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Science and Spirituality*

David K. Scott
University of Massachusetts Amherst

The truth must dazzle gradually
Or every man be blind.
Emily Dickinson

Scenario:

Professor McLeod had just read the results of a survey on the role of spirituality in the lives of today's college students, conducted at the Higher Education Research Institute at UCLA (Astin and Astin, 2006). One of the questions addressed the connectedness students felt toward others and to the world around them. She was surprised to learn that 80% of entering students expressed an interest in this connectedness as part of their spirituality to some or to a great extent. A similar percentage reported that they often prayed. But she was even more surprised to discover that the students expressing the lowest interest in spirituality were generally in the physical sciences, mathematics and engineering, with computer science usually ranking dead last. This finding surprised Professor McLeod, because she believed that many of the results of modern science reveal deep connections between science and spirituality. Since she was teaching a class on quantum physics the next day, she decided to check the views of her own students.

The next day in class, when Professor McLeod asked students about the relationship between spirituality and science, most of the class subscribed to the independence hypothesis for science and spirituality, characterized by Gould (1999) as "non-overlapping magisteria." Both represented valid domains of human experience; they just have nothing to do with each other. The students were not at all sympathetic when Professor McLeod explained Alfred North Whitehead's perspective that a clash of worldviews is not necessarily indicative of disaster, but frequently of a finer perspective, a deeper understanding of reality that has not yet been uncovered. They stated emphatically, "Science deals with external reality while religion–or spirituality–deals with an interior human experience." They confidently proclaimed, "This division was made clear hundreds of years ago, with the birth of modern science, by the philosophers and scientists who separated mind and matter. Furthermore, it is only a matter of time before science explains all of the interior dimensions of human experience through physical and chemical processes of the brain."

Professor McLeod wondered how her students could compartmentalize their views of science and spirituality in this way and whether it could be destructive in their development. It seems that college students are forced into a difficult choice. Either they had to accept that their spirituality bore little relation to science and to their intellectual studies more generally or, even worse, they were forced to renounce their faith completely. As Wilber points out, students are trapped in an uncomfortable position. They cannot discuss their faith with their professors, who are generally in a rationalist, analytical level of consciousness evolution, or with many friends who hold a fundamentalist version of religious belief. Psychograhpically, Wilber notes, this is the same problem faced by terrorists; their fundamentalist beliefs find no home in a

* The September issue of *Zygon: Journal of Science and Religion,* Volume 41, Number 3, 2006, in particular the review by L. Schafer, gives many valuable references to current research related to science and spirituality (Schafer, 2006). A recent popular account is given in the October 2006 edition of US News and World Report on Science and the Soul (Tolson, 2006).

rationalist, scientific world. She surmised that these tensions drove many people to fundamentalist religions, and perhaps was at the root of terrorism in the world (Wilber, 2006). She decided to digress from her next lecture to discuss the history of the engagement of science and spirituality and to raise the possibility that these subjects were actually deeply entangled. She would suggest that ideas emerging from many recent discoveries in physics, biology, neuroscience, psychology and health sciences were implicit in many, if not all, of the world's spiritual traditions. Professor McLeod had long kept secret her belief in the emergence of a more integrative view of science and spirituality. A senior colleague had advised her early in her career that such topics were taboo in the academy, and might even violate the constitutional separation of Church and State, but now she felt ready to tackle this important topic. Regardless of the ultimate outcome of the nature of reality, Professor McLeod was confident that the mere discussion of the ideas would of themselves constitute a shaping and focusing force for her students. As Zajonc(2006, p.57) has written, in surveying the terrains of science and spirituality it is a case of finding the right map.

Given widespread political conflicts in the world today, which to some extent stem from the tension between science and religion, Professor McLeod believed that she had a professional responsibility to engage students in a discussion about how to integrate science and religion (spirituality). She would be careful though to emphasize that such integration is controversial and by no means accepted by many, or even most scientists, and that new discoveries in science and religion might necessitate different interpretations in the future. In fact, she was confident that all our current knowledge about science and religion might be radically transformed in another 100 years. For example, current versions of string theory, perhaps the best available theory for understanding the structure of the universe, postulate that the universe may be 10-dimensional, rather than 4-dimensional in space and time, but that six dimensions are curled upon themselves (Kabat-Zinn, 2006). “Might it not be possible,” Professor McLeod speculated, “that our inner curled up dimensions, once unfurled, might equally transform the landscape of consciousness?”

To Professor McLeod it seemed absurd that conscious life could have evolved by accident in a vast, unconscious universe, devoid of feeling and oblivious to the life it had spawned. In fact, it seemed downright unscientific. She recalled how many of the great scientists and philosophers, such as Copernicus, Newton and Descartes, were motivated by spiritual and religious ideas, and that their original discoveries were charged with intense spiritual significance. They “perceived their breakthroughs as divine illuminations, spiritual awakenings to the true structural grandeur and intellectual beauty of the cosmic order” (Tarnas, 2006, p.5). Perhaps, she surmised, these scientists had intimations of a deeper level of reality that must be uncovered gradually. The line in Emily Dickinson’s poem “Slanted Truth” came to mind: “The truth must dazzle gradually, or every man be blind.” On the path towards a deeper and fuller understanding of the cosmos, perhaps the universe is kind to us; we might be overwhelmed and become dysfunctional if too much were revealed too quickly about the ultimate nature of reality. Dickinson’s lines are reminiscent of the prisoners in Plato’s Cave; when they suddenly leave the cave of the shadows of the world, they are blinded by the true reality of the light outside.[†]

Analysis of Scenario:

In the context of this chapter, spirituality means a sense of connection to the cosmos and to all life within it, as well as a sense of transcendence. This view of spirituality is in opposition to the separation between scientific and spiritual worldviews based on the idea that life evolved by chance in an impartial universe and that, while the evolution of life and the evolution of the universe can be described by science, the two are not connected. The separation is to a large degree the result of the birth of modern science and the western Enlightenment from the 16th century onwards. But its roots extend much further back in time to the Axial Age, centered around 500 B.C.E. Prior to that period, primal cultures did not separate science and spirituality, art and religion or any other area of human experience. Tarnas (2006, p.16) points out, "The primal human being perceives the surrounding natural world as permeated with meaning…whose significance is at once human and cosmic. Spirits are seen in the forest, presences are felt in the wind and the ocean, the river, the mountain. Meaning is recognized in the flight of two eagles across the horizon... in

[†] I am grateful to Richard Tarnas for reminding me of this analogy.

the unfolding cycles of the moon and the sun. The primal world is ensouled." In primal cultures the relationship between an observer and the observed, the subject and the object, is not separated.

Karen Armstrong (2005/2006, pp.34-37) points out that the decades around 500 B.C.E. witnessed the birth of many of the world's principal religions and spiritual traditions. "And in every single case, the spiritualities that emerged during the Axial Age–Taoism and Confucianism in China, Monotheism in Israel, Hinduism, Buddhism and Jainism in India, and Greek rationalism in Europe–began from a conviction that the world was awry." The Axial Age occurred at a time when individualism was just emerging to define humanity, as we now know it. During this period men and women became conscious of their existence, their own nature and their limitations in an unprecedented way. "People who participated in this great transformation were convinced that they were on the brink of a new era and that nothing would ever be the same. They sought change in the deepest reaches of their beings, looked for greater inwardness in their spiritual lives, and tried to become one with a transcendent reality." This transformation led to the separation of spirit and matter with spirit in the ascendant (Turner, 1998). While today we often associate this split with science, it actually originated in the world's religious and spiritual traditions. This evolution is illustrated in Fig. 1, based on the work of Turner (1998).

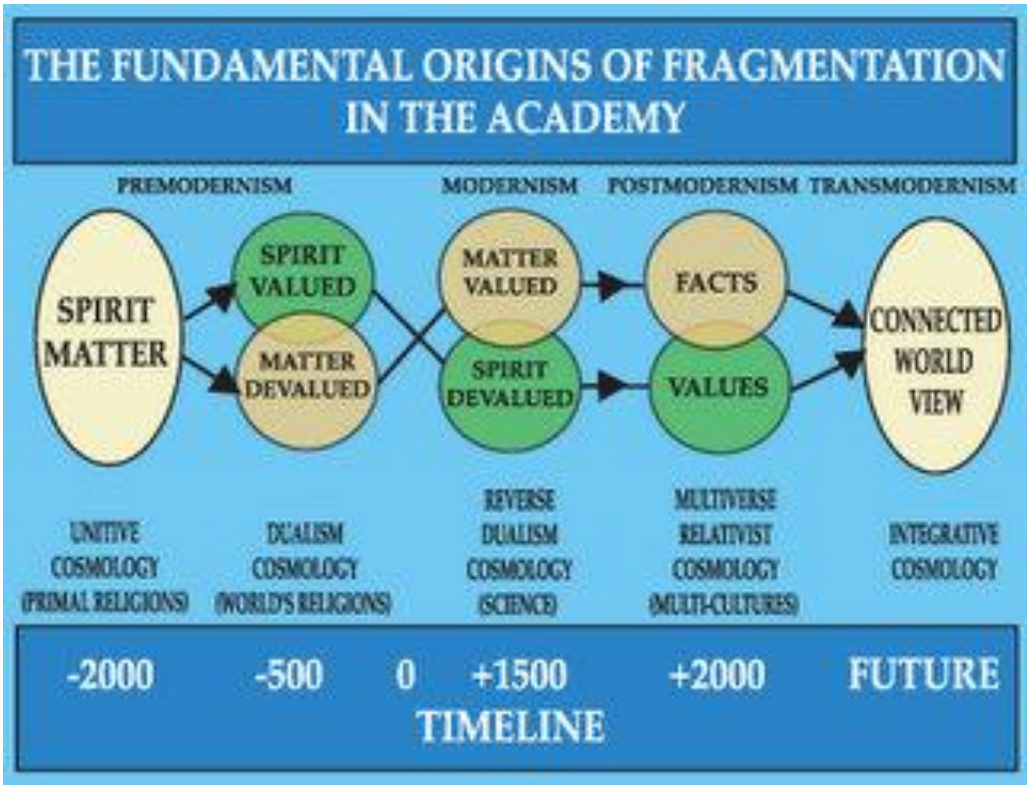

Figure 1: Simplified illustration of the evolution from the unified cosmology of Primal religions through dualism and reverse dualism to a possible future integrative cosmology (based on Turner, 1998).

Now fast forward to the birth of modern science in the 16th century. The scientists and philosophers of this time accepted the idea of the separation of matter and spirit but set us on the path–unintentionally–of reversing the priority of the spirit-matter split by ascribing greater importance to matter. The diagram drastically simplifies the complexity of the transformations. For example, the scientists and philosophers of the time were often deeply involved in religion and mysticism in some cases. Furthermore significant impetus for the scientific revolution came from the Reformation that fostered a context for questioning the authoritarianism of the Christian church. The rise of science was, in retrospect, part of the

historical revolt of the Renaissance against the inflexibility of medieval thought more generally (Lemkow, 1990, p.58).

More than anyone, Descartes is responsible for creating this clear distinction between matter and mind. He solved the problem of relating the two by assuming that God, who created both mind and matter, connects them by putting into the minds of human beings the clear and distinct thoughts that are needed to deal with matter as extended substance (Bohm, 1990). However, Godly intervention was soon abandoned as a valid philosophical argument, leaving us with no clear idea how the two are connected. In the middle of the 17th century, Spinoza had argued that body and mind are not two separate entities but one continuous substance. Imagine how different our world might be today if Spinoza had prevailed!

Oscillations between materialist and spiritualist views are not uncommon throughout history. Sorokin (1992) expressed the phenomenon as a cyclical waxing and waning of two basic value systems that underlie all manifestations of culture, called sensate and ideational. The sensate value system, characteristic of scientific materialism, views matter as the ultimate reality; all ethical values are relative and sensory perception is the only source of knowledge and truth. The ideational values system holds that ultimate reality lies beyond the material world in the spiritual realm; that ethics, truth, and beauty are expressions or reflections of attributes of this transcendent reality, and that knowledge may be obtained through inner experience. Sorokin noted, "We are seemingly between two epochs: the dying sensate culture of our magnificent yesterday and the coming ideational culture of the creative tomorrow."

However, this reversal led to alienation of human beings from the cosmos, begun by the Copernican revolution, and resulted in the displacement of human beings to a peripheral position in a vast, impersonal universe with a concomitant disenchantment with the natural world (Tarnas, 2005,2006). According to Tarnas, a century later another shift took place with Descartes' *cogito ergo sum*, resulting in the human mind being distinct from the world, and the apprehended world being ultimately the mind's creation. After another century Kant expanded the epistemological consequences to say that all human knowledge was interpretive, affirming that the world is a construct of human thought. Darwin further intensified the alienation in the 19th century through emphasizing the relativism of the human being in the flux of evolution. When Darwin combined the materialism and the laws of chance, which had come to be the method of physical sciences, he believed he had found a comprehensive mechanism for the evolution of life and our existence. It seemed to many, especially those with a background in science, that the universe was a place without hope. And in the 20th century, Freud first recognized the deep continuity linking the Copernican revolution with the depth psychology revolution. Just as the former event had irrevocably transformed the outer cosmos, so the latter irrevocably transformed the inner cosmos, in each case radically overturning humankind's naïve conviction of its centricity. The Copernicans displaced the earth from the center of the universe to reveal a much larger, unknown cosmos in which the earth was now but a tiny peripheral fragment, while the Freudians displaced the conscious self from the center of the inner universe to reveal the much larger unknown realm of the unconscious. The modern self had to acknowledge that it was not master of its own house, as the confident Cartesian *cogito* had implied, but was rather a peripheral epiphenomenon of far more powerful processes working unfathomed beyond the boundaries of its awareness. This multidimensional alienation has led to cosmological, ontological and epistemological estrangement in a universe without hope and with no room for spirituality or God (quoted in part from Tarnas, 2005; Schafer, 2006, p.506).

However, there are signs that we may be in the midst of a new transformation, moving from modernism and postmodernism to trans-modernism and a more integral worldview (Yihong, 2004). Indeed, Armstrong suggests that we may be entering another Axial Age. If so, then the integration of science and spirituality will be key to this transformation and therefore an important topic to discuss in classes. Having moved from the unexamined integration of the unitive cosmology in primal cultures to the dualism stretching from the Axial Age to the modern era, we may now formulate a new level of integration, built on the deep knowledge acquired in all the separate disciplines, including science and the world's spiritual traditions. As Lemkow (1990, p.274) observes, "Societies create their own reality. In the past this creation has been largely unconscious. But now we have become conscious of situating ourselves to grasp better what it is we do, what we need to do to shape societal order. Our problems are of global proportion." The pluralism and multiplicity of worldviews of the postmodern era, all with their separate validity, have

set the stage for this transformation with the potential to alleviate the alienation felt by societies everywhere. This stage is illustrated at the right of Fig.1 by the anticipated stage of integrative cosmology and a connected worldview that is not a return to the unexamined unitive cosmology of the past (it was just the way things were). We may now build on the knowledge in all fields to permit integration at a different level of insight and consciousness. Some indication of the perceived significance of science and spirituality comes from the inclusion of their relationship as one of only twenty-four Commissions of the World Future Council in addressing the root causes and systemic problems of our global ills (Barber, 2005). It is also a dominant theme in the Science and Medical Network (2007), where many of the members have written about holistic theories of the universe.

In considering how to approach the integration of science and spirituality in the classroom, it is useful to frame a discussion around three ideas with philosophical implications potentially as far reaching as those originating in the sixteenth century. Each is illustrative of an apparent, fundamental connectivity and coherence in the universe that is central to a spiritual worldview.

The first idea relates to consciousness. In contrast to the modern worldview of separating subject and object, quantum mechanical theory implies that they are fundamentally entangled suggesting, according to some interpretations, that consciousness may be necessary for the full manifestation of reality. The new scientific understanding points to transcendent aspects of physical reality, and thus of human nature itself, providing new hope that a life with values is not necessarily in conflict with our sciences (Schafer, 2006). Prior to observation of an event an infinite potential for possible outcomes exists. Only through the participation of the observer, i.e., through consciousness, does the event crystallize into reality. Consciousness in some form may even have been present at the birth of the universe for the universe to manifest itself, or at least some information content must have been present, possibly inherited from prior universes. In this theory, consciousness is not a chance byproduct of matter in the universe but is an integral constituent of the universe. The entire universe is participatory and coherent. We find that the fundamental constituents of the universe exist in a kind of reality that appears different from the reality of the objects they form. The quantum entities stand betwixt the idea of an event and the actual event, in the middle between future possibility and reality. The particles are not definite in space. In a sense they are nowhere. They can act on each other without any delay or transmission of information, and appear to remain locked in a cosmic pattern, responding to an underlying field of information that is constantly present.

For completeness I must add that not all scientists who have thought about quantum reality would agree that consciousness *per se* is necessary for reality to emerge from the sea of potential. Wheeler (1998, pp.337-338), for example, argues that what is important is a measurement regarded as an irreversible act in which uncertainty collapses into certainty, whether by the click of a counter or the activation of an optic nerve in someone's eye. But he also emphasizes that the universe is a grand synthesis assembling itself all the time as a whole. Its history is not a history as we usually conceive history. It is not one thing happening after another. It is a totality in which what happens "now" gives reality to what happened "then," perhaps even determines what happened then. There remains a holistic aspect to the universe–not only in space but also in time. On the other hand, Shimony (1998, p.158) notes "from Whitehead's viewpoint of process reality, the hypothesis that the actualization of potentials through the psyche is not as ridiculous, anthropocentric, mystical and unscientific as it is commonly thought to be. According to Whitehead, something like mentality is pervasive throughout nature, but higher level mentality is contingent upon the evolution of special hospitable complexes of occasions. The capacity for a system to actualize potentialities…may be pervasive in nature but non-negligible only in systems with high-level mentality." Whatever the future understanding of the nature of reality, it is fairly clear that insight is coming from science, philosophy, spiritual traditions, art, poetry, psychology, neuroscience and much else. The progress in constructing reality is likely to be quicker if the builders in each area keep a close watch on the progress of the others. The intimations of reality of the present are likely to change radically when we also consider that new levels of consciousness are evolving that are conducive to greater integrative insight (Wilber, 2006; Gebser, 1954; Thomson, 1998; Gidley, 2006).

These discoveries open up a different interrelationship of all entities in the universe and the relation of subject and object, of interior and exterior. Such partitions may not even exist. The European

Enlightenment philosophers of the late 18th and early 19th centuries sought to bridge the diverging positions of empiricism and idealism (essentially science, spirituality and humanism) and tried to unite subject and object by assigning all power to reason as the source of reality. The Idealist program may perhaps now be resumed on the basis of quantum reality proposing that the background is mind-like and that it is the source of our metaphysical convictions (Schafer, 2006, p.506). We reach this conclusion because the only entity we know that can respond to a flow of information is the mind and, if the fundamental constituents of the universe also appear to act in this way, they too may have mind-like qualities. An exemplar of this multidimensional approach in science, humanities and spirituality is Goethe, who was an advocate for multiple ways of knowing. He spoke of a "delicate empiricism that makes itself utterly identical with the object, thereby becoming true theory. But this enhancement of our mental powers belongs to a highly evolved age." Let us hope that we are now entering that age He also anticipated the quantum reality on the relationship of subject and object when he wrote: "Every object, well contemplated, creates a new organ of perception within us."(Zajonc, 2006). Curiously, this same idea appears in Coleridge's writing; "Every fact, rightly considered, unlocks a faculty in the human soul." (Kane,2007). We may only wonder from where such synchronicities in thought arise. Perhaps they are indicative of the ability of writers to plumb some other, deeper level of reality.

The second idea that can help integrate science and religion is the anthropic principle, which asserts that many parameters of the universe, for example the strengths of the four fundamental forces and the masses of elementary particles, are finely tuned to make life possible. Even minute variations in these constants would lead to a sterile universe without life. This remarkable observation has several interpretations. Some say the universe is simply a matter of chance; the universe is the way it is and were it not we would not be here to talk about it! A vast mechanical, unconscious universe would play out its lonely existence without observers. However, this chance is estimated to be so remote that most scientists find the explanation unacceptable. Another interpretation is that our universe is simply a local region of a much more vast universe–or possibly of a series of multi-universes evolving over time either in parallel or serially–most of which, if not all, with different parameters that exclude life. According to Randall (2005) many disconnected universes probably exist, but we inhabit one with an incredibly small value of the vacuum energy necessary for life to exist, but the only one apparently allowing structure, including life, to form.

In response to this, many scientists are "optimistic" that in time we will discover there is nothing remarkable about the fine-tuning that makes life possible; it will be a consequence of some undiscovered principle. Some conjecture that the "purpose" of the universe is to maximize the number of black holes (Smolin, 2005), a constraint that may just happen to coincide with the conditions for life. But we might ask why this outlook is optimistic. Might it not also be possible that our universe is special in some way with its "design" for life? At least it is worth considering whether the universe, life, consciousness and the fundamental parameters all exist in some participatory, self-consistent, coherent design with some other "purpose." Perhaps that discovery might be more optimistic–and even the greatest discovery in the history of the universe! As Freeman J. Dyson once said, it is as if the universe had to know that we were coming from the first instant of the Big Bang when the fundamental constants were determined. Many other apparent "coincidences" also suggest design, such as space-time being perfectly flat in the absence of matter, implying an equally finely tuned universe in which even one billionth less or more matter would have resulted in a curved space-time (Laszlo, 2004). A possible conclusion from these and other apparent coincidences is that the coherent structure is difficult to understand in the absence of any purpose or self-consistent design. In one version of the anthropic principle by Wheeler (1983), known as the participatory anthropic principle, the universe explored all possibilities until it was able to generate consciousness. At that moment our universe crystallized into actuality, just as events in quantum mechanics collapse into reality through the observer. Where this consciousness came from is an open question–at least in science. Buddhist philosophers would claim that consciousness is primordial and exists prior to entering the physical event. The complete understanding of these matters may call for all the tools at our disposal, whether from science or spirituality.

These ideas serve as more productive launching point for discussing "intelligent design" in the theory of evolution of the universe rather than in the evolution of life, which is only one component of the entire design. The question of design or chance in the evolution of the *entire* universe remains an open

question, whereas biological evolution is better established. The finely tuned constants may be understood in a future theory, but in the meanwhile belief in either the extremes of chance or design is a matter of faith–faith in science or faith in religion. A wise approach is to keep an open mind, not rejecting *a priori* the spiritually connected and coherent universe implicit in the world's spiritual traditions for hundreds and even thousands of years.

The third idea that can be used as evidence for coherence between mind and matter, between cosmos and psyche, comes from mathematical theorems created as elegant models which then often find an application even hundreds of years later in a new theory of the universe, seemingly implying a connection between the structure of the mind and the structure of the universe (Polkinghorne, 2002). An example is certain theorems of Euler developed over 200 years ago, which now find an application in modern string theory of the universe. An older example is the abstract shapes of conic sections in Greek geometry, which then found application in the motions of the planets.

All three ideas point to a very different model of the universe from what we are accustomed. Bohm (2002) has proposed a holographic theory in which information about the entire universe is embedded in each and every component of the universe and vice versa. He refers to an implicate order in the universe, ultimately requiring that the universe has to be understood as a single, undivided whole. According to this theory, the uncertainty principle is simply a principle of unavoidable ignorance with epistemological rather than ontological significance. At a deep level of reality, everything may be determined (Polkinghorne, 2006). This idea, if correct, has enormous significance beyond science, such as notions of free will (Merali, 2006). Events in time may also possess a holographic dimension. To quote Peat (1987, p.58), "It is only when causality is pushed to the limit that it is discovered that the actual context in which events take place must extend indefinitely. In other words, everything that happens in our universe is caused by everything else. Indeed the whole universe could be thought of as unfolding or expressing itself in its individual occurrences." An extraordinary and ancient description of a holographic reality is also to be found in a Hindu Sutra describing the heaven of Indra where there is said to be a network of pearls so arranged that if you look at one you see all the others reflected in it. In the same way each object in the world is not merely itself but involves every other object, and in fact is in every other object (Eliot, 1954, p.6). We have to marvel from where that remarkable insight, now discovered in some scientific theories, appeared from thousands of years ago. Havel (1994) draws an analogy with the Gaia hypothesis, according to which we are parts of a greater whole in the world. In his words, "All of these principles of wholeness remind us, in modern language, of what we have suspected, of what we have projected into our forgotten myths and perhaps what has lain dormant within us as archetypes–the awareness that we are integral parts of higher, mysterious entities…encoded in all religions."

Pribram (2004) has suggested that the world of appearances is not totally wrong; there may be objects out there at one level of reality. But if we penetrate through and look at the universe with a holographic system, we arrive at a different reality, one that can explain things that have hitherto remained inexplicable: synchronicity as an apparently meaningful coincidence of events, such as the strange coincidences in the fundamental constants of the universe and the requirements for life.

If we believe in this interpretation, our relationship to the universe, to the world and to each other could change radically for the better (Apffel-Marglin, 2006; Barad, 2006). For those who question whether such abstract ideas have any relevance to everyday experience, we need only remind ourselves that the theories leading to separation and fragmentation were equally abstract hundreds of years ago but have nevertheless succeeded in generating a worldview separating the human being from the cosmos and from each other. The practical outcome has been that our universe and world are seen in a utilitarian way that has shaped human motivation in relation to the environment, to the persecution of anyone and anything we regard as separate. If everything is connected, we might more easily adopt a more global outlook. How do we extend these ideas into education so that a new generation will see the world whole? We need to show how this scientific knowledge can under-gird a search for harmonious relationships rather than furthering exploitation of others (Lemkow, 1990, p.286). To quote Schafer (2006, p.526) again, "If the nature of the universe is mind-like (and the data mentioned earlier in this essay seem so to indicate), it must be expected to have a spiritual order as well as a physical order and, (transcribing Eddington) in human beings this order rises to the level of morality…The nature of quantum reality now seems to suggest that to live in

accordance with the order of the universe is the cardinal value on which to build a system of ethics…It seems reasonable to suppose that the universal principles that appear in our thinking are reflections of a universal order. In that case the adaptation involved in moral behavior is the capacity of the mind to comprehend moral principles. In the same way that we have evolved the capacity to understand universal principles in physics, we evolved the capacity for universal principles in ethics." Of course, many might argue that the nature of reality at the quantum level has little to do with our macroscopic world. But then we have to ask where the quantum reality disappears. Recent experiments show that macroscopic phenomena may also exhibit non-locality, appearing in two places simultaneously, or be influenced by merely observing them (Schwab, 2006).

These discoveries and theories are not meant to suggest that we now have a "scientific" explanation of spirituality. Rather we now have a deeper understanding of reality that appears to have been implicit in the world's wisdom traditions for a long time. The lesson is to recognize that multiple ways of knowing may help to advance our understanding of all areas of knowledge and, more significantly, may accelerate the eventual integral understanding of the universe and of life within it. Rather than the *non-overlapping magisteria* of Gould, we come to realize that both science and spirituality are contributing to the understanding of the universe, and that the construction of this understanding will be more secure and more authentic if the builders of each maintain a close connection with each other.

Related Situations:

Since scientists are often considered the least likely to accept a spiritual dimension to their quest, the evidence for a connection in the light of modern discoveries may be a powerful catalyst for engaging other disciplines, which are *a priori* better disposed to a dialogue. For example a tension also exists between science and humanities in our academic institutions, related in many ways to the tension between science and spirituality. Wilber (1998) has drawn attention to the Kantian Big Three–the knowledge areas of science, art and religion, or equivalently science, humanities and spirituality–which are central to all cultures and societies throughout human history. Some differentiation of these knowledge areas is necessary, and led to what Wilber calls the dignity of the Enlightenment and modernity. It is their complete dissociation that resulted in the fragmentation and the disaster of our age, with this disaster nowhere more prominent than in science and spirituality or humanities. In the spirit of the analysis in the previous section, it may well be that the three knowledge spheres are akin to three languages, each projecting an understanding of reality, the ultimate understanding of which may require a new language. At present we have only dimly perceived intimations in the embryonic convergence of science and spirituality, although the world's spiritual traditions and the humanities have glimpsed this reality for a longer time. The problem is that they attained their insights–through organized religion or in the Romanticism, Idealism and Transcendentalism movements–by rejecting science and attempting to return to a pre-scientific worldview (Wilber, 1998). Our discussion here attempts to show a path forward, integrating the best insights and research from all disciplines–the essence of an integral worldview and a goal worthy of education at all levels everywhere. An exemplar of this multidimensional approach in science, humanities and spirituality is Goethe, who was an advocate for multiple ways of knowing. He spoke of a "delicate empiricism that makes itself utterly identical with the object, thereby becoming true theory. But this enhancement of our mental powers belongs to a highly evolved age." Let us hope that we are now entering that age (Zajonc, 2006)

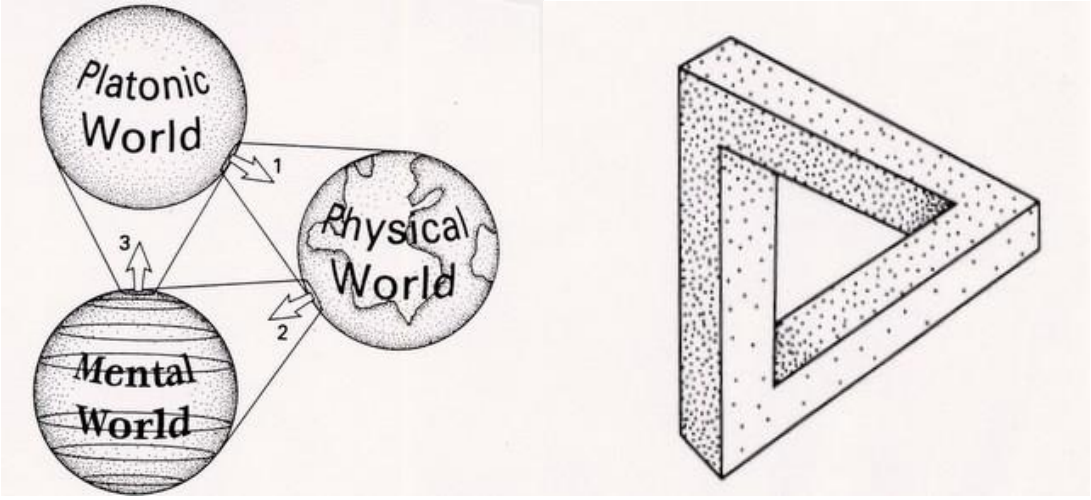

Figure 2: Three worlds and three mysteries (Penrose, 1997, p.138).

The relationship between these three "languages" in interpreting reality constitutes a mystery similar to the mystery of the three worlds shown in Fig. 2 (Penrose, 1997, p.96), representing the Platonic, Mental and Physical worlds. In this representation the physical world emerges from a Platonic world of forms (e.g. mathematical structures), because mathematics seems to describe our physical world with uncanny accuracy (refer to our earlier discussion). But there is also a feeling, as Penrose points out, that mathematics is "out there in the universe" quite independent of the physical world while it also seems to be an abstract creation of the human mind. It is hard to imagine that mathematics in all its beauty with Euclidean, Hilbert and Riemann spaces was built into the structure of the universe from the first moment of the Big Bang, long before human consciousness appeared on stage–unless consciousness was also present in some fashion as we have already alluded to in this essay. If consciousness is ubiquitous the relationships in Fig. 2 are less mysterious. The diagram also depicts a small part of the mental world accessing a larger Platonic world of (other) forms. Reciprocally and symmetrically the mental world accesses a part of the physical world. Penrose regards this triad as a mystery. The arrows are not actually meant to imply that any of the worlds simply emerge out of any of the others. Rather they imply a relationship and yet there is an impossibility about the entire representation in analogy with the diagram of triangles on the right, where each section is valid but the whole is not. The impossibility is a feature of the *whole* structure that can be resolved in a form of non-local mathematics. We might look at the triad of the three languages of reality in a similar way in that the relationship calls for a new language, a larger container that moves us into a new space.

The holistic unity that seems to be part of the ultimate reality of the universe, as we have been discussing in this essay, may eventually provide a solution. We may imagine the arrows in Fig.1 passing through each world rather than ending on a world (Penrose, 2004, p.20), pointing to a larger space beyond all the projections. The ideas in this essay give intimations of this larger space; they certainly provide fertile ground for cultivating the relationship of science, along with other areas of knowledge, and spirituality.

The languages of poetry, art and literature are powerful agents in moving us into new spaces, into larger mansions of the mind. It is extraordinary how the theme of holism runs through the work of so many writers, who provide constant intimations of a spiritual and connected worldview. The poem by Whitman is a good example:

I will not make poems with references to parts,
But I will make poems, songs, thoughts
with reference to the Ensemble.
And I will not sing with reference to a day,
but with reference to all days,

And I will not make a poem nor the least
part of a poem but has reference to the soul,
Because having looked at the objects of the Universe,
I find there is no one nor any particle of one
but has reference to the soul.

Not only writers but also poets, artists, scientists, philosophers, spiritual leaders and mystics show us that, although we live in a world of seeming division and multiplicity, their common vision expressed in the Perennial Philosophy (Huxley, 1940/1970) is unequivocal in asserting that a profound unity underlies the appearance of separation. Is it possible that so many people in so many diverse fields of knowledge can be wrong? Here are a few examples of this affirmation of wholeness, which is found in every spiritual tradition, in every culture, and in every age (adapted from Elgin, 1993) :

Ultimately, the entire universe…has to be understood as a single undivided whole."
--David Bohm, physicist

"Heaven and earth and I are of the same root…are of one substance."
--Sojo, a monk and scholar from the Zen tradition

When Jesus was asked, "When will the kingdom come?" He replied: "It will not come by waiting for it…Rather, the Kingdom of the Father is spread out upon the earth, and men do not see it." Jesus also said, "….the Kingdom is inside of you, and it is outside of you."
--Gospel of Thomas, Gnostic Gospels

"The Self is not reached. You are the Self; you are already "That."
--Ramana Maharishi, Hindu sage

"*For those who are awake the cosmos is one."*
--Heraclitus, philospher who lived in ancient Greece

"The flickering film of the phenomenal world is an illusion which cannot obscure the eternal unity that lies behind it."
--Arnold Toynbee, scholar of the world's civilizations and religions

"Each element of the cosmos is positively woven from all the others… The universe holds together, and only one way of considering it is really possible, that is, to take it as a whole, in one piece."
--Teilhard de Chardin, Catholic theologian

"God is nearer to me than I am to myself, He is just as near to wood and stone, but they do not know it."
--Meister Eckhart, Christian mystic

"The Absolute…dwells within the flux of things: stands as it were at the very threshold of consciousness and knocks, awaiting the self's slow discovery of her treasurers."
--Evelyn Underhill, from her book *Mysticism*

"Earth's crammed with Heaven, and every common bush afire with God."
--Elizabeth Barrett Browning, poet

"Not knowing how near Truth is,
People seek it far away—what a pity!
They are like him who, in the midst of water,
Cries in thirst so imploringly."
--Hakuin, from the Zen tradition in Japan

A promising gateway to this integral worldview may be opening through research on meditation and contemplative practice in various fields–law, education, health care and many others (Bush, 2006; Kabat-Zinn, 2006; Lutz, 2004; Robinson, 2005). Research on long-term meditators shows that their mental training involves a temporal, integrative mechanism in the brain, as well as a heightened capacity for compassion. It appears that we have a built-in integrative capacity, which is not well developed in most of us, but which may be enhanced through contemplative practice. Great spiritual leaders have a deeper understanding of this potential, but it is latent in all of us. Imagine the transformative power of discovering that a more developed spiritual sense might enhance the integrative and caring capacities we have always sought in all of education (Goleman, 2006; Robinson, 2003).

