are near or distant. The universe is a continuously changing phenomenon, which does not mean that everything changes. Locations, combinations and quantities of objects do change. The nature of elementary particles, whether they are bound or unbound, does not

alter, what does alter is the amount of intrinsic and kinetic energy, as well as their location. These five elementary particles also function directly or indirectly as media to deliver information to conscious observers. Clinical tests have shown that the minimal quantities of those media can be very small. In 1979, Baylor, Lamb and Yau showed that the rods in the retina of toads responded to single photons.

A sense may be capable of absorbing and interpreting small amounts of information, yet its capacity to receive is limited. Sound waves can only be heard between 20 and 20.000 Hz. Touch is a subtle and complicated sense, but also has limitations. Light can be seen between 390 and 700 nm wavelength. Four basics tastes[64] are more or less accepted: sweet, sour, salty and bitter. Other tastes are controversial: umami, pungent, mouth feel, carbon dioxide, minty and fresh. Ayurveda recognizes 6 tastes: sweet, sour, salty, bitter, pungent and astringent. The human nose can smell at least a trillion scents[65] but most people only recognize 100-200. Seven basic scents are recognized: musky, putrid, pungent, camphor, ethereal, floral and peppermint. Smell and scent are closely connected.

This knowledge may be impressive for the sake of knowledge and in some situations even essential, but in practical life a sense of perception is created with bulk amounts of involved particles. In situations that are fit for life, those particles are available in huge quantities. The philosophical name for those quantities is *Bhu'ta*, literally meaning 'created object', 'created' or 'past'. However, when we observe something, whether it is a musical instrument, a rose, a glass of water or the night sky, we don't receive the directly involved particles, but their reflections on cruder *Bhu'tas*. (See Figure 12. and Attachment B.)

A common man would ask now: "What could possibly be the reflection of a *Bhu'ta* on a cruder *Bhu'ta*?" For sound and form, the general accepted mechanical explanation seems appropriate and without conflict with this philosophical approach. Light waves in huge quantities, *Bhut'as*, touch many electrons of an object (cruder *Bhu'tas)* and are reflected from it in such a way that they affect the sense organ of an observer. The philosophical approach of smell seems to be in conflict with physical research, because researchers explained the particular molecules as their direct cause.

The situation changes when the earlier mentioned approach of Luca Turin is applied and even more when the presence of microvita will be included. The vibrational frequency at quantum level still is a mechanical interpretation and does not include the reflection of *Bhu'tas*. Atoms and molecules not only contain elementary particles of energy, but also[66] at least crude, negative microvita. When these microvita conclude that something like smell is beneficial for the survival and reproduction of e.g. the plants they are part of, they may choose for a particular expression. In turn, this expression causes a change in the vibrational frequency at quantum level in the molecules. One consequence is that the internal level of energy will be influenced. Those influenced molecules are integrated into their gaseous surroundings and will make contact with other present molecules in the air. This will result in absorption of the smell characteristics of the influenced molecules by the air molecules.The waves of these reflected molecules, *Tanma'tras*, will enter the nose and be recognized by the smell organs. Compared to the bulk amount of smell *Bhu'ta*, the number of molecules inside need only be microscopic.

This interpretation deserves a much more focused investigation. Microvita not only include consciousness, but also a certain amount of subtle energy, (See Figures 3. and 4.) which is energy with a longer wavelength than, for instance, elementary particles. Microvita, as well as elementary particles, are also waves, which means that they will superimpose and interfere. The two wave patterns will meet and be in constructive, destructive or intermediate interference. Both forms of interference can be in phase, in an extreme level of 180º out of phase or somewhere in between, e.g. 10º out of phase.[67] The two pulses will form an algebraic sum of the displacement of the individual waves.

Two or more waves can have a random impulse for interference, but if microvita and matter (which, by the way, also contains microvita) meet, it is unlikely that random superposition will be initiated. It makes much more sense to suppose that these units of consciousness will play with such a situation and manipulate like a bird manipulates the movement of its body, high in the sky. Not like a boy or girl, moving a toy airplane with the joystick of a computer, but integrated. This looks the beginning of a new kind of intuitive, rational and empirical research.

