THE QUANTUM PHYSICAL COMMUNICATION BETWEEN THE SELF AND THE SOUL

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ABSTRACT

In this paper I offer a metaphorical model, based on quantum physics and ancient spiritual science, explaining how the soul and the self communicate. The soul can be envisioned as emanating from virtual processes in the vacuum, which appear much like reflections of the real processes occurring in everyday life. The egoic self arises in a quantum physical process of reflection brought on by a specific wave function collapse. This collapse takes place from a large but bounded physical volume state to a smaller physical volume state wherein the ratio of appropriate lengths (for example radii in the case of spheres, widths in the case of boxes) of the new system to the old is either a rational or "irrational" number. In this "cave-in" model the being "reads" undistorted (rational) or distorted (irrational) memories of itself as a body centered entity along with either an undistorted or distorted memory of itself connected to a larger virtual soul. Communication from the self to the soul is brought on through expansion of the wave function's boundaries.

The soul has the structure of a point in actuality. . ., and the figure of a circle in potentiality. It pours itself forth from that punctiform abode into a circle. Whether it is obliged to perceive external things that surround it or whether it must govern the body. . ., the soul itself is hidden within. . .It goes out, then, to the exterior of the body according to the same laws by which the surrounding lights of the firmament come in towards the soul that resides in a point.[1]

Johannes Kepler, 1619 CE

Harmonices Mundi

If the existence of the soul is admitted on the basis of the argument that it is self-luminous, that knowledge, existence, and blessedness are its essence, it naturally follows from this that . . . there was never a time when it did not exist; because if the Soul did not exist, where was time? Time is in the Soul; when the Soul reflects its powers on the mind and the mind thinks, then time appears. When there was no Soul, certainly there was no thought, and without thought there was no time. [2]

Swami Vivekananda

A "NEW PHYSICS" OF THE SOUL

Until very recently, science has concerned itself with defining the universe's attributes as *objective* processes. Little attempt was made to consider *subjective* processes as they are. However many fields of thought including philosophy, metaphysics, and psychology borrow from science, particularly physics, as they attempt to deal with the problems facing humanity. Undoubtedly these fields use metaphors from physics to describe the intangible elements in them. Usually these metaphors are based on classical science and the assumption of reductionism. With the discovery of quantum physics and its present strength in describing a wide range of physical phenomenon, new metaphors are emerging making it easier to grasp the most arcane subjective processes known.[3]

Yet, as we near the end of the 20th century science is attempting to define consciousness as a phenomenon emerging from simpler physical processes. The greatest effort seems to be aimed at the wrong question, namely: how does a self-aware entity emerge from deeper and more elementary physical processes? The answer may be: it doesn't, and that is very difficult to deal with in today's reductionistic science.

My aim here is to set up a metaphorical "new physics" of the soul using quantum physics as a basis for the metaphor. I remind the reader that subjective processes elude the objective scientific seeker for a variety of reasons. Hence we need new metaphors to describe subjective processes involving consciousness. In my "new soul physics" I will show how the soul, the self, matter, and consciousness are, although related, not equivalent. Present science would incorrectly reduce the soul and consciousness to purely objective physical and mechanical energy. At best the soul would appear as an epiphenomenon generated by material processes.

When we bring in quantum physics we see the soul as a process involving the subjective consciousness of knowledge. This internal process is postulated to occur in the vacuum of space in the presence or absence of both matter and energy. From the inclusion of quantum physics in the description of the soul, it becomes apparent why the soul is immortal—beginning when the universe of space, time, and matter first appear and ending when the universe returns to the nothing from whence it came. The major activity of the soul is manifestation of matter and energy and the shaping of the material world by knowledge. This idea can be traced to Plato's idealistic vision of the soul. It can also be traced back to ancient Qabala, and its concept of void and spirit. Both manifestation of the world and the soul's knowledge of it are then tied to quantum physics principles, specifically the observer effect and the uncertainty principle.

THE SOUL IS A VIRTUAL PROCESS AND NOT AN ENTITY

I propose a new vision of the soul here, one that explores many of our earlier concepts in light of the tenets of modern science, particularly based as this vision is on the existence of an "intangible, irreducible field of probability"—the quantum physical wave function, from which all physical matter and energy arise.[4]

Many, ranging from modern scientists to perhaps the Buddha, introduce great confusion into the search by not differentiating between spirit, soul, and self. Based on my research, the spirit appears to be *virtual* vibrations of vacuum energy, the soul turns out to be reflections of those *virtual* vibrations in time (I'll explain what a virtual process is momentarily), and the self is an illusion arising from reflections of the soul in matter, appearing as the bodily senses as suggested by the Buddha. Hence the three are related but essentially different.

The quantum wave function demonstrates what I mean by a *virtual* process—one that has an effect even though it is not a result in fact. Thus this wave function, although never measured, has extremely important physical consequences. The soul arises along side this intangible field of probability—as *virtual processes* in the vacuum of space. These processes appear much like reflections of so-called "real" processes occurring in everyday life. However, these virtual processes have a life of their own, and even though they are never observable themselves they account for even the simplest things that we do observe.[5]

In other words, the soul is a virtual process and not an entity. Without it there is no awareness of entity. Metaphorically, I believe the soul involves us in a manner similar to the way virtual processes involve the ordinary processes of material existence. We know that in quantum physics virtual processes are extremely important. An example of this is whenever light scatters from atoms or molecules, such as in the everyday occurrence of sunlight scattering from air molecules and producing the blue sky of the heavens, virtual electronic processes are involved.

Consider what the electrons in air molecules must do to accommodate this fact. It is fantastic. When light scatters from an atom, each atomic electron excites itself by literally absorbing energy from the light, even more energy than the light contains! Each electron also moves away from that atom in incremental steps from just a few atomic dimensions to an infinite distance all the way across the galaxy! Then each electron makes the long journey back to where it started, again in incremental steps, giving back all of the energy it had absorbed from the light. In the end, the debt of energy is paid back and the light is re-emitted in a different direction from whence it came.[6]

All of this takes place in literally no time at all as a virtual or *imaginary* process. It appears to the outside world that a particle of light has simply scattered from the atom with no change in energy at all and no obvious escape of electrons from the atom. Yet without all of that going on, it is impossible to account for the scattering pattern of light observed when light interacts with any atoms or molecules. In other words, the sky is blue because electrons take virtual journeys to the vacuum and back!

The vacuum is fundamentally unstable. Anything that comes into existence arose from it through the soul's desire to manifest. This desire governs both the appearance of all matter and through the effect of observation spelled out by quantum physics, the relationship of a unified consciousness to matter. Thus the soul cannot be seen either materialistically or reductionistically. In fact the soul cannot be seen as a mechanical physical thing, at all. The

soul's fundamental purpose is the shaping of knowledge into material form.

Here I leave contemporary science's search for the material basis of consciousness and self-awareness and offer a new and original concept. I wish to show that the self is fundamentally an illusion arising as a reflection of the soul in matter much as a clear lake at midnight reflects the moon. At the same time, the soul is not an illusion although it is a reflection of spirit. (I'll define what I mean by spirit shortly.) From this we will see how the concept of self differs vitally from the soul.

In separating soul and self it is natural to ask why. As I see it, the soul and the self must dialogue with each other and maintain a separation in consciousness. Soul speaks to each of its many illusions called selves. Ludvik Bass, in his paper, "The Mind of Wigner's Friend."[7] concluded that there is only one consciousness or one mind and hence one soul. From this it follows that the sense that your mind is separate from another's must be false. Thus the little bodymind or ego, the one we count when we count heads or play musical chairs, is an illusion. The bodies are real, but the separated souls are not.

I conclude that consciousness--the field by which the soul communicates with the self—is a singular noun whose plural is meaningless. Yet you and I each feel we are uniquely conscious. Certainly, at times, we have heard a nagging voice inside our heads urging us to take some form of action or possibly to cool it. Even if we failed to hear that voice inside our heads speaking as if someone else were actually there, we are aware of being conscious. Much as if someone had turned on a television receiver when no station was broadcasting, the buzz of our conscious minds, like a hive of bees in a field of clover, asserts itself. If this buzzing field is directly attributed to the presence of the soul within each of us--and, as Bass has shown, this field cannot be personalized--you and I face the paradox of a single potential voice, a world-soul residing in each of us, capable of speaking to us as if broadcast from a single television antenna, no matter where we are in space or when we existed in time.

The soul-voice speaks to us instantaneously in spite of any apparent separation in space or time. Therefore we conclude that this soul-voice clearly exists not only within each of us, but also without. I am convinced this voice can be heard inside of you, and I assume that you are convinced it can be heard inside of me. We seem to face the nonspatial or nonlocal[8] characteristic of the soul, namely that it is in instantaneous--beyond space and time--communication with the self or body-mind.

In this paper I want to examine further the non-sensical (no pun intended) characteristics of the soul's communication with each of us. Communication between soul and self is difficult

at best. Often the soul is not heard or becomes devastated in its attempts to reach the deeply embodied and preoccupied self.

THE INNER SELF AND OUTER SOUL ARE NOT IDENTICAL

The soul is somehow both outside of the body and inside the body at the same time. The self is strongly embedded in the body, perhaps even identified with the body or body and mind, while the soul remains in some way aloof from such material concerns, but in danger of losing its ability to guide by becoming embedded more deeply in the body. The language of the soul is not a language of logic and words but instead is one that speaks through the heart and intuition, often mostly loudly when we are in the deepest trouble.

The self is lost without the direction of the visionary soul. What could the soul be saying to us and why is soul-talk so mysterious? The soul's message appears to be both visionary and compassionate--enabling the self to burst out of its egoic shell.

Some of you may feel that you do not have a **soul** or, if you have, that it has never personally talked to you. After reading this paper, you will come to a different conclusion. You all have had soul-talk experience. To understand this, however, first we need to look at how soul-talk takes place. You might call this God's technology in action. After all, when your **soul** talks to you, **she** or **he** doesn't exactly call you up on a telephone![9]

When the soul talks, the message is not going from somewhere else to locations in your brain.[10] Soul-talk is not only nonlocal--the strength of the message does not decrease with spatial separation from the source, it is also noncausal--meaning without prior or earlier cause. When the soul talks, you can't help but listen, and the words it speaks arise spontaneously from no location and from no earlier time. In fact if time enters the relationship at all, it appears that the soul speaks to the self from the future. We will investigate what the soul says and whether it can be taken to be rational at all times and whether it is the soul talking or some other rambling entity.[11]

THE ANCIENT WORLD-SOUL

According to legend Moses went up Mount Sinai able to hear the voice of God and came down unable to hear it, with the law in his own hands. From that day forward, the *Old One*, as Albert Einstein called God, has remained silent. From that day forward, we have been left to our own devices and we have struggled, attempting to find life's meaning. Going back through the early history of science, in my attempt to depict this picture of how the post-Mosaic soul speaks, I discovered Johannes Kepler's ideas cited in *The Interpretation of Nature and the Psyche* written

by Carl Gustav Jung and Wolfgang Pauli. Kepler, a German astronomer and astrologer, lived during the later 16th--early 17th century.

Kepler was interested in astrology, mysticism, the soul and its connection to the world. He also was fascinated with geometry and its relation to the sacred universe. As he put it, *geometry is the archetype of the beauty of the world*. In his view planets were living things and, like people, endowed with individual souls. Yet, as he probed the then-emerging physical science of astronomy, he began to take a de-animated, i.e., no-soul, view of nature. As in Moses' time when God became silent, the mysticism of Kepler's time was growing mute.

What drew my attention was Pauli's realization that Kepler's life at a crucial time in the history of physical science, the very beginning of physics as we know it, spanned the twilight time of both science and mysticism. While science was growing stronger, mysticism was diminishing. Thus Johannes Kepler is a figure worth noting for anyone interested in the soul. Prior to Kepler (1571-1630 CE), there was no such thing as science, particularly as it is understood today, based on experimental investigation and mathematical quantification. Kepler was a scientist on the bridge connecting the mystical views of nature with those of the fledgling concepts of the new modern science of experimentation and mathematical theory.

Kepler is thus, as Pauli put it,

> *especially suitable, since his ideas represent a remarkable intermediary stage between the earlier, magical-symbolical and the modern quantitative-mathematical descriptions of nature.*[12]

Pauli may have seen himself in the figure of Kepler since a battle was raging between the spiritual soul and the material self in him also. Like Kepler, who had more than a passing interest in mysticism, Pauli was motivated by archetypal concepts that, although having deep roots in the human psyche, emerge as foundations for culture and discovery in nature. Thus Pauli, like Kepler, was greatly influenced by archetypes, and, if one digs deeply enough into his writings, one sees he was a number mystic.

THE GEOMETRY OF THE SOUL

From the day Moses descended from Mount Sinai to the present, the ancient world-soul has remained silent. Not content with this silence and entranced with the geometry of the universe, Johannes Kepler provided the first scientific model of the soul. Kepler saw the soul as a central point pouring itself forth into a circle like radial lines connected to circular waves issuing from a

stone dropped in a still pond. It radially moves out then, to the exterior of the body according to the same laws by which the stars shine. Kepler believed that the individual soul reacted to specific **rational** and harmonious divisions of that circle.

