

## How physics could explain the mind

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**Abstract:** This discussion shows how the science culture of physics—and theoretical physics in particular—has elated itself to mind and “nonphysical” phenomena. A perception of mind based on experiences from psychology and meditation is explained. After a presentation of some of its important features, string theory is proposed as a way to model matter particles of the perceived mind and how the existence of such “nonphysical” matter could help solve outstanding problems within physics. The analysis shows how the measurements of dark matter and dark energy could be an experimental confirmation of the string theory. © 2013 *Physics Essays Publication*.

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**Résumé:** Cette discussion démontre à quel point la culture scientifique de la physique et de la physique théorique peut être liée particulièrement à l’esprit et aux phénomènes “nonphysiques.” Une perception de l’esprit fondée sur des expériences de psychologie et de méditation est expliquée. Suite à une présentation de quelques-unes des plus importantes caractéristiques de la théorie des cordes, on propose une explication quant à la façon dont la théorie des cordes pourrait se modeler sur les particules de matière de la perception de l’esprit, et comment l’existence d’une telle matière “nonphysique” peut contribuer à résoudre des problèmes en suspens de la physique. L’analyse démontre comment les mesures de matière sombre et d’énergie noire pourraient s’avérer une confirmation expérimentale de la théorie des cordes.

Key words: String Theory; Dark Matter; Dark Energy; Nonphysical; Mind; Memory; Introspection; Consciousness.

### I. INTRODUCTION

Science has evolved from a mixture of religion, philosophy, folkloristic culture, and magical thinking. Discovery of nonEuclidian geometry in 1854 initiated a discussion among both scientists and lay persons as to whether extra dimensions existed as an explanation of nonphysical and spiritual phenomena. In 1877, this discussion was settled and our science-based understanding of the world was, from then on, virtually cleansed of everything that is not measured by physical instruments. The incident leading to this is explained by Paul Halpern (Ref. 1, p. 44):

“The public perception of a link between higher dimensions and mysticism was cemented in 1877 when the German physicist Johann Zöllner defended American medium Henry Slade against accusations of fraud during a sensational trial in London. Slade, who drew attention to himself by conducting séances with prominent Londoners, was charged with “using subtle crafts and devices, by palmistry and otherwise,” to deceive his followers. Zöllner called for a thorough scientific inquiry into Slade’s abilities.

Under the watchful eyes of Zöllner and several other witnesses, Slade performed a number of seemingly impossible tricks. He linked solid wood rings together, transported objects out of sealed containers, removed the knot from a tied rope whose ends were attached together, and produced written messages on paper trapped between solid slabs of

slate. Zöllner was mesmerized by these feats, concluding that the only possible explanation was that Slade had found a way to move things through a dimension other than length, width, and height.

As if announcing a revolutionary scientific discovery, Zöllner enthusiastically reported his conclusions to the public. In his mind, he had discovered the portal to a whole new world. Even after sceptics pointed out that any good magician could replicate Slade’s tricks, Zöllner wrote assuredly in several scholarly works that higher dimensions were real. Consequently, as the American architect Claude Bragdon wrote, “Zöllner’s name became a word of scorn, and the fourth dimension a synonym of what is fatuous and false.”

From that point on, those interested in the scientific possibility of a realm beyond the ordinary dimensions often felt compelled to emphasize that their views had nothing to do with mysticism. Yet for every serious scientist or mathematician laying down his arguments, dozens of occultists would invoke the fourth dimension to justify their beliefs. The expression “another dimension” became tantamount to the world of the spirits, a connotation that remains today.”

Even if Henry Slade deceived his audience, this incident does not imply that extra dimensions and nonphysical phenomena do not exist. In any case, mainstream scientists seem to have withdrawn from the field, leaving it to nonscientific claims from occultists and other representatives from religions, spiritual societies, and New Age. Serious research on this topic since then has been difficult because of negative reactions from fellow scientists.<sup>2</sup>

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Science has taken a long step further since 1877. Physics has established relativity, quantum mechanics, and the standard model of particle physics and has proposed string theory. The mind is understood much better through the establishment of psychology at the end of the 1800s (Refs. 3–5) and lately from research on meditation.<sup>6,7</sup> Most theoretical physicists now talk of an imminent crisis in understanding the world because so many measurements cannot be understood and included in the accepted models of physics.

This article endeavors to lead our attention back to where physicists left the discussion of extra dimensions and spirituality and to show that string theory, with its extra dimensions, could have a potential to include nonphysical/mental and maybe spiritual phenomena in mainstream physics and also to solve the imminent crisis in theoretical physics. If physicists want to research the physics of the mind, then they would have to leave some established ways of thinking, which are regarded as so obvious that they are not scrutinized, and move into a field that is very muddy and difficult to navigate because its proximity to occultism and charlatanry, such as mentioned by Halpern. They would also need a good understanding of the mind, comparable to what is found amongst psychotherapists and experienced meditators.