The matters brought forward so far, only concern the first part of perception: the reflection from external objects to observers. Observation, interpretation, memory and recognition belong to the internal part of perception. Also this part has two components, a material, and a subtle procedure.

8.4 Internal part of perception and meaning

PERCEPTION occurs in principle in relation to events in three cohesive spaces. The first space is connected with exteroception, which is perception of relatively and really distant space outside the body. The next, much smaller space is connected with proprioception, perception of orientation and movement of the body in its direct environment. Stance, perception of the body in its near environment, requires an additional tool that is located in the inner ear. Interoception is the perception of signals inside the body itself and includes thirst, hunger, breath, defecation and muscle awareness.

As long as we are conscious, perception and interpretation are connected. For instance, ‘pain’ is not a perception, but a concept, a signal of the mind, in which microvita are involved. Objective information and subjective interpretation are intertwined. Take one example, seeing a form. Photons are reflected by cruder objects, atoms. These reflected waves touch our eyes, recreate new waves in our brain and we see ‘something’ or we could say that the reflected and the internal waves become united. Fortunately, atoms also contain microvita that create sub-waves on the luminous *bhuta*. These reflections touch our ecto- and endoplasm, made up of subtle microvita, and the form that we see, gets meaning: ”Oh, what beautiful red birds! But parrots are not part of our local environment, how did they get here?“

Another example, hearing. Electromagnetic waves reflect against objects, molecules of air with their internal heavy quarks, after which longitudinal waves are produced. Our ears receive the chaos of sound waves and translate them into new waves that our brains understand. We become aware of sound and, by the presence of microvita, know: ”It is a piano with a quick and subtle melody that I hear now. It makes me relaxed and mellow.” Objective information is complemented by a subjective interpretation, as an answer to the ‘hard problem of consciousness’ that David Chalmers hinted at.[68]

9. Concluding thoughts

ACCORDING to this line of thought, atoms are the climax of the first phase of evolution and that characteristic moment can be found at the very nadir of the Wheel of Creation.[69] [70] That moment is also the beginning of the second phase of evolution, otherwise the two phases would be disconnected or at least interrupted. Evolution is a continuous flow, which means that the end of one phase has to be the very start of the next phase.[71]

Atoms may not be called living objects or the start of life, but if they are its ultimate basis, they can be called the *very* start of life, or the *very* start of the animated phase. In that case, this phase must be the very first connection with microvita, the carriers of life, or the matrix, as Dr Uttam Pati[72]

calls them. As it was shown before, microvita entered the Wheel of Creation immediately after the Planck Epoch, at the moment of Bifurcation. But all they did was hibernate until the moment of recombination, after which the crude negative microvita woke up and acted. (see Figure 13.) So atoms are indeed the culmination of the first phase of evolution, the very end of the inanimate phase and the very start of the animated phase.

As it was indicated before, extremely high temperatures are only one situation in which microvita hibernate; they also have to face contact with frost until 0ºK. At this temperature they, and the atoms they are part of, completely hibernate and lose their identity in the Bose-Einstein condensate.

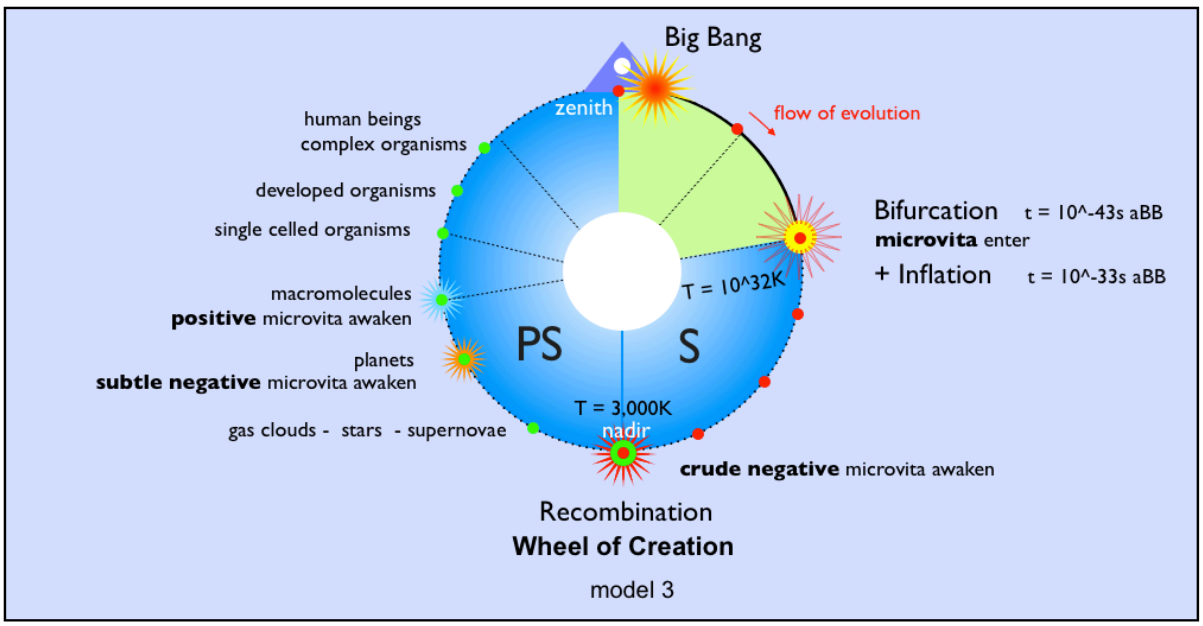

Figure 13.

Crude negative microvita are the least sensitive for extreme temperatures. Subtle negative microvita are more sensitive for temperature and their extremes lie between 4ºC (39.2F) and 57ºC (44.6F). The most sensitive for temperature are positive microvita. Their temperature horizon lies between 35ºC (95F) and 53ºC (127,4F). When organisms meet temperatures beyond the given numbers, death, disease, hibernation or at least stagnation will result, unless precautions have been taken.

How do microvita form atoms, what is the composition of mind and matter, what binds the two, how did mind evolve from matter, what are the characteristics and forms of a simple and complex mind, where lies the transition between chemical and organic structures? Legitimate questions, that ask for a separate explanation and, most of all, empirical research. How does perception occur, if and when microvita are included?

Attachment A

Cosmology at a glance

0 - **Planck epoch** t = 10^-43 s ABB
Ti= ≤ ∞ -Tf = 10^32K

The four forces are presumed to be united; the laws of physics don't apply. This epoch is beyond our event horizon.

1 - **Grand unification epoch** (start of radiation era) t = 10^-43 --- t = 10^-27s aBB

Electroweak epoch t = 10^-35 --- t = 10^-12s aBB

The Higgs field emerged, causing mass to later particles.

The universe consisted of energy in the form of **photons,** be it that they are part of a plasma and only exist as theoretical units.

- *Inflationary epoch* t = 10^-33s (?) t = 10^-32s aBB
Tf = 10^27K

The universe expanded with a speed many times the speed of light.

2 - **Quark-antiquark** epoch t = 10^-32- t = 10^-6s aBB

Quarks and **antiquarks** pairs annihilated each other almost completely, while new ones emerged. Just one in every billion (10^9) **quarks** remained (baryogenesis).

- *Hadron epoch* (= particles, composed of quarks) t = 10^-6 -- t = 1 s aBB
Tf = ≤ 10^13K

- Quarks united to form separate protons and neutrons (baryons) with specific identity.

3 - **Lepton epoch** t = 1 -- t = 10s aBB Ti = ≤ 10^13K

The density and temperature of the universe had become too low for the emergence of new hadrons. Leptons (particles with little mass, like electrons) and anti-lepton pairs were being created, that annihilated each other, but leaving a small surplus of leptons. After reaching t = 10 sec aBB this process stopped and **six varieties of leptons** remained. Photons formed the bulk of energy in the universe, but still without identity.

- *Neutrino decoupling* Tf = 10^9K

4 - **Photon epoch** t = 10s aBB --- recombination
Ti = 10^9K

In the plasma of protons, neutrons, electrons and co-photons, photons interacted with all, but could not separate from them. Photons did exist in the plasma, yet without specific identity.

- Nucleosynthesis t = 3 mins --- t = 20 min aBB
Ti = 10^6

Here protons and neutrons fused, to form the first and simple atomic nuclei. Tf = 3,740K

At the end of this epoch **photons** decoupled from matter and escaped into space, finally with identity.