Remember that Kepler lived during a time that spanned the ending of the dark mystical age and the beginning of the enlightened scientific era. Kepler's spiritual universe was filled with his Platonic love for order, symmetry, and beauty. In a somewhat similar way, Wolfgang Pauli's world lay, like a light-reversed negative of Kepler's picture, in the shadow of science and the sunlight of mysticism. A mystical number intuition led him to a new model of the atom. Pauli, until the end of his life, believed science went too far in its attempt to throw the psyche out of the universe. His goal was to model a science that encompassed both the soul and the physical world.

Kepler saw the planetary orbits forming shell-like spheres that fitted within structures--the regular polyhedra, all centered about the sun quite similar to Pauli's shells.[13] Kepler believed these spherically-inscribing and circumscribing regular solids were proof that God created and regulated the order of the cosmos. Pauli saw with his exclusion principle the formation of regular geometrical shells setting the order of the atom.

In his vision Kepler also saw the holy trinity[14] in the image of God, the Father, as the center of the universal sphere, Jesus, the Son, an image in the surface of that sphere, and the Holy Spirit as the relationship between the center and the surface. A movement or emanation passed from the center to the surface represented creation. In this manner the world-soul or God communicated with His creation.

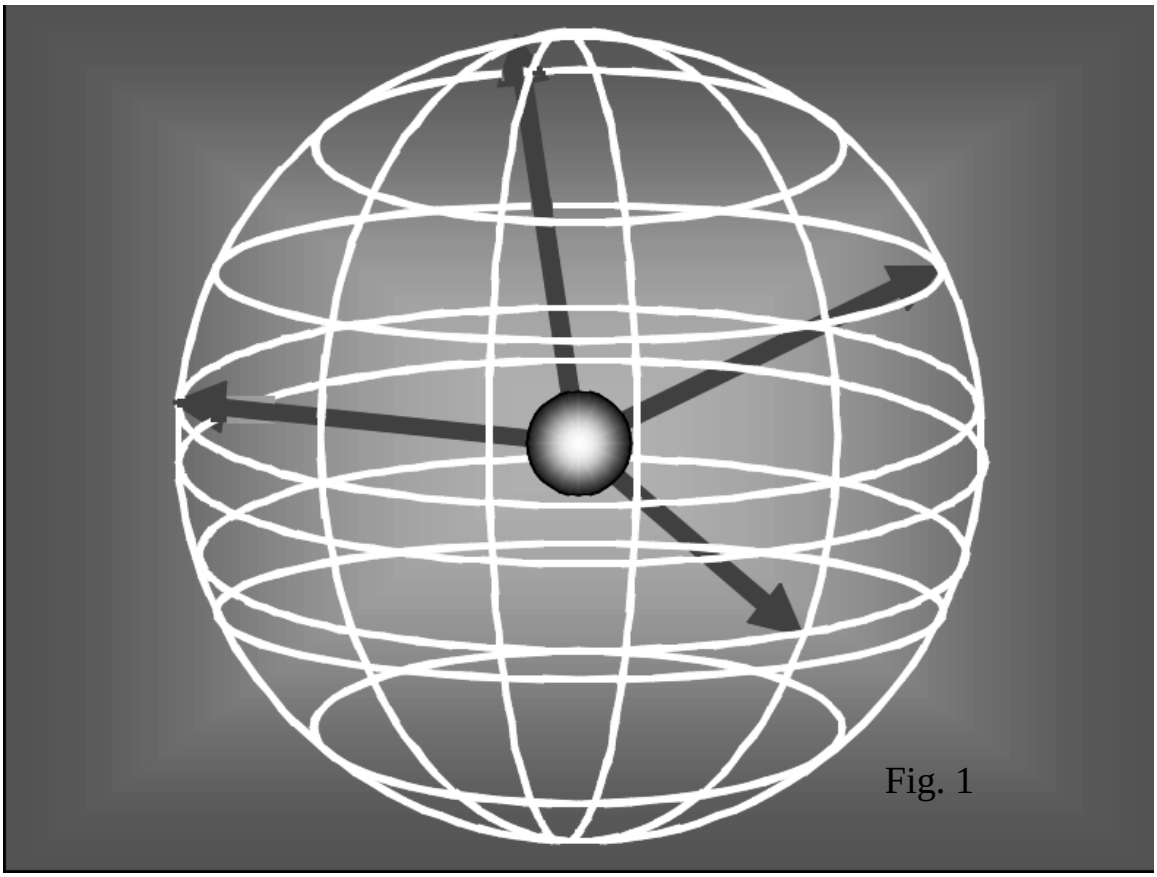

FIGURE 1

SOUL-TALK AS KEPLER SAW IT.

The soul (and God), at the center of the sphere, communicates with the body (Jesus), at the surface of that sphere, by emanating radial lines of spirit.

Just as the world soul communicated from the sun to its planets in the great celestial nest of inscribed and circumscribed solids and spheres, Kepler believed the soul communicated with the body by emanation: a beam of light-energy was sent from the soul at the sphere's center along radial straight lines to the surface representing the body. So taken with geometry was Kepler that he firmly believed that the individual soul had to possess the fundamental ability to react to certain harmonious proportions which corresponded to specific rational divisions of the circle. We saw this appeal to rationality in the ancient Greek Pythagorean science of music. This shouldn't be surprising, since Kepler had little else on which to base a science of the heavens.

In a manner similar to Moses, Kepler, and Pauli, I sense that we are in a unique period of rediscovery of the soul. As Moses manifested the law of human affairs at the cost of silencing

God, and Kepler manifested the vision of a logical universe with the mysticism's fading, Pauli attempted to rebuild the bridge to God's mystical universe with scientific principles. My work here, the physics of the soul, is based on the work of Plato, Pythagoras, Kepler, and Pauli.

BOXING THE SOUL

The connection of Kepler's views with a model[15] of the self and the ego, which I offered earlier in my book, *The Body Quantum*, interested me. With a slight modification I think it useful to show how this model applies to the soul and the self. So, following on Kepler's lead, imagine the domain of the soul is again a volume of space. Instead of a sphere, I shall use a box to represent the domain of the soul because it is easier to visualize the concepts I wish to demonstrate.[16]

Just as Kepler's soul, as a point in actuality and a circle in potentiality, was able to essentially change its size by radiating light from the actual point to the potential circle, imagine that the soul-box is capable of changing its dimensions by instantaneously altering its width, thereby growing wider or narrower. I'll take it that the world-soul is represented by the wider, and the restricted or fallen soul known as the self, by the narrower. Such a sudden collapse or expansion of the box is commensurate with the notion that the soul communicates instantaneously with the self by collapsing its boundaries. Similarly the self is capable of communicating with the soul by expanding its boundaries.

Hence in seeking each other the soul falls inward and the self expands outward. When the box collapses in width, information that was within the soul domain becomes quite localized within the body domain. If the collapsed information-waveform is undistorted, the soul *falls* into the self providing it with guidance. In this way the self has "learned" of the soul's existence.

Within the boundaries of the box, knowledge exists in the form of standing quantum waves of possibility. We want to see how that knowledge, **soul-talk**, is delivered to the self. One might imagine that the box represents the whole universe or some particular region in the vacuum of space perhaps within the space of the body.

Following Western Judeo-Christian spiritual tradition, it has long been held that humans were created in the image of God. So in what follows, we are to imagine that the world-soul, universal-soul or oversoul or God is simply as a box. I mean nothing sacrilegious by this. I am sure that God or the oversoul is not a box. In a similar manner I imagine the self as a smaller version of the soul, another box, capable of holding the image of the soul and attempting to communicate with it. I certainly know I am not a box and I know you aren't either. This is just a

model representing an aspect of soul-to-body or soul-to-self communication that I'm sure hasn't been seen before.

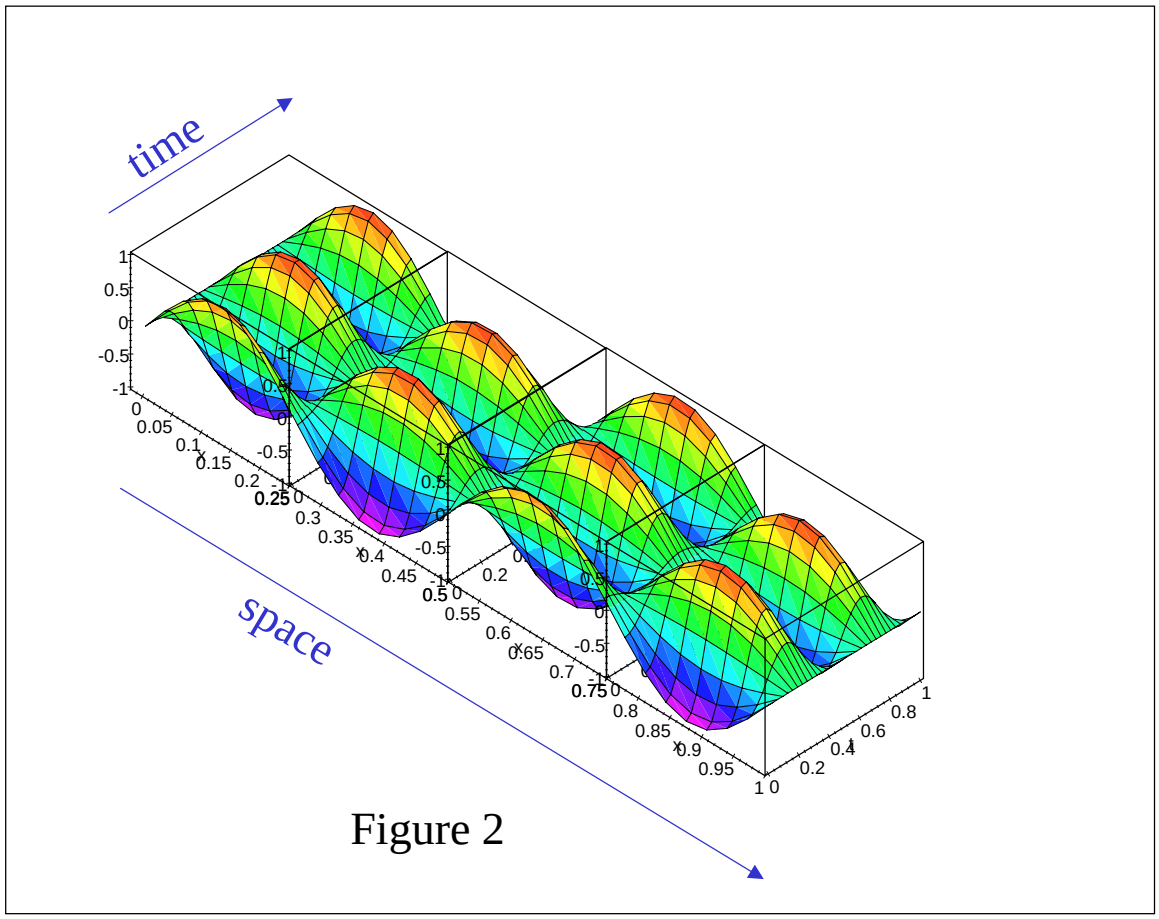

FIGURE 2. QUANTUM SOUL-TALK

Standing quantum waves of possibility confined to a box of length *l=1*. The box represents the soul and the wave its soul-talk. Here we see the real part of the wave function, a wave with four maxima and three nodes. The figure shows the wave throughout its temporal oscillation. The pattern represents some aspect of soul knowledge. Here the self and the soul knowledge are the same.

Inside the soul-box, quantum waves of possibility vibrate up and down much like a jump rope held by two children. Such a vibration is called a standing wave simply because the wave does not propagate or move from one side of the box to the other. The pattern is quite simple, representing a bit of knowledge. That bit is perhaps contained in the internodal separation, the distance between two nodes, which measure one half of the wavelength of the vibration. Like any vibrational pattern, it has a frequency and wavelength and when it excites some receiver, that receiver will in turn feel the vibration. Perhaps this pattern represents a thought or a feeling,

perhaps a sacred understanding of the universal vibration of **aum**.

. Next the box undergoes a collapse in width. In quantum physics this is related to the so-called collapse of the wave function corresponding to the action of consciousness. When this happens information that was spread out suddenly becomes quite localized.