We have no deep, generally accepted understanding of the mind to lean on. This article relies on an understanding of the mind that has been established partly through psychology, partly through the ACEM<sup>8</sup> school of meditation and partly by the author. One tool for conducting research on the mind is called introspection.

Shut your eyes and observe inside. Observe how you direct your attention; how thoughts, memories, images, and emotions come and go. Some thoughts are strong and disturbing; some are faint and difficult to catch. There is a difference between the spontaneous activity of the mind and the volitional activity of the mind. Spontaneous activity is everything that comes to our minds, such as memories, thoughts and impressions from the senses. This activity comes all by itself. We can choose, by free will, to direct our attention to different content. We can choose to concentrate on certain content, so that other thoughts are kept out, or we can choose to widen our attention and become aware of more content at the same time. Most importantly, we can decide on what action to take.

Most of what we say and do is a volitional selection from a limited number of alternatives. A recent article<sup>9</sup> written by Mason *et al.* is regarded by many psychologists as a breakthrough in understanding the mind. It shows how the mind does not become still or empty when it is idle, but that the attention starts wandering. The mind has a lot of stored memories or psychological residues. When we do not control our attention, it is attracted to these various residues. Thoughts, images, and emotions, etc., from these residues are poured into our conscious awareness.

We can look at these psychological residues as complex entities that are stored in an inner space. They might be freely available for our attention or buried/hidden, partly or completely. These entities are emotionally charged and can attract our attention with different strengths. They contain various

psychological contents, such as specific images, thoughts, self images, emotions, and world views; these come into our awareness or unwittingly influence us more strongly when the attention gets close. The distance in this inner room could be called “emotional distance.” Emotionally connected memories/residues are close. The minds of our friends and beloved ones are also close to us. Therefore, we have an inner room that can be measured in emotional distance, with content called psychological residues and a force called emotional attraction that can act on the content. We can observe in this room by directing our attention, just as we do in the physical universe.

The author’s entry into the study of the physics of the mind came about through introspection. Inner phenomena seem to exist in a room different from the physical universe, as explained above. In this room, we also find the source of dreams. According to Freud,<sup>10</sup> dreams are connected to the psychological residues and express themselves through a mythical language. A separate part of the mind seems to be associated with this obscure emotional room. It has a kind of magico-metaphysical frame of understanding that differs from the rational frame of understanding associated with the physical universe. Our way of seeing in this inner room is more diffuse than it is with our normal day vision. Our mental capacity of seeing normally uses the eyes, but also seems to function when the eyes are shut. Dreams have a lot of imagery and some people get an abundance of visual impressions when the eyes are shut. The mental capacity of seeing has two different modes of operation that are supported in the eyes. Day vision is associated with the dots of the retina and the focal sight, while night vision is associated with the rods of the retina and peripheral vision. Only night vision can see into the inner room and you must look slightly beside the object of interest and broaden your vision to see it, exactly as you would do in the dark. If you focus to see something in this inner room, you just lose it. When dreaming, our attention is completely embedded in this inner room.

A second inner room could also exist, where the mind is very still and the sense of time is not present, or is at least different. You can come into contact with this in precious moments, such as when you are in front of a fireplace or hiking in the mountains. Thoughts in this room are nonphenomenological; they can contain a “fragrance” of all sorts of things without being specific. These nonphenomenological thoughts are like quantum probability waves before collapsing. They contain a complex whole, but nothing specific. The part of the mind that is attached to this room has a frame of understanding that we could call intuitive. After grasping an intuitive thought, you can use days, weeks or months to shape it into a specific theory, piece of art, product or way of behavior. Just as for quantum probability waves, we can say that an intuitive thought collapses into a specific incarnation in time and space. For another person at another time, the same thought could collapse into something very different, but it would express the same basic quality or insight when related to its time and place.

The intuitive room actually seems to be a quantum mechanical space where items do not change with time such as in the other inner room and in the physical universe

where emotions, thoughts and the vibrations of physical particles do change with time. Quantum mechanical items have a distribution of probabilities that change much more slowly, if at all. A sense of distance in this room could be perceived as a kind of quality difference, a character difference or a difference in characteristics. For human relationships, this distance could be perceived as what is often referred to as good or bad chemistry between persons. You feel close to a person with good chemistry, independent of emotional closeness and physical closeness. When in deep sleep, the mind is totally embedded in this intuitional room.

These two inner rooms, which we could call the “emotional room” and the “intuitional room,” seem to be persistent and real for our attention, just as the outer physical world is persistent and real. We shall also see later that the inner rooms can be based on real matter and particles, modeled by string theory. The laws of physics in the inner rooms are different from those in the outer room. The particles are not physical like those in the outer room and the stuff is psychological residues containing thoughts, emotions, images and values, rather than physical objects.

A mind phenomenon quite different from these three frames of understanding and their associated rooms and part-minds is the perceived speed of time, which can vary substantially. For children, the days are long and lasting. For older persons, the time slips by with a much higher speed. The first time people meditate after learning Acem meditation, they usually experience that the meditation time has leapt past with surprising rapidity. During long retreats, some experience that time can pass very fast, even if they are awake and present all the time. In Eastern cultures, this is a well known phenomenon called samadhi. Some people can also experience a kind of slow motion (time is going slowly) during extreme concentration. This can happen during sudden danger, such as for soldiers during an assault, or for people who have trained their concentration beyond what is normal. The speed of time, as well as the time itself, is regarded as a phenomenon of the mind.

If you observe who is the observer, decision maker, and actor—who is really you—then none of the observed objects are part of your identity. Your physical body, your memories and emotions, and your intuitions are something you have; perhaps you feel they are a part of yourself, but they are not part of your identity. If that had been the case, you would not have been able to separate them from yourself as observable objects. Something certainly exists outside these three spaces. The conundrums of existence might never be fully solved. This article is limited to the physics of the spatial dimensions and time, plus a second time-like dimension, to be introduced below.

As an engineer trained in theoretical electronics, I have always been curious for an explanation of these inner experiences. When I heard of string theory and its several extra dimensions, which was assumed to explain everything, I saw the possibility to explain mind phenomena based on modern physics. This article is a result of several years of study and work to clarify the possibilities. It does not portray a scientific theory, nor is it scientific in a way that delivers proofs. It is instead a piece of engineering—a conceptual analysis

based on available knowledge and direct experiences of the world, with no biasing emotions or philosophy. It shows how string theory could model both the physical universe and the mind, as perceived and explained above. All verified theories of physics are honored. Three nonconfirmed assumptions that are generally honored in the scientific society, however, are given new interpretations that better match experiences and relevant research from both inside and outside the mainstream. A fourth assumption gives the connection between physics and the mind. I assume the following:

1. *The mind is an entity separate from the brain and the volitional activity of the mind can influence the brain*
2. *The extra dimensions of the string theory are open dimensions that are not curled up.*
3. *The extra dimensions of the string theory cannot be measured as physical distances given by meters or inches but represent a different kind of distance.*
4. *The extra dimensions of string theory are adapted to model the mind so that three dimensions make up a space (a “brane” in string theory). This space is named “the emotional room of the mind” and has an emotional distance as length, width, and height. Three other dimensions make up a space/brane called “the intuitional room of the mind” that has a character/quality difference as length, width and height.*

The chapter on Synthesis gives a further presentation of how string theory can be viewed to model particles of both the physical universe, the emotional room of the mind and the intuitional room of the mind, and how this theory could allow us to model a varying speed of time. This conception of string theory also seems to solve the imminent crisis of theoretical physics.

## II. THE CRISIS OF THEORETICAL PHYSICS

Advancement in experimental physics and astrophysics has now accumulated several measurements that cannot be understood and included in the accepted theories that are used to model the world. Many theoretical physicists are feeling pressured to come up with new theories that can explain these measurements. This is what is called the imminent crisis of theoretical physics. The best known phenomena that cannot be explained are listed below.

**Dark matter** is assumed because gravity from something is measured in galaxies and also in the intergalactic space. Whatever the entity is, it does not emit light and it is not made of normal protons and neutrons. Calculations show that weakly interacting massive particles (WIMPs) might exist. Some of the major physical experiments today are WIMP detectors, trying to catch some of these anticipated particles as they race through the earth. None has been detected so far.

**Dark energy** is assumed to exist evenly distributed throughout the universe because a force is expanding empty space; i.e., the space between the galaxies is getting larger and larger. This can only be caused by a negative gravitational force, which is provided by this assumed dark energy. The normal matter in the universe is only 5% of the total when dark matter and dark energy are included.

**The force of gravity** is much, much weaker than the other forces of particle physics (i.e., electromagnetic force, strong nuclear force and weak nuclear force). These three forces (but not the gravitational force) and all known elementary particles are part of the standard model of particle physics. The “Higgs field,” which is assumed to take part of the quantum vacuum, is proposed for giving mass to particles that are otherwise mass-less according to the standard model. The existence of the associated Higgs particle might be confirmed by the Large Hadron Collider in the near future. The graviton particle, however, which is assumed to carry the gravity force that interacts between particles having mass, has not been detected and it has not been possible to include it in the standard model of particle physics.

**Consciousness** is one of the mental phenomena considered by scientists as “emerging” from complex physical phenomena in the brain in some unexplained manner. The mind is regarded as a kind of illusion or reflection of the brain. Some persons, such as philosophers Plato and Descartes and the well known neurologists John C. Eccles<sup>11</sup> and Dr Jeffrey Schwartz,<sup>12</sup> argue exactly the opposite; namely, that the mind has a life of its own. “Emergence” is an expression derived from complexity science and describes a phenomenon that is observed but not explained; namely, that more complex (e.g., biological) systems often acquire functions and qualities that are not present in less complex systems. There is also no real explanation of how dead matter happens to organize itself into such advanced entities as living biological bodies. The common assumption by mainstream scientists is that this reduction of cosmic entropy happens by chance only.

A large amount of work has been done by neurologists and psychologists to understand the plasticity of the brain (how volitional activity/training can change the brain)<sup>13</sup> and to allocate mental functions and even self consciousness to different parts of the brain.<sup>14</sup> Associations and patterns of thought are explained by neuron connections that form and dissolve all the time, but the storage medium of memories, images, emotions, self images, and instincts, etc., has not yet been found. In the case of the mind as an independent entity separate from the brain, no agreement has been reached on what kind of substance or energy the mind should be based on.

**Entanglement** is the name of an observed quantum state phenomenon that is predicted by quantum theory but seems to violate special relativity. A famous experiment that confirms the quantum theory on this point use two entangled photons that are sent via separate fiber cables to detectors several kilometers apart.<sup>15</sup> Entanglement is not easily understood, but a physicist would say that two photons are produced in a total intrinsic spin state of zero angular momentum. This then results in a wave function, where photon 1 with a spin “up” is paired with photon 2 with spin “down,” plus an additional term in the wave function where photon 1 with spin “down” is paired with photon 2 with spin “up.” The direction chosen for the measurement of the spin of the first photon is arbitrary, but when the photon is detected, the second photon must then immediately have a spin of the opposite orientation. The quantum state information measured on photon 1 must go to the other measurement station faster than the speed of light, in order to arrive there

before particle 2 is measured. This should not be possible, according to special relativity.

**The size of the universe has not been determined to be finite or infinite.** According to Brian Greene (Ref. 16, p. 10), no observations violate one or the other solution. He gives the possible alternatives of a space that abruptly ends, a space that goes on indefinitely, or a space that circles back to its starting point.

**A forgotten controversial measurement.** Dr. Duncan MacDougall, MD had a great interest in the human soul and tried to measure its weight. He made a very sensitive scale to measure the weight of a bed holding a person. He then measured how the weight changed for several terminal patients around the moment of their deaths. After compensating for the slow reduction of weight from moisture escaping with the breath and checking for weight loss from the last exhalation, he found an average nonexplainable loss of weight of approximately 21 g at the moment of death. The New York Times got information on this experiment and published it as a sensational proof of the existence of the soul. MacDougall then published prematurely in two scientific journals, simultaneously, in May 1907. Much discussion was generated around these measurements at the time, but none have tried to replicate the results in a proper scientific experiment, probably due to the difficult ethics and controversiality among scientists. A detailed explanation of the experiment and the circumstances can be found on the Internet.<sup>17</sup>

### III. UNDERSTANDING STRING THEORY

String theory is based on a simple assumption that the tiniest pieces of matter and force—the elementary particles—are not point-like entities but are string shaped.<sup>1,18–21</sup> These strings can be either like a violin string that is attached to something at both ends and they vibrate in a certain pattern, or they can be shaped like a ring, but they still vibrate in a specific pattern. A certain vibration pattern represents a certain elementary particle.

All particles and forces modeled by the standard model, and also the graviton, can be realized by specific patterns of vibration. This is why string theory is called the theory of everything. All known particles and all known forces can be expressed in one model that supports both relativity and quantum mechanics. The ends of violin type strings are attached to something called “branes.” A brane may be shaped like a membrane, which is a surface in two dimensions, or the brane can be shaped like a space that has three dimensions, or it could have any other number of dimensions.

String scientists have proposed that our universe could be this type of a three-dimensional brane (Ref. 20, p. 388). The ends of all open (violin type) string particles would then be stuck to our universe, but could vibrate into other branes if there is a possibility to do so. Ring shaped strings are capable of wandering from one brane to another and perform interactions between particles of different branes. Gravity is realized by a ring shaped string and will attract matter particles in different branes to each other. Violin type strings can model forces that act only within each brane. This finding in brane theory defines a kind of nonphysical particle.

Particles in a brane that differ from the physical will attract physical particles by gravity, but they cannot be viewed by light emission and they cannot collide with physical particles since electromagnetic and strong/weak forces cannot act across brane borders. Particles based on violin type strings in branes other than the physical are defined as nonphysical in this article. Nonphysical particles can make up nonphysical matter and nonphysical entities. A nonphysical force may act between nonphysical matter particles in its own brane.

During the development of string theory, anomalies (negative probabilities) kept popping up in the equations, indicating that something was wrong. The addition of six spatial dimensions caused the anomalies to disappear (Ref. 18, p. 202). A string must vibrate in nine different dimensions, but the extra six dimensions are not observed in real life. The proposed solution to this requirement is that the extra dimensions are curled up into such a small size that they cannot be measured. The dimensions can still be much larger than the size of the strings. A large part of string research is devoted to solving the problem of how the six extra dimensions may be curled up, and a huge number of ways are available for this to be done. Each way yields a universe with laws of physics that are different from the others.

The mathematics of string theory shows that strings must be enormously energetic. They contain several orders of magnitude more energy than is found in the known elementary particles. According to Brian Greene, this contradiction is explained because the strings are almost totally cancelled by negative quantum jitter (Ref. 19, p. 150). Quantum jitter is a manifestation of the uncertainty principle. Small entities can vary a lot. The number of particles with an almost exact cancellation by negative quantum jitter should be dwarfed by the sum of particles that are not cancelled. This means that physical matter, according to string theory, should constitute just a fraction of the total matter in the cosmos. Greene suggests that these very high energetic particles from the Big Bang could have disintegrated. In the chapter on Synthesis, I propose a different solution.

Supersymmetry and symmetry breaking were introduced into string theory, and have also been applied to other parts of physics. This concept states that, due to changes in external conditions (e.g., decreased temperature), symmetry breaking can occur, creating two separate supersymmetric particles. One particle will have a half integral spin (matter particle) and the other will have an integral spin (force particle). According to this theory, all existing particles should have a supersymmetric sibling, but none of these has been found. Even if the theory is never confirmed, it is used by physicists because of its beauty and good results when applied to various problems.

The nine spatial dimensions, plus time, give a string theory describing a 10-dimensional cosmos. For many years, this was the case and five different mathematical expressions of string theory were developed. When one more dimension was introduced, these five different theories could be shown to be special cases of a higher order string theory. Today, string theory is assumed to describe an 11-dimensional cosmos. String theory is promising, but also controversial among physicists, because no verifying experiments have been provided.

#### IV. SYNTHESIS

My original quest was to see if string theory could describe a cosmos that included the inner rooms of the mind as well as the physical universe. Here is what I found:

One extra dimension was proposed in 1921 by Theodor Kaluza as a means to combine electromagnetism and gravity, the two only known forces at that time. This possibility was not widely accepted until Oskar Klein proposed a way to curl up the dimensions to a nonobservable small size. This made curled up spatial dimensions accepted to the degree that it has been included in the basic understanding of string theory as a means to explain the requirement for extra dimensions that could not be observed. String theorists now take for granted that the extra dimensions represent physical distance and can be measured by units such as meters and inches (called metric dimensions in this article) and that they are curled up in a three-dimensional metric space. This assumption seems strange to me, since additional metric dimensions in a metric space could just be definition of paths that are able to store particles from different “dimensions” in the same location. A three-dimensional space is easy for our imagination to comprehend but it does not necessarily need to be metric. Our inner space in the mind is not metric. If we take string theory on face value and let the required nine spatial dimensions make up three 3-dimensional branes, we could allocate these branes to the physical universe, to the emotional room of the mind and to the intuitional room of the mind. This represents the fourth assumption given earlier in this article. With support from the string theory, we have been able to suggest that the mind contains two rooms comparable to the physical universe. The rooms we can observe by directing our attention inwards can now be called the “emotional” room/brane/space/universe and the “intuitional” room/brane/space/universe. All three spaces have open dimensions and different units of distance measurement. We will have a true nine-dimensional cosmos that includes both the physical universe and the mind. The high number of string theories resulting from curling up the dimensions in different manners boils down to only one.

String scientists have proposed a cosmos with different configurations of metric branes having one, two, or three dimensions. I have not seen a proposal with three 3-dimensional branes having different units of distance. Neither have I seen any reason why it should not be a possible configuration. The superpartners that have never been found in the physical universe could hide in the emotional brane or the intuitional brane.

Since gravitons are ring shaped strings, gravity is able to act between matter in the physical brane and the other two branes. How would we observe this? If there are two other branes with open dimensions and real particles, we should be able to observe the mass of those particles by the gravitational pull on the matter in the physical universe; however, we should not be able to observe light from the particles in the other branes nor should those particles be able to collide with particles in the physical universe. This is exactly how dark matter and dark energy are observed today. Scientific observations have been made only in the physical space. Since all branes have open dimensions and the cosmos is a

real nine-dimensional entity, the matter in the emotional and the intuitional branes could have some kind of representation in the physical space, which is what we observe. We could say that dark matter and dark energy are the "projection of matter from the emotional brane and the intuitional brane into the physical brane" and we observe the three branes as superimposed. This leads to a fifth and sixth assumption:

5. *Dark matter and dark energy are observed as the projection into the physical universe of "nonphysical matter" that is situated in two three-dimensional branes different from the brane that forms the physical universe.*
6. *Dark matter represents the constituents of the emotional room observed in the mind, where psychological residues are stored. Dark energy represents the constituents of the intuitional room observed in the mind, where intuition and qualities/personality are stored.*

The measurements of dark matter and dark energy, as observed today, can be seen as the first experimental confirmation of the string theory. Dark matter in the physical universe seems to be partly attached to physical objects such as galaxies, the earth and the human body, and partly nonattached, such as dark matter in the intergalactic space. Since dark energy is distributed evenly in the physical space, each dark energy particle probably has a projection into the physical space that is evenly distributed.