5 - **Recombination** t = 377,000 yrs. aBB Ti = 3,740K
Tf = 3,100K

After the departure of photons, the existing nucleons were able to unite with electrons to form the very first simple but complete **atoms**, yet with specific identity: Hydrogen ^{1}H and ^{2}H (in mass 75%), Helium ^{4}He (in mass 24%) and traces of Beryllium, Lithium and Boron.

^{4}Helium has four times the mass of ^{1}H, so the number of Hydrogen atoms in the universe is about 92% and Helium 7%.

Ti = initial Temperature of the Epoch
Tf = final Temperature of the Epoch
aBB = after Big Bang

References

http://hyperphysics.phy-astr.gsu.edu/hbase/astro/planck.html#c6 : Retr. 8 Jan. 2015
http://historyoftheuniverse.com/index.php?p=leptonEpoch.htm : Retr. 8 Jan. 2015
http://pages.uoregon.edu/jimbrau/astr123/Notes/Chapter27.html : Retr. 8 Jan. 2015
http://www.astro.cornell.edu/academics/courses/astro201/primordnuc.htm : Retr. 12 Jan. 2015

Attachment B

About waves

Formula 1. $f = v / \lambda$ $E = h*f$

f = frequency in Hz
v = velocity in m/s
λ = wave length in m; $\lambda = v / f$

Formula 2. $E = h*f$

E = energy in J.s
h = Planck constant = 6.626*10^-34
f = frequency in Hz

$E = h*f$ So, if 'f'is taken from formula 1,
$E = h*v / \lambda$

List A

1.10 λ of an electron = 0,364*10^-9 m (c5)
Velocity = 2.2*10^6 m/s
Frequency = 6.04*10^3

1.20 - λ of low sound in air = 340 : 20 = 17 m (c2)
Frequency = 20 Hz;
Velocity = 340m/s

1.30 - λ of high sound in air = 340,000 : 20,000 = = 1.7*10^-2 m (c3)
Frequency = 20,000 Hz

1.40 - λ of a light wave ~500 nm = 5*10^-7m (c4)
Velocity = 3*10^8 m/s

1.50 - λ of Extreme Low Frequency (ELF) radio waves = ≤ 10^8 m (c1)
Velocity = speed of light

List B

1.51 - E of an Extreme Low Frequency (ELF) radio wave
= 6.626*10^-34 x 3*10^8/ 10^8 = 1.99*10^-34 J.s (c1)

1.21 - E of low sound = 6.626*10^-34 x 3*10^8/ 17 = 1.17*10^-26 J.s (c2)

1.31 - E of high sound = 6.626*10^-34 x 3*10^8/ 17*10^3 = 1.17*10^-23 J.s (c3)

1.41 - E of a light wave = 6.626*10^-34 x 3*10^8/ 5*10^-7 = 4.00*10^-19 J.s (c4)

1.11 - E of an electron = 6.626*10^-34 x 2.2*10^6/0,364*10^-9= 4.00*10^-18 J.s (c5)

List C

If the outcome of the separate media in List A is multiplied by the outcome of list B (wavelength multiplied by energy level) the following order appears:

1) - ELF ~ 1*10^-44 extreme low amounts of energy, in extreme slow order (c1)
2) low sound ~ 2*10^-25 low amounts of energy, in slow order (c2)
3) high sound ~ 2*10^-25 low amounts of energy, in slow order (c3)
4) light wave ~ 2*10^-25 higher amounts of energy, in slow order, (c4)
a bit subtler than electron
5) electron ~ 4*10^-10 crudest element in this table (c5)
(c5 = is the highest level of crudity; c1 is the lowest)

- Radio waves contain such low amounts of energy, that moreover arise in such long intervals of time, that they will not interact with the waves of electrons and nucleons.
- The amount of energy involved in high sound is 100 million (10^8) times more than in ELF waves.
High sound will, and does, interact with the mass of construction materials.
- The amount of energy that is involved in low sound is 100 billion (10^11) times more than in ELF waves. Sound will interact with the mass of atoms, low sound less easy than high sound. This means that low sounds are more difficult to isolate by interior walls than high sounds. This is reality conform.
More waves will create more constructive interference and consequently more energy.
- The wavelength of visible light is a bit longer, and the amount of energy involved about 10 times as high, than the waves of an electron. Interaction with mass and matter will be more intensive than sound. More light energy will be reflected and absorbed, and much less will be transmitted than by sound waves. Also this corresponds to reality.
- This explanation still is rather mechanical and needs a deeper approach.