Sarath (2003) quotes testimonies from students engaged in meditation at the University of Michigan that suggest a wide range of benefits, from relieving stress to listening more carefully to each other, learning to clear the mind and focusing better on doing our jobs, and to enhancing our ability to remain calm in difficult situations. There is also evidence that meditation can promote a profound connecting link between different cultures, running sharply counter to prevailing postmodern tendencies that reject such transcendent connections. Sarath goes on to say that, ironically, the academic world–due to the necessity of extricating contemplative practice from overtly religious practice–may be poised to play a leadership role in restoring to religious practice the unifying aspects of this important domain of human experience. Meditation and contemplative practice may be thought of as simply extending the continuum of what constitutes education from more quantifiable, external kinds of knowledge (often regarded as the territory of science, the intellect and, indeed, of all academic knowledge) to those that are more interior (often regarded as the territory of spirituality) and abstract, but no less important to students' overall development. These developments suggest a growing interest in the relationship between spirituality and science as well as other disciplines. Not only have the discoveries in science generated this interest, but also the methods of science validate spirituality as a way of experiencing reality.

Mathematics is yet another point of contact for the integration of science and religion (spirituality). As we mentioned earlier, mathematics, an abstract creation of the human mind, is well accepted as a valid way of knowing in science and has, as we have seen, the remarkable capacity to explain the structure of the universe. The idea of mathematics as a spiritual activity has a long lineage from Pythagoras and Plato to Newton, Einstein and, in modern times, Stephen Hawking (McFarlane, 1995). Given this accepted expansion of the scientific way of knowing that has little connection with materialistic reality, it would be unscientific–as Professor McLeod conjectured while she was preparing to discuss science and spirituality with students–to reject out of hand the possibility of this third way of knowing, the path of spiritual insight and contemplative practice. Far from denying spirituality as a force in the universe and in human experience, science can pave the way for an expanded and integrative view of reality. The European Idealist philosophers in the 18th and 19th centuries wanted to bridge the diverging positions of empiricism and idealism, and they attempted to unite subject and object by ascribing all power to reason as the source of reality. As I noted earlier, the Idealist program may now be pursued afresh, based on theories of quantum reality, which seem to infer that fundamentally reality is mind-like (Schafer, 2006, p.507). In a mind-like reality, expanding human spiritual powers seems natural to the evolution of the universe and our actions should contribute to enhancing this reality (Polkinghorne, 2006). How might this happen? Quoting Schafer, "It seems reasonable to suppose that the universal principles which appear in our thinking are reflections of a universal order. In that case the adaptation involved in human behavior is the capacity of the mind to comprehend the significance of universal principles. In the same way in which we evolved the capacity to understand universal principles in physics we evolved the capacity for universal principles in ethics…The nature of quantum reality (as we have been describing in this essay) is the basis for considerable hope that that a life of meaning and values is not incompatible with the scientific frame of mind. In the quantum phenomena (and in the other phenomena I have mentioned in this essay) the universe has opened again" (Schafer 2006, p.528). Many years ago Palmer (1997) expressed the close connection between ways of knowing and ways of being in the world when he said, "The way we know has powerful implications for the way we live…Every epistemology tends to become an ethic, and…every way of knowing becomes a way of living."

Some might find it curious that the interest expressed by students in spirituality, mentioned at the beginning of this essay, is occurring at the same time that new insights on the convergence of science and

spirituality is also gaining significance. Such confluences often occur. They are examples of Hegel's comment that, "The Owl of Minerva spreads her wings only as dusk is falling." As an old order gives way, we see the maximum activity in the arise of a new paradigm. Although the world seems to be in a fragmented sate at the present time, a new hope is rising for a more connected and compassionate outlook. Professor McLeod saw the events as an example of a phase transition. In science as a system makes a transition to a new phase, there is a preceding state of great turmoil and chaos. She thought of the transition from water to steam. As the temperature increases the molecules in the water become increasingly agitated, each moving independently with greater random energy. But then suddenly at the boiling point all the molecules magically move in unison carrying the system to a new state. Perhaps, she surmised, there is an analogy with a paradigm shift in culture in society. The chaos and fragmented individualistic energy in the world today may be a harbinger–a tipping point–to a new collective phase of a more spiritual and connected worldview.

It is also the meaning underlying the quote by Richard Tarnas in his recent book, *Cosmos and Psyche: Intimations of a New World View*, from Sir James Frazer in *The Golden Bough*, written over a century ago. His words are also appropriate to end this essay. "In the last analysis magic, religion, and science are nothing but theories of thought and as science has supplanted its predecessors, so it may hereafter be itself superseded by some more perfect thought–the dreams of magic may one day be the waking realities of science" (Tarnas, 2006, p.492).

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David K. Scott received his D.Phil. from Oxford University and has worked as a nuclear scientist and as an educator, most recently as the Chancellor of the University of Massachusetts Amherst. He is now interested in creating a Community for Integrative Learning and Action (CILA) and in exploring the role of spirituality in higher education.

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