The explanation above seems promising, but string theory has an 11th dimension that should be explained in the real world. String scientists present this dimension as a space dimension but I do not know if this is just because there was no other possibility. In the 19th century, a folkloristic assumption existed that a fourth dimension roomed all the spiritual worlds with angels and maybe God himself. Now, when string theory may provide two different three-dimensional spiritual worlds, it is not very likely that one extra spatial dimension will be a reality. So what about a time dimension? Brian Greene explains (Ref. 19, pp. 204–205) that string scientists at a certain time checked for a possibility of an extra time dimension without finding a suitable candidate. Could there anyway be an extra time dimension that we have not been aware of? Could the varying speed of time as observed and explained above be modeled by a separate dimension? If the mind is seen to perceive like a movie with a series of still images, then the time of each image, called the sampling time, will vary with the perceived speed of time. Nørretranders (Ref. 22, p. 155) explains some research that was conducted on this, early in the 20th century. The sampling time of the mind for humans was even measured to be at a minimum of 63 ms at the age of 20, and increased with greater age. More recently, a group of neurologists have proposed a "40 Hz hypothesis" (25 ms sampling time) constituting a unit of consciousness.<sup>23</sup>

I propose to choose the sampling time of the mind as a separate dimension. If relativity says that: "Cosmos is what can be observed. The laws of physics differ between branes, but are independent of the observer's position and speed," then a dimension of the cosmos will generally be defined as "a direction where your attention can move along without

moving along any other dimension." In this case, the sampling time of the mind is a real dimension. When the sampling time of the mind is close to zero, even the fastest process of atoms can be observed as a normally passing event. When the sampling time of the mind approaches all time, all occurrences in time and space disappear and the mind becomes still, but everything is present in some mystic way—a true mystical experience. This could be a scientific explanation of experiences reported from some persons, usually in a religious context, but from different religions. The sampling time of the mind can probably also be expressed as coupling strength/attachment or scale of observation. Short sampling time requires strong coupling and a small scale of observation, while long sampling time requires weak coupling and a large scale of observation. An exact mathematical expression of this should be possible, with some definition of terms.

This analysis shows that string theory might be able to model the cosmos such as is observed by introspection and explained above. However, a significant question remains to be answered. If memories are stored in the mind, what kinds of signals are used to transfer the content of the stored memories to and from the brain? Only forces made by ring shaped strings can interact between the branes. Is gravity able to signal between the mind and the brain? Could there be other forces made by ring shaped strings to support this type of communication? Stephen L. Adler found that the density of dark matter bound to the earth could be  $10^{12}$  times higher than the density of dark matter bound to the galaxy at our position in the galaxy.<sup>24</sup> This means that we have lots of dark matter around. If dark matter and physical matter exist in different branes, they cannot collide or interact in any other way than through gravitational attraction. The ultimate result of attraction could lead to a dark matter particle and a physical particle occupying the same location in the physical universe (remember that dark matter particles seem to have a specific location in the physical universe, even if they inhabit a different brane). The distance between the centers of the physical and dark matter particles can be virtually zero. The gravity force is inversely proportional to the square of the distance between the particles, so gravity may become strong enough to hold a physical particle and a dark matter particle together. When a dark matter particle comes close enough to a physical particle, the two will "snap" together and occupy the same physical volume.

A physicist could probably calculate the strength of the gravitational attraction between two particles when there are no electromagnetic or nuclear forces involved. All physical matter might actually have dark matter attached to it by this type of gravity snapping. A mental force operating on mental matter that is locked to physical matter by this snapping mechanism could be capable of introducing a dragging force on physical matter. This means that emotional forces in the mind could influence sensory perception of the nervous system. In this way, emotions and memories stored in the mind may be rendered into our physical senses and become conscious.

Epigenetic research show how genes can be switched on and off as a result of life experiences. There is still no

explanation of how this can occur. If the genes have dark matter attached by gravity snapping, then emotional forces could influence the dark matter and thereby influence the physical genes directly.

For signals from the mind to the physical body, gravity snapping seems to be a possible mechanism. A possibility for gravity snapping to send signals the other way is not so evident, though, since physical particles are not so easily moved around and therefore are not so capable of influencing what is stored in the mind. The possibility of an undiscovered force based on a ring shaped string is more speculative, but this type of a force, according to string theory, must be very, very weak, much as gravity is much weaker than electromagnetism. Our instruments could have missed this fifth force of particle physics. My guess is that the aura, which is claimed to be associated with all forms of life, could be this type of a force and that it acts both ways between the mind and the brain to make a seamless function.

If you have brain damage in an area of a certain mental capacity, usually this capacity seems to be lost. Sometimes training and the plasticity of the brain<sup>13</sup> return the capacity. The brain damage could just have destroyed the communication to the mental capacity that is located in the mind. The brain has signal transmitters and receivers for communicating with the mind and its various mental capacities, and it also has adaptable neurons that make cross-connections between the various locations of the brain. The brain could have found new ways of communicating with the required mental capacity that is unharmed and located in the mind.

The question of emergence, e.g., why humans are more intelligent than flowers, could be explained if we are willing to reverse the causality from “mind emerges from matter” to “matter emerges from mind.” The hypothesized particles of the mind could be far more energetic than physical matter and could probably have a much higher information density. The bulk of cosmic energy—the noncancelled string particles that are billions of times more energetic than physical matter—could be found in the mind-branes or they could be found in branes and dimensions beyond what is discussed in this article. Mind “stuff” might, in any case, be much more highly organized (have lower entropy) and have far more functionality than what is possible to implement in physical matter. The phenomenon of human self-development could show this.

If you prepare your mind and body through meditation or other techniques, you can be able to manifest into your body and life more of your inner qualities and you can “blossom” (also called consciousness expansion or personal growth). This can be seen as an emergence from your undiscovered potentials stored in the mind to be represented in your physical life. This view is supported by psychodynamic (Freudian) psychology. You may have more mental and spiritual qualities hidden in your mind than you have been aware of. Some self improvement techniques, such as Acem meditation, just make you relax and open up, thereby becoming more sensitive and receptive to inner impulses, so that you are able to incorporate into your body and physical life what already exists as an unconscious possibility in your mind. Darwinian evolution may be influenced by such an emergence from mind to

matter—deep unconscious wishes selecting from a limited number of options, in a longer time scale.

The measurement of entanglement could indicate the existence of some kind of “mind” even attached to elementary particles. The state of entanglement between two infrared photons indicates that the photons still have something in common. This “common” could be stored in the mind. If the infrared photons are strings with both ends connected to the physical brane, they will have vibrations going into the emotional and the intuitional branes. Entanglement could indicate that these vibrations are still not separated. Just like Siamese twins, parts of the photons’ bodies are common. They will both know instantly when this common body is altered by the other.

When defining a size of the universe, physicists have normally not differentiated between the “universe” and the “cosmos.” Both expressions have included everything there is, which means all matter, all energy and all space. An alternative to metric space is not proposed and a space-less “nothingness” is difficult to imagine. On this background, it has not been easy to conceptualize a size of the universe. Based on the concept presented in this article, it is possible to define “universe” to mean each 3-brane and let “cosmos” include everything, such as the two expressions are used in this article. Our physical universe started at the Big Bang,  $13.7 \times 10^9$  years ago. We can observe light emitted some thousand years after the Big Bang (the cosmic background radiation). This electromagnetic radiation has traveled for  $13.7 \times 10^9$  years. Because of the expanding universe, the source of this light is calculated to be  $45\text{--}46 \times 10^9$  light years away. Other kinds of radiation (e.g., gravitational waves) that was emitted closer to the Big Bang may be detected in the future. The calculated distance to the Big Bang should be a bit more than to the source of the cosmic background radiation.

A sphere with the Big Bang as the surface should be the size of our observable universe. If we use the definition of relativity given above, then it is obvious that the physical universe does not extend beyond the sphere we potentially can observe. If we move our observation point very close to the periphery (from here, we observe that point as it were right after the Big Bang) and extend the time to  $13.7 \times 10^9$  years later, then we will still be in the middle of a sphere exactly as we observe from our Milky Way galaxy today. The periphery of the sphere has a singularity that our universe cannot extend beyond. Based on assumptions made in this article, our physical universe has a finite size and is today a sphere with radius approximately  $46 \times 10^9$  light years. A kind of multiverse might also be possible based on this concept; e.g., by letting multiple physical universes collapse from a quantum mechanical universe (the intuitive brane) by means of symmetry breaking. The physical universes could then be part of nine-dimensional blobs in a three-dimensional quantum mechanical space.

The 21 g weight of the soul has become a saying, especially in spiritual communities. There could, however, be some real physics to it. It is the main issue of this article to show that the mind can be separate from the body and that it can be based on real particles that interact with physical

matter by means of gravity, so it must have some weight. If the mind is attached to the body by gravity snapping, the mind will certainly add to the weight of the body. If the mind leaving the body is synonymous with the death of the body, this can explain the sudden weight reduction at the moment of death measured by MacDougall.