Notes and references

1. Vincent Icke, 2014. *"Zwaartekracht bestaat niet - Gravity does not exist."* Amsterdam: Amsterdam University Press B.V.
2. Ac. Ratnesh Ph.D., 1988. *"Microvita-Cosmic seeds of life."* Mainz: Dharma Verlag.
3. Astrophysics may be connected to cosmology, yet it is a separate field of research. Cosmology specifically researches the study of the origin, evolution and eventual end of the universe.
4. Michael B. Towsey, 1986. *"Eternal dance of Macrocosm."*. Copenhagen: Proutist Publications.
5. This is Latin for: "creation out of nothing. It is in contrast with the statement of Parmenides and later from Lucretius "nihil fit ex nihilio": nothing comes from nothing, but also with "Creatio ex Deo": creation out of the very nature of God.
6. Cosmology is the science that explores and describes the overall structure and evolution of the universe.
7. Such assumptions are accepted without a guarantee that proper information is being used, or will ever be discovered.
8. Hameroff and Penrose collaborated for a number of years in formulating the Orchestrated Objective reduction (Orch-OR) model of consciousness.
9. The underlying, most basic material.
10. In this essay a number of sanskrit words will repeatedly be used. The ideas expressed in this essay are based upon Indian philosophy and unfortunately many sanskrit terms lack English equivalents.
11. These will be explained in Chapter 4.
12. <http://www.mathsisfun.com/definitions/mass.html> Retr. 14 jan. 2015.
13. <http://hyperphysics.phy-astr.gsu.edu/hbase/mass.html> Retr. 14 jan 2015.
14. <http://www.infoplease.com/encyclopedia/science/mass-physics.html"> Retr. 14 jan. 2015.
15. P.R. Sarkar, 1987. *"Microvita in a nutshell"* - Chapter 1, Microvitum, the Mysterious Emanation of Cosmic Factor. (The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009).
16. *"Billions of microvita produce a single carbon atom"* translated into 10^10, as an indication. P.R. Sarkar "Microvitum in a nutshell" - Chapter 4, The Neo-Ethics of Multi-Lateral Salvation (The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009).
17. US National Library of Medicine - National Institutes of Health.E. Bianconi ea. An estimation of the number of cells of the human body. see<http://www.ncbi.nlm.nih.gov/pubmed/23829164>Retr.:2013, Oct 12
18. American Association of Anatomists, How many organs (no matter how minor it is) does a human being have? And what are they? see <http://www.anatomy.org/content/how-many-organs-no-matter-how-minor-it-is-does-human-beings-have-and-what-are-they>Retr.: 2013, Oct 12.
19. Science daily. Humans Have Ten Times More Bacteria Than Human Cells: How Do Microbial Communities Affect Human Health? see <http://www.sciencedaily.com/releases2008/06/080603085914.htm>Retr.: 2013, Oct 17.
20. In the past I distinguished between microvita without spin (neutral microvita), with negative spin (negative spin) and microvita with positive spin (positive microvita). Subatomic particles have orbital angular momentum and spin. To find the spin of atoms, we first have to add all the orbital and spin angular momentum of all protons and neutrons to obtain nuclear spin. After the same has been done for nucleus and electrons, Atomic Spin results. This means that atomic and even molecular spin depends on all involved particles. If microvita also have spin, and billions are included in an atom, they obviously do not influence the net overall spin. So two possibilities exist, either neutral microvita have no angular momentum or they do. If they have no angular momentum there is no need for them, provided they don't have a substratum that differs from negative and positive microvita. But all microvita have one and the same substratum, conscious ness, which is why the presence of neutral microvita will not answer specific questions. If neural microvita do have angular momentum and spin, just like the other denominations, they don't make a difference too. Moreover microvita don't have mass, so they also don't have angular momentum. This could mean that such spin adds something additional to already present spin. If all microvita have no angular momentum and spin, they follow the present atomic angular momentum and spin and still get spin.
21. H.J. Rudolph, 2012.*"From Imaginary Oxymora to real Polarities and Return*." Bloomington: AuthorHouse.
22. P.R. Sarkar, 1987. -*"Microvita in a nutshell"* - Chapter 9-B-Questions and answers (The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009).
23. Matter knows five stadia, plasma, gaseous, liquid, solid and Bose-Einstein condensate. The first state is a

high energy state in which all electrons are or added on or ripped off the nucleons (in cosmology). The last state is an extremely low energy at zero K, in which all particles lose their identity.

24. 75% of all atoms in the universe is Hydrogen and 23% is Helium. All other atoms, from Lithium till Uranium, share the remaining 2%.
<http://hyperphysics.phy-astr.gsu.edu/hbase/astro/hydhel.html> Retr. : 12 Jan. 2015
25. <http://www.volkskrant.nl/wetenschap/reuzenvirus-overleeft-30-millennia-in-permafrost~a3606772/>
Retr.: 23 jan. 2015.
26. All four quotes are from the following complete references:
1 - "Truly speaking, any molecule, atom, electron or proton which is taken to be the fundamental stuff of this world, are but the manifestations of energy, for matter is nothing but bottled-up energy."
- Supreme Benevolence and Mundane Pleasure (Shreya and Preya) 1956
2 - "The fundamental essence of matter may be called by any name - molecule or atom, but the basic cause of matter is nothing but energy, matter is nothing but bottled-up energy." Matter and Spirit 1956
3 - "First, what is matter? Matter is bottled-up energy. And, what is mind? Mind is when matter gets powdered down, then it is mind." Making the Man Universal 1979
4 - "Some intellectuals are of the opinion that matter is bottled-up energy. No, matter is not bottled-up energy. The characteristics and different wonts and specialties of energy are quite different from those of matter. The mass of matter has got nothing to do with energy."
"So matter is not bottled-up energy."
"So matter is not bottled-up energy - it is "known I" Matter and abstract 1989
(The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009).
27. P.R. Sarkar. 1987- *"Microvita in a nutshell"* - Chapter 1, Microvitum, the Mysterious Emanation of Cosmic Factor. (The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009*).*
28. *"The mass of matter has got nothing to do with energy."*
"So matter is not bottled-up energy - it is "known-I" Matter and abstract1989
(The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009).
29. Entropy is the process of increasing chaos. Syntropy is the opposite.
30. *"The further development of a conscious, organic model of the universe clearly requires the cooperative efforts of biologists and physicists, as well as other scientists, not to mention philosophers and spiritual leaders in a great co-creative process."* Elisabeth Sahtouris.2000. "Earth dance-living systems in evolution"
31. Literally: "Circle of Brahma" This is the first appearance of Sanskrit words and many more will follow. Indian philosophy, represented by P.R. Sarakar, offers a realistic chance to unite the spiritual and the scientific approach and because of that potential has been applied in this ess*ay.*
32. see: <http://www.anandamarga.org/articles/brahmacakra.htm> Retr.: 19 Jan. 2015.
33. An explanation of this triangle goes beyond the intention of this essay.
34. *"This vast Citta, which we call universe"*- P.R. Sarkar. 1959, "Subhasita Samgraha, part 4" -Vibration, Form and Colour- (The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009)
35. *"The very start of the animated stage is the beginning process of pratisaincara. The crudest solid is the final stage of saincara." P.R. Sarkar. 1959. "Idea and Ideology" -Bhu'tatattva, Tanma'tratattva, Indriyatattva- (The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009).*
36. *Ibid.*
37. John A. Macken. 2001 (?). *"The universe is only spacetime"* <Only spacetime.com.> Retr.: 11 jan 2015.
38. *'5 FF' meaning 'five fundamental factors'. See Chapter "Fundamental particles and microvita".*
39. This refers to the unmanifested universe where the three binding principles, the subtle (sattva), the dynamic (rajah) and the static (tamah) are disconnected.
40. *Ibid. "Prakrti has a tremendous force" "At this stage the flow of expression must therefore, be in a straight line, because the sentient-dominated force itself must be a straight line."*
41. P.R. Sarkar. 1959. "Idea and Ideology" -The creation of the universe-
(The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009).
42. Ibid. *"Here Purus'a has become the universe of creation and therefore Purus'a is called Bhava."*
43. Ibid.
-The Macrocosm and the Microcosm,1959-, -*Tantra and its effect on society,*1959- and -*Macropsychic conation,1971-*
44. *"The greater the energy, the larger the frequency and the shorter (smaller) the wavelength. Given the relationship between wavelength and frequency - the higher the frequency, the shorter the wavelength — it follows that short wavelengths are more energetic than long wavelengths."*
<http://hubblesite.org/reference_desk/faq/answer.php.id=73&cat=light> Retr. 22 Jan. 2015
45. *"Microvita come from outer space"* P.R. Sarkar"Microvita in a nutshell" - Chapter 20.(The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009*).*
46. What is meant here: Hilbert space, which is Euclidian space, or Minkowski space, in which both space and

time are included?
47. P.R. Sarkar, 1990. *"Microvitum in a nutshell"* - Microvita and cosmology- (The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009).
48. P.R. Sarkar, 1993. "Discourses on Tantra, Volume 1." Calcutta: A.M.P.S. (Central). p16.
49. < http://math.ucr.edu/home/baez/physics/ParticleAndNuclear/photon_mass.html> Retr. : 11 jan 2015.
50. Michael B. Towsey, 1986. *"Eternal dance of Macrocosm"*. Copenhagen: Proutist Publications.
51. P.R. Sarkar. 1987. *"Microvitum in a nutshell"* -The Theory of Microvita and its Possible Effects on Society- excerpt A- (The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009).
52. Ibid. The Neo-Ethics of Multi-Lateral Salvation.
53. Ibid.
54. A cloud in the sky and steam are not gases, but little drops of H2O so, molecules of water.
    In a gas the atoms or molecules are surrounded by empty space and can move freely. Light perceives some hindrance and accordingly move slower, but is able to pass.
55. Chemical bonding is interaction of electrons from 'separate' atoms.
56. In a liquid the molecules have enough intermolecular space to move.
57. In solid matter the atoms are very close to each other and so tightly fixed in a grid, that photons -with few exceptions- cannot pass.
58. In a medium with lower density in which atoms are closer to each other.
59. <http://math.ucr.edu/home/baez/physics/Quantum/see_a_photon.html> retr.: 26 Jan. 2015.
60. <http://www.innerbody.com/image/nerv12.html> Retr.: 25 Jan. 2015.
61. *A base is a molecule or an ion, which has free electrons and because of that is able to form a chemical bond with an acid.*
62. <http://health.howstuffworks.com/mental-health/human-nature/perception/smell1.htm> Retr.: 25 Jan. 2015.
63. <http://www.sjsu.edu/faculty/watkins/turin.htm> Retr.: 30 Jan 2015.
64. <http://www.eattasteheal.com/ETH_6tastes.htm> Retr.: 25 Jan. 2015.
65. <http://www.nature.com/news/human-nose-can-detect-1-trillion-odours-1.14904> Retr.: 26 Jan. 2015.
66. depending on the size and complexity of the molecules concerned.
67. <www.physiv=csclassroom.com/Class/waves/u1013c.cfm> Retr.: 28 Jan. 2015.
68. David Chalmers. 2006. *"The Character of Consciousness"*. New York: Oxford University Press.
69. *"The crudest stage is ksititattva, where consciousness exists as an inanimate object."*
    P.R. Sarkar. 1959. "Idea and Ideology" -Bhu'tatattva, Tanma'tratattva, Indriyatattva- (The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009).
70. *"As it has all the five tanma'tras, ksititattva is the crudest form - an inanimate object."*
    P.R. Sarkar. 1959. "Ananda Marga -Elementary philosophy-" (The electronic edition of the works of P.R. Sarkar, A.M.P.S. (Central) EE7.5, 2009).
71. *"The **very** start of the animated stage is the beginning of the process of Pratisaincara. The crudest solid is the final stage of Saincara."*
    Ibid.
72. Uttam Pati. 2014.-*"Microvita as matrix"* -Speaking Tree- Delhi: Times of India, July 27