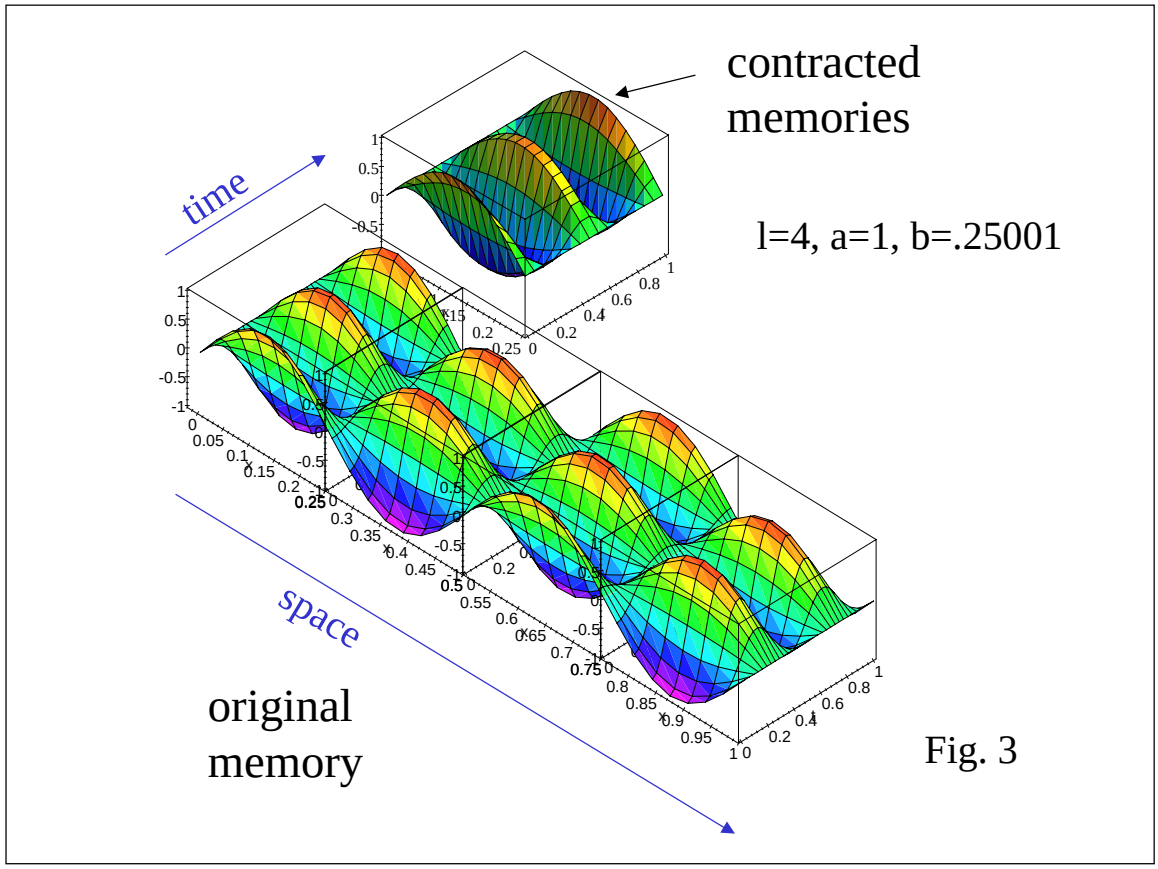

FIGURE 3. QUANTUM SOUL-TALK (B).

The standing quantum wave pattern after the box has undergone a sudden "rational" collapse and the standing wave pattern is reproduced. The box is now exactly 1/4 its original length and the pattern is exactly as it was except there are only one maximum and two nodes. Since 1/4 is a ratio of two integers, the new length is *rational* when compared with the original length. The new smaller box represents the self and the *rational* collapse represents the soul communicating its knowledge to the self. The soul remains the same size as it was. The collapse could correspond to the original fall of the soul into the body or birth. The self and the world-soul are separate but still joined by shared information.

Although the information is now confined to a smaller region of space, if the ratio of the widths of the box corresponds to a ratio of integers, a so-called *rational* number, the pattern remains identical to the original wave.[17] In this case the information is available to this localized

region--the narrower box—taken as the model of the self or perhaps the body. The shrinkage of the box's boundaries corresponds to a form of communication of the soul to its confined space, the self. If the wave-form is identical we say that soul has fallen and has created the patterning of the self. The self has "learned" of the soul's existence. The soul and the self are vibrating together with the same harmonious pattern of **Aum**, for example. This picture can also correspond to the soul at the moment of birth.

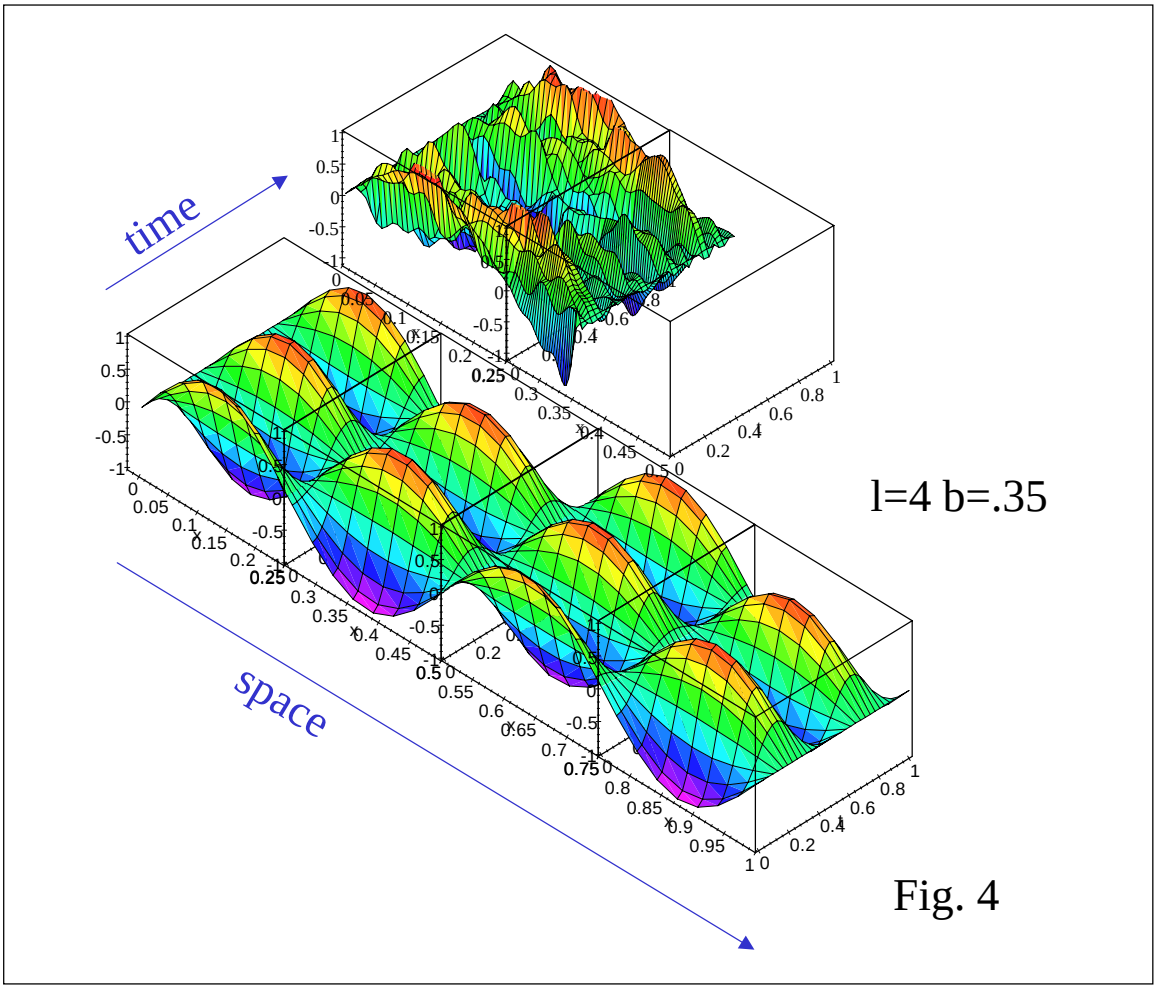

Fig. 4

FIGURE 4. QUANTUM SOUL-TALK (C).

After the box has undergone a sudden "irrational" crunching collapse, the original standing wave pattern is no longer reproduced. The box's width is not any rational fraction of its original width and the pattern is no longer as it was. As time goes on, the pattern becomes more jagged and only resembles the original pattern. Here the self has gained the knowledge of the soul imperfectly. The message is garbled. But some of its essence is present. This corresponds to the soul attempting to communicate with the self after it has already achieved a certain state of awareness. This could also correspond to life between birth and death and the difficulty each self has receiving soul-talk after birth.

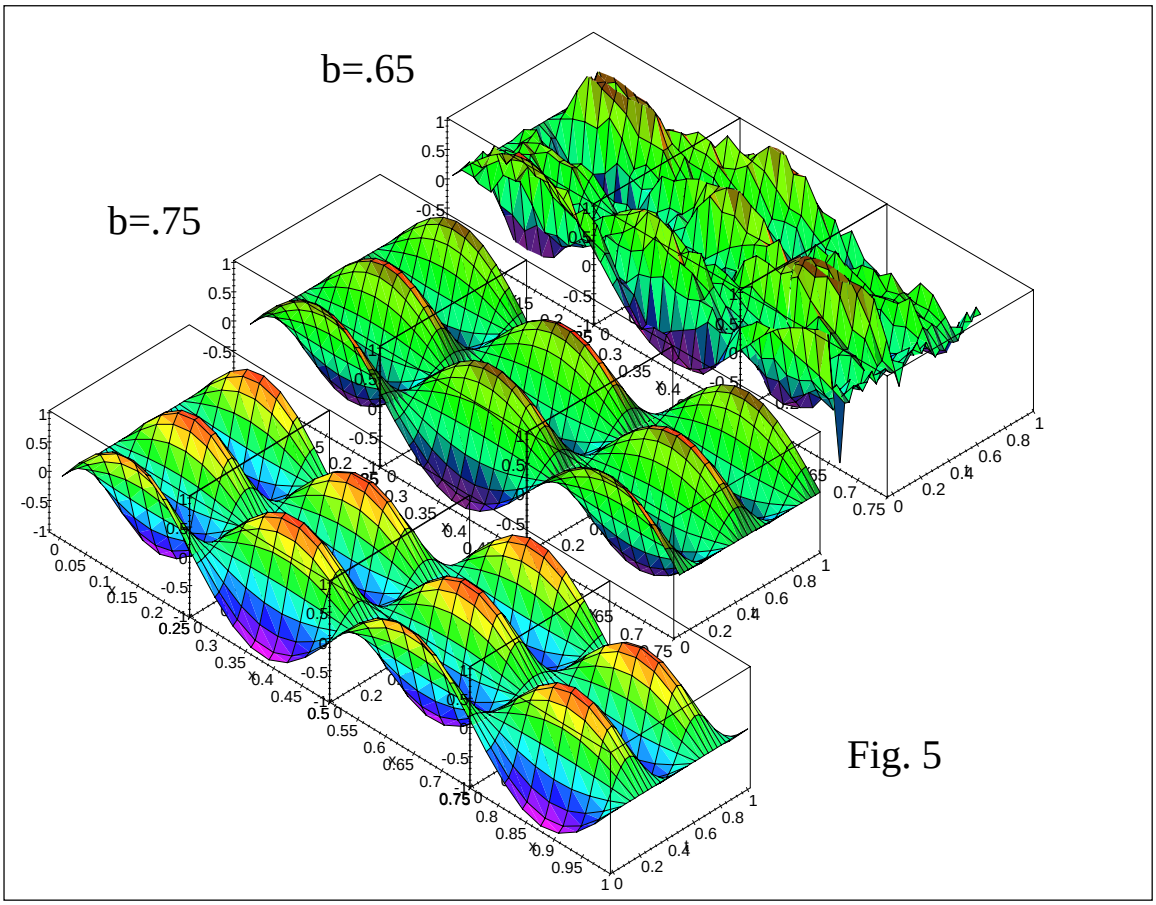

Fig. 5

FIGURE 5. QUANTUM SOUL-TALK (D).

A comparison between a "irrational" crunching collapse, and a wave that has undergone a "rational" collapse.

On the other hand, it is possible for the box to collapse irrationally, meaning the ratio of the widths cannot be expressed as the ratio of integers. For example, the ratio of the new width to the old could be $\sqrt{2}/3$. Interestingly enough, when such a collapse occurs the pattern is never reproduced except for fleeting periodic occurrences. One might think of this as a distorted message from the soul, or, if the message is remembered, i.e., put back together by the self, the message indicates there is something else beside the self and the world.

Irrational collapse garbles the message, although some of its essence is present. An irrational message still provides guidance, but since the message is not clear, it is often ignored. This explains the difficulty each self has receiving soul-talk. Such garbled messages could be heard normally by the mature self, but it would take some discipline to really listen to them. For example, soul-talk may be heard while meditating.

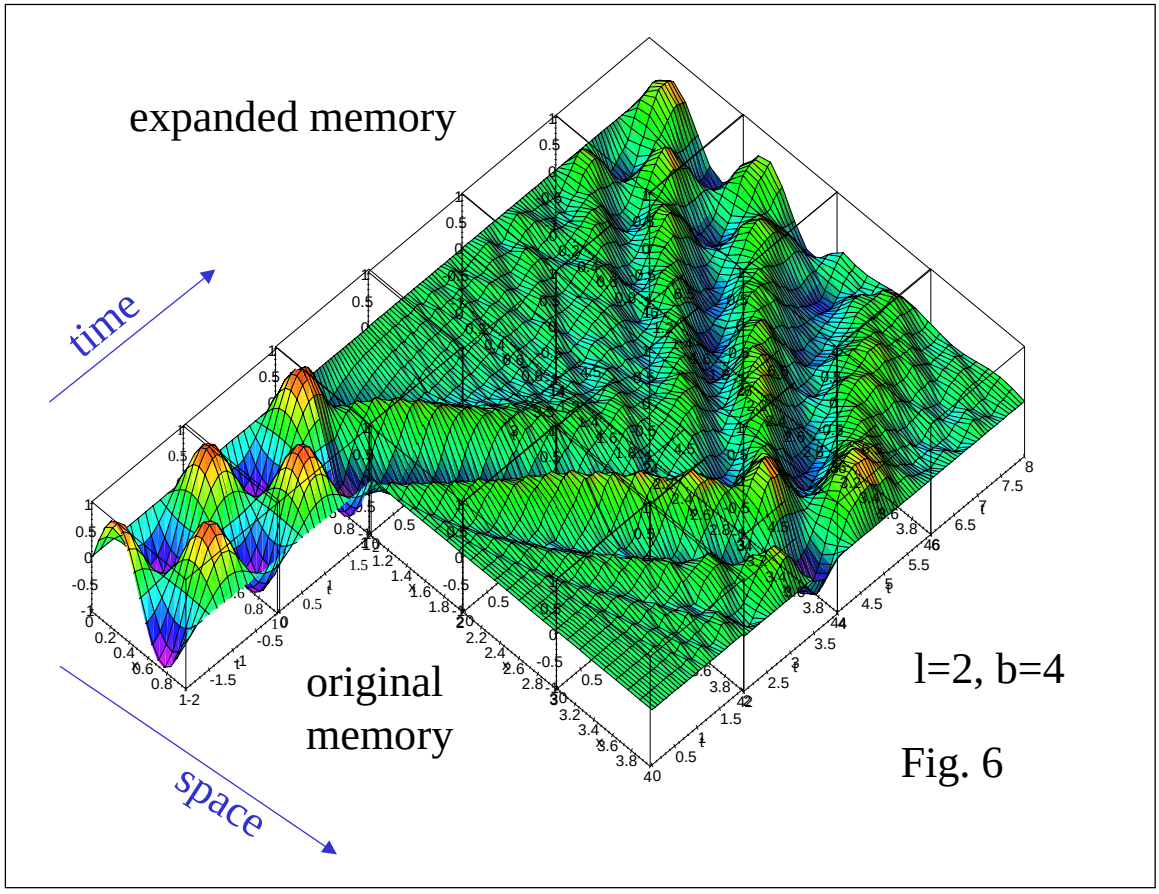

FIGURE 6. QUANTUM SOUL-TALK (E).

After the rationally contracted box (b) has undergone a sudden expansion, the standing wave pattern is also not reproduced as it expands to fill the volume. Regardless if the box undergoes a rational increase over its original width or not, the pattern is never reproduced exactly. As time goes on the pattern sloshes back and forth never resembling the original pattern. Here the self attempts to communicate with the soul by undergoing expansion. The self-knowledge is lost in the expansion. This could be a model for enlightenment or a model for what happens to the self or ego upon death.

Finally, when the self wishes to communicate with the soul, the boundaries of the box undergo a sudden expansion. The pattern of the self, whether in the form of a garbled message originally from the soul or in a rational vibrational pattern, suddenly expands and there is, associated with the expansion, a feeling of release or letting go. At such a moment the self feels released from tension. It's a bright new day, suddenly you feel good again. This could represent freeing the soul from physical bounds at the moment of death.

When the self talks to the soul, the box expands. In such a moment the self feels release from tension and in self-less communion with God and all sentient life forms in the universe.

Buddhists call this Nirvana. Christians call it Faith or Consciousness of God. I call it realized compassion.

NOTES

[1] Taken from C. G. Jung and W. Pauli, *The Interpretation of Nature and the Psyche. Synchronicity: An Acausal Connecting Principle* (Jung) and *The Influence of Archetypal Ideas on the Scientific Theories of Kepler* (Pauli). NY: Bollingen Foundation, Pantheon Books, 1955, p. 178.

[2] Swami Vivekananda, *Jnana-Yoga*. New York: Ramakrishna-Vivekananda Center, 1982, p. 140.

[3] See my books: F. A. Wolf, *The Dreaming Universe: A mind-expanding journey into the realm where psyche and physics meet*. New York: Simon & Schuster, 1994, Touchstone, 1995 and *The Spiritual Universe: One Physicist's Vision of Spirit, Soul, Matter and Self*. NH: Moment Point Press, 1999. Much of this article is based on an expanded version of the material in the latter.

[4] The *quantum wave function* is a mathematical formula that presents the possibilities of events occurring in the form of a wave pattern distributed through space and changing in time much as an ocean or sound wave ripples and flows. However, as seemingly physical as this appears, it has no physicality in and of itself. Moreover, it cannot even be represented by real numbers but must be represented by complex numbers consisting of real and imaginary numbers.

[5] One of the best discussions of the importance of virtual processes is found in Richard Feynman. *QED: The Strange Theory of Light and Matter*. Princeton, New Jersey: Princeton University Press, 1985.

[6] In 1961 while I was employed by the Lawrence Radiation Laboratory in Livermore, California, I published a paper with my colleague Dr. Marvin Mittleman on this subject. In doing the calculation I was impressed with this process of infinite goings-on by atomic electrons in the simplest processes. See M. H. Mittleman and Fred A. Wolf. "Coherent Scattering of Photons by Atomic Hydrogen," *Physical Review*. Vol. 128, p. 2686, 1962.

[7] Ludvik Bass, "The Mind of Wigner's Friend," *Hermathena: A Dublin University Review*. No. 112, (1971), p. 58.

[8] *Nonlocality* is a bit of quantum physics jargon. Normal experience with interacting objects (imagine holding two bar magnets in your hands) shows that if one object affects the other, the effect grows weaker as the objects are moved farther from each other. The objects are said to be *locally* connected. The simplest description of *nonlocality* is when a single event occurs at two distinct places in space or time, as opposed to two distinct events influencing one another like bar magnets. As an example of *nonlocality*, imagine watching a football game on many television screens simultaneously, as in a large department store. You see the same thing repeated at different locations. If the program was taped, you could even see the same thing at different times. One could conclude, if one didn't know better, that the different games were actually occurring at different locations and many different times, played by tiny beings all living within the television sets. Somehow there was a very strong interaction between them, regardless how far apart the television sets were placed. In physics *nonlocality* refers to objects that strongly

interact in rhythm no matter how far apart they are as if they were one event like the football game rather than separate events. What happens to one of them instantly affects the other with no change in strength, even when they are lightyears apart. One says that one object is *nonlocally* connected to the other.

[9] I've heard some people have had conversations with the newly-departed via devices like telephones and tape recorders. I've never heard of anyone talking to his or her own soul in this way.

[10] Regions of the brain are associated with speech and understanding of words. However, soul-talk can be understood without any intermediary of words, although at times, certainly, words could be used and these speech areas of the brain (such as Broca's area and Wernicke's area) would show electrical activity during these times.

[11] We do have inner child and parental voices. However, these voices are not soul-talk. See Stephen Wolinsky, *The Dark Side of the Inner Child.* Norfolk, CT: Bramble Books, 1993, p. 123.

[12] Pauli in: C. G. Jung and W. Pauli, *op. cit.*, p. 154.

[13] I. Bernard Cohen, "Kepler's Celestial Music." *Project Physics Reader 2: Motion in the Heavens*. The Authorized Interim Version. New York: Holt, Rinehart and Winston, 1968-69, pp. 53-75. These structures were the five regular polyhedra, including the **tetrahedron** (**4** sides are equilateral triangles), **cube** (**6** sides are squares), **octahedron** (**8** sides are equilateral triangles), **dodecahedron** (**12** sides are equilateral pentagons), and **icosahedron** (**20** sides are equilateral triangles). As Kepler saw it, there were **6** concentric spheres, corresponding to the Copernican system of six planets, concentrically nesting the five perfect solids. **Sphere (1)--Saturn's sphere**, inscribed a cube. **Sphere (2)--Jupiter's sphere**, was circumscribed by Saturn's cube and inscribed a tetrahedron. **Sphere (3)--sphere of Mars** was circumscribed by Jupiter's tetrahedron and inscribed a dodecahedron. **Earth's sphere (4)** circumscribed by the Jupiter's dodecahedron and inscribed an icosahedron. **Venus's Sphere (5)** circumscribed by the Earth's icosahedron and inscribed an octohedron. Venus's octohedron finally inscribed the **sphere of Mercury (6)**.

[14] I discussed a very different version of the trinity in chapter 7 of F. A. Wolf, *The Spiritual Universe: How Quantum Physics Proves the Existence of the Soul*. New York: Simon & Schuster, 1996..

[15] F. A. Wolf, *The Body Quantum: The New Physics of Body, Mind, and Health*. New York: Macmillan, 1986, pp. 263-279.

[16] What I present here as a model would hold equally as well for a sphere or for any other closed volume. In this footnote I provide the quantum physical equations describing the model discussed in the text without any equations. You may wish to read the text of the article first and then come back to this note.

Consider a particle of mass M with coordinate x in a one dimensional box of length a. Let h be Planck's constant and let the particle exist in the nth energy level in the box. Suppose that at time zero the box undergoes a sudden change in length, a collapse or an expansion to a length b. The equations describing the particle of mass M in the box of length a just before time zero, i.e., $t = 0$, are:

$$\psi(x,t) = \psi_0(x)\, exp(-if_m t), \quad \text{if } t<0, \qquad \text{(eq. 1)}$$

where,

$$\psi_0(x) = \sqrt{(2/a)}\, sin(m\pi x/a), \quad \text{if } 0 \le x < a, \qquad \text{(eq. 2)}$$

$$\psi_0(x) = 0, \qquad \text{if } x \ge a \text{ or } x < 0, \qquad \text{(eq. 3)}$$

and,

$$f_m = m^2\pi h/4Ma^2. \qquad \text{(eq. 4)}$$

After the sudden change to the length b the equations describing the particle in the box are:

$$\psi(x,t) = \sqrt{(2/b)} \sum_{n=1}^{\infty} \alpha_n\, sin(n\pi x/b) exp(-ie_n t), \quad \text{if } 0 \le x \le b \qquad \text{(eq. 5)}$$

and $\psi(x,t) = 0$ elsewhere and where

$$e_n = n^2\pi h/4Mb^2 \qquad \text{(eq. 6)}$$

and α_n depends on whether the box has expanded or contracted.

Consider first the contraction of the box, i.e., the case $b < a$. Here we have two possibilities depending on the value of the ratio b/a. In the first case, if b/a is rational, i.e., the ratio of two integers then either $(b/a)m = k$, i.e., the integer k exists or else it doesn't. If k exists, then we find, for all n,

$$\alpha_n = \sqrt{(b/a)}\delta_{nk}\,, \qquad \text{(eq. 7)}$$

where the Kronecker delta is zero unless $n = k$. In this case all of the α_n vanish with the exception of α_k, and the final wave form exactly duplicates the initial wave form. A little algebra shows that $e_k = f_m$ hence the energy of the particle as well as the wavelength remains the same after the collapse. The only difference is the wave form contains fewer half wavelengths between the enclosed walls of the collapsed box than it had before the collapse even though the wavelength remains the same.

If, on the other hand, b/a is irrational or, $(b/a)m \neq k$, i.e., the integer does not exist, we find for α_n after the collapse,

$$\alpha_n = \sqrt{(b/a)}\, 2n(-1)^{n+1} \sin(m\pi b/a)/\, \pi[n^2 - (mb/a)^2], \quad \text{if } (b/a)m \neq k \qquad \text{(eq. 8)}$$

Each term of the sum is present and the waveform is not reproduced. This called an "irrational" collapse.

Next consider the expansion of the box, i.e., the case b > a. Here

$$\alpha_n = \sqrt{(a/b)}, \qquad \text{if } n = (b/a)m = k \text{ (an integer)} \qquad \text{(eq. 9)}$$

and,

$$\alpha_n = \sqrt{(a/b)}\, 2m(-1)^{m+1} \sin(n\pi a/b)/\, \pi[(m)^2 - (na/b)^2], \quad \text{for } n \neq (b/a)m. \quad \text{(eq. 10)}$$

Two possibilities exist. Either $(b/a)m$ is an integer k or it is not. If b/a is rational then for the integer m, the integer k may exist and eq. 9 yields the value of α_k. Eq. 10 yields all of the other values ($n \neq k$) for α_n. If b/a is irrational, or $(b/a)m$ is not an integer, hence k does not exist, eq. 10 yields all of the values for α_n. In all cases irrational or rational expansion with k existing or not, all of the α_n must be included meaning that in no case will an expansion of the box reproduce the initial waveform.

An interesting question arises as to the mass parameter M used to describe the soul. Since the soul is taken to be nonmaterial what could I mean by mass? I take the mass to be that of a subatomic particle if we are looking at soul to body interactions on the scale of atomic and subatomic space. If on the other hand we are looking at the central nervous system, the mass could correspond to that of a vesicle emitted by boutons in the presynaptic grid calculated to be about $3 \times 10^{-17} g$. In this case typical lengths for a and b are around 40 nm. Protein gate molecules in the neural wall are typically of this mass as well. See my earlier work: F. A. Wolf, "The Quantum Physics of Consciousness: Towards a New Psychology," *Integrative Psychology* Vol. 3, pp. 236-247, 1985 and F. A. Wolf, "On the Quantum Physical Theory of Subjective Antedating." *Journal of Theoretical Biology*. Vol. 136, pp. 13-19, 1989.

[17] Compare this model with the rational number mysticism of the Pythagoreans discussed in chapter 3 of F. A. Wolf, *The Spiritual Universe*. Communication with the soul is harmonious when a rational collapse occurs in the same sense as music is harmonious when two plucked strings have lengths with a rational ratio.