## V. CLOSING REMARKS

Observation of inner phenomena is an elusive undertaking and might in essence be ambiguous. We have no guarantee for giving a “correct” description. Agreement over time among several persons can, however, give a kind of experienced consensus. We cannot give hard facts, such as when measuring the physical universe, but the inner world certainly is a part of human existence and we have to face it one way or another.

It is the reader’s privilege to evaluate the sanity of assumptions and the credibility of the analysis presented in this article. Until there are scientific arguments against the proposed concept, it represents a potential to open up for discovering a new science-based reality that includes a fuller understanding of ourselves, both as humans and as spiritual beings. It is not the author’s intention to teach physics to physicists, but to show how thinking from other sciences might influence how physicists can look at their own scientific achievements. It is just too easy to become one-directional in any society with a very high degree of specialization. Discussions across boundaries can prove beneficial for all parties.

A wider discussion of the mind and the physics of the mind can be found in Ref. 25. The basic idea was first published in Ref. 26. Dr. Usama Al-Binni gave important comments on this article.

<sup>1</sup>P. Halpern, *The Great Beyond* (Wiley, New York, NY, 2004).

<sup>2</sup>J. M. Campanario and B. Martin, *J. Sci. Explor.* **18**, 421 (2004).

<sup>3</sup>S. Freud, *The Psychopathology of Everyday Life* (WW Norton & Co, New York, NY, 1914).

<sup>4</sup>S. Freud, *Introductory Lectures on Psycho-Analysis* (WW Norton & Co, New York, NY, 1920).

<sup>5</sup>S. C. Yudofsky, *Fatal Flaws* (American Psychiatric Publishing, Washington, DC, 2005).

<sup>6</sup>H. Benson, *The Relaxation Response* (Harper Collins, New York, NY, 1975).

<sup>7</sup>S. Davanger, H. Eifring, and A. G. Hersoug, *Fighting Stress, Reviews of Meditation Research* (Acem Publishing, Oslo, N, 2008).

<sup>8</sup>See <http://acem.com> for more information about Acem School of Meditation.

<sup>9</sup>M. F. Mason, M. I. Norton, J. D. Van Horn, D. M. Wegner, S. T. Grafton, and C. N. Macrae, *Science* **315**, 393 (2007).

<sup>10</sup>S. Freud, *The Interpretation of Dreams* (The Macmillan Company, New York, NY, 1913, <http://books.eserver.org/nonfiction/dreams>).

<sup>11</sup>J. C. Eccles, *How the Self Controls its Brain* (Springer-Verlag, Berlin, D, 1994).

<sup>12</sup>J. Schwartz and S. Begley, *The Mind and the Brain: Neuroplasticity and the Power of Mental Force* (Harper Collins, New York, NY, 2002).

<sup>13</sup>N. Doidge, *The Brain that Changes Itself* (Penguin Books, London, UK, 2008).

<sup>14</sup>M. Solms and O. Turnbull, *The Brain and the Inner World, An Introduction to the Neuroscience of Subjective Experience* (Other Press, New York, NY, 2002).

<sup>15</sup>W. Tittel, J. Brendel, H. Sbinden, and N. Gisin, *Phys. Rev. Lett.* **81**, 3563 (1998).

<sup>16</sup>Brian Greene, *The Hidden Reality* (Allen Lane, London, UK, 2011).

<sup>17</sup>See <http://anomalyinfo.com/articles/sa00106.php> for more information about Anomalies.

<sup>18</sup>L. Smolin, *The Trouble with Physics* (Houghton Mifflin, Boston, MA, 2006).

<sup>19</sup>B. Greene, *The Elegant Universe* (Vintage Books, London, UK, 1999).

<sup>20</sup>B. Greene, *The Fabric of the Cosmos* (Penguin Books, London, UK, 2004).

<sup>21</sup>See <http://superstringtheory.com> for more information about The Official String Theory Website.

<sup>22</sup>T. Nørretranders, *The User Illusion, Cutting Consciousness Down to Size* (Penguin Press Science, London, UK, 1991).

<sup>23</sup>A. Engel, A. Kreiter, P. M. Koenig, and W. Singer, *Science* **252**, 1177 (1991).

<sup>24</sup>S. L. Adler, “Solar system dark matter,” e-print arXiv:0903.4879v1 [astro-ph.EP] 27 March, 2009.

<sup>25</sup>O. Drageset, *A Matter of Mind: Exploring the 11-Dimensional Cosmos*, Ed 2.1 (Ado Publishing, Oslo, Norway, 2012).

<sup>26</sup>O. Drageset, *Phys. Essays* **22**, 225 (2009).