COSMOLOGY, SPIRITUALITY AND SCIENCE

'One cannot help but be in awe when one contemplates the great mysteries of eternity, of life, of the marvelous structure of reality.'
Albert Einstein

A New Worldview

The scientific understanding of the universe underwent a profound revolution during the 20th century. New methods of inquiry, the emergence of novel ideas, theories and cosmological models, and the advent of advanced technology and sophisticated experiments, revealed a world unlike anything imagined before, one which differed profoundly from that conceived by earlier generations of scientists. "The new physics and cosmology of the twentieth century are replete with understandings that challenge nearly every classical scientific notion of the past."

> With the opening of the twentieth century, the theories of quantum mechanics and relativity would make incomparable demands on our conception of the universe. We are still struggling to grasp their full implications. They challenge the simple mechanistic accounts of matter and the cosmos we inherited from earlier centuries, replacing them with accounts that shun such pictures. In addition, both quantum theory and relativity grant a new prominence to the observer. It is hard to overestimate the significance of these developments. The ramifications of twentieth-century discoveries for physics and cosmology have been enormous, changing our very notions of space and time, the ultimate nature of matter, and the evolution of the universe. They have also begun to affect philosophical discussions in significant ways. (1)

The radically new concepts and findings of relativity and quantum theory created a new scientific paradigm and worldview. "The theories of relativity and the quantum theory enabled tremendous advances in the ability of physics to explain phenomena, but in the process the concepts of space and time, matter and energy, and their relationships, became completely different from those we develop naturally as a result of our ordinary interactions with the world." Physicist Fritjof Capra describes the groundbreaking impact of this new paradigm:

> The new concepts in physics have brought about a profound change in our world view; from the mechanistic conception of Descartes and Newton to a holistic and ecological view, a view which I have found to be similar to the views of mystics of all ages and traditions. The new view of the physical universe was by no means easy for scientists at the beginning of the 20th century to accept. The exploration of the atomic and subatomic worlds brought them in contact with a strange and unexpected reality that seemed to defy any coherent description. In their struggle to grasp this new reality, scientists became painfully aware that their basic concepts, their language, and their whole way of thinking were inadequate to describe

> atomic phenomena. Their problems were not merely intellectual but amounted to an intense emotional and, one could say, even existential crisis. It took them a long time to overcome this crisis, but in the end they were rewarded with deep insights into the nature of matter and its relation to the human mind. (2)

The new worldview of subatomic physics replaced the seemingly solid, mechanistic and deterministic model of classical physics. Concepts such as dynamic process, non-causality, interdependency, uncertainty, mind and consciousness soon became part of the new vocabulary of physics:

> Developments in twentieth century physics have questioned and transcended every postulate of the Newtonian-Cartesian model. Astonishing explorations of both the macro-world and the micro-world have created an image of reality which is entirely different from the earlier model used by mechanistic science. The myth of solid and indestructible matter, its central dogma, disintegrated under the impact of experimental and theoretical evidence that the fundamental building blocks of the universe – the atoms – were essentially empty. Subatomic particles showed the same paradoxical nature as light, manifesting either particle properties or wave properties depending on the arrangement of the experiment. The world of substance was replaced by that of process, event, and relation. In subatomic analysis, solid Newtonian matter disappeared. What remained were activity, form, abstract order, and pattern . . . In new physics, the objective world cannot be separated from the observer, and linear causality is not the only connecting principle in the cosmos. The universe of modern physics is not the gigantic mechanical clockwork of Newton, but a unified network of events and relations. Many prominent scientists believe that mind, intelligence, and possibly consciousness are integral parts of existence rather than insignificant products of matter. (3)

Modern physics points to the unity and oneness of the universe. Matter, rather than consisting of independent building blocks, appears as a complicated 'web of relationships' among the various parts of a unified whole. In the words of Nobel physicist Werner Heisenberg: "The world thus appears as a complicated tissue of events, in which connections of different kinds alternate or overlap or combine and therefore determine the texture of the whole." Physicists discovered that reality is not a mechanical system of separate objects and events, of isolated entities, but a network of interconnected and interwoven dynamic events or processes.

In the quantum world matter is not passive and inert; it is in continuous, vibrating motion whose rhythmic patterns are determined by the molecular, atomic and nuclear structure in nature. "There is stability, but this stability is one of dynamic balance." These processes in the subatomic realm have sometimes been metaphorically described as a "cosmic dance":

> Physicists and mystics agree that what we call "objects" are really patterns in an inseparable cosmic process, and they also agree that these patterns are intrinsically dynamic. In subatomic physics, mass is no longer associated with a material

> substance but is recognized as a form of energy. Energy, however, is associated with activity, with processes; it is a measure of activity. Subatomic particles are dynamic patterns, processes rather than objects – a continuous dance of energy. The metaphor of the dance naturally comes to mind when one studies the dynamic web of relationships that constitutes the subatomic world. Since mystics have a dynamic worldview similar to that of modern physicists, it is not surprising that they, too, have used the image of the dance to convey their intuition of nature. The metaphor of the cosmic dance has found its most beautiful expression in the image of Shiva Nataraja, the Lord of Dancers. For the modern physicist, the dance of Shiva is the dance of subatomic matter. As in Hindu mythology, it is a continual dance of creation and destruction involving the whole cosmos – the basis of all existence and of all natural phenomena. (4)

One of the consequences of the new paradigm is the realization that processes in nature never occur in isolation, since a multiplicity of influences enter into any event. Chaos theory reflects this complexity and unpredictability. One example is the "Butterfly Effect," whereby a cumulatively large effect can be produced over a period of time by a very small initial force. In the natural world this principle can be observed in the long-term development of weather patterns from the influence of seemingly insignificant factors. Physicist Arthur Zajonc: "How can the extremely small effects of quantum mechanics make a difference at the macroscopic level? The study of nonlinear dynamic systems shows that under certain circumstances small influences can be magnified dramatically, even exponentially. This is called sensitive dependence on initial conditions, or the 'butterfly effect'."

> Incredible as it seems, scientists discovered that the tiny turbulence created by a butterfly flapping its wings in Tokyo can eventually amplify into a tornado in Kansas. And a person slamming a car door in Iowa can therefore influence the weather in Brazil. Everything is connected on a deeper level of reality. Weather only appears random to meteorologists because they are unable to perceive and measure all the millions of influences that contribute to a stormy day – such as flapping butterflies and slamming doors. (5)

The Observer in Science

One of the assumptions of the classical scientific method is that the experimenter or observer is *independent* of that which is observed, so that the observation and interpretation of an event, pro- cess or object does not depend on any particular person. In this way the outcome of an experiment can be generalized, with the assumption that other experimenters can obtain the same result with a similarly designed experiment at another time and place.

It was not until the beginning of the 20th century that scientists began to realize that the experimenter was an integral component in the perception and interpretation of scientific studies and experiments. Quantum theory challenged the prevailing scientific worldview which mini-

mized the importance of the role of the experimenter. The objects of the world were no longer seen as having pre-existing properties which can be discovered by passive observation. Quantum physics acknowledged that the process of observation is essential to the determination of the property. Physicist Niels Bohr once famously said: "No phenomenon is a phenomenon until it is an *observed* phenomenon."

Quantum physics differs sharply from classical physics in terms of the emphasis placed on the importance of human consciousness in the process of observation and interpretation of phenomena. "Quantum mechanics destroyed the materialistic scientist's ideal of complete objectivity, of removing himself from the subject of investigation. Observation – some would say consciousness – plays an inescapable role in determining the apparent nature of phenomena."

> The most astonishing transformation of world view that the new physics has undertaken is this – the recognition that *consciousness does play a role in the so-called physical universe*. Since the time of Newton, physics has always tried to maintain a strictly empirical approach. It was a trusted myth that the laws of the physical world did not change; given the proper tools and instruction any physicist could duplicate the experiments and observations of any other physicist. The role of empiricism in science has always demanded a dispassionate observer and concentrated upon objective reality as a single, observable "something" *a priori* to the consciousness. It doesn't matter which physicist or which mind makes the observation. It's the "same" universe and that's what counts. But the new physics, the physics of quantum theory has found *it does matter*. Given the proper tools and instructions a physicist will not necessarily duplicate the experiments and observations of another physicist. The outcome of any particular experiment no longer seems to depend only upon the "laws" of the physical world, but also on the consciousness of the observer . . . The recognition of the role of consciousness in the processes of the physical universe is a radical departure from classical physics. (6)

One of the implications of quantum theory is the essential unity of subject and object, observer and observed. The notion of an "objective," neutral, value-free scientist was no longer tenable. Erwin Schrödinger: "The world of science lacks, or is deprived of, everything that has a meaning only in relation to the consciously contemplating, perceiving and feeling subject. I mean, in the first place, the ethereal and aesthetic values, everything related to the meaning and scope of the whole display. The show that is going on obviously acquires a meaning only with regard to the mind that contemplates it."

> We now know in physics, since Heisenberg, that the classical ideal of scientific objectivity can no longer be maintained. Scientific research involves the observer as a participant and this involves the consciousness of the human observer. Hence, there are no objective properties of nature, independent of the human observer. Now this insight, which is one of the main parallels to mystical knowledge, implies that science can never be value free. The detailed research, for

> instance knowing the mass of a proton or the interactions between particles, will not depend on my values, my political beliefs, and so on. However, this research is pursued within the context of a certain paradigm, a broader vision of reality, which involves not only concepts but also values. And therefore science is always implicitly subscribing to a set of values, and scientists are not only intellectually responsible for their research but also morally responsible. There is no way of escaping this responsibility. (7)

Mind and Consciousness

One of the implications of Einstein's theory of relativity was the critical importance of the observer in any attempt to measure natural phenomena. Einstein demonstrated that the flow of time depends on the frame of reference of the observer. There is no such thing as absolute time, independent of the act of measurement. This accords with traditional spiritual teachings on the nature of mind and consciousness. Professor Jacob Needleman: "According to the ancient idea of *universal relativity*, all things in the universe exist only in relationship to a mind which perceives them or a purposive consciousness which creates them."

In a series of conversations on the interface between science and spirituality with leading scientists, the Dalai Lama stressed the largely unacknowledged role of mind and consciousness in the scientific effort to understand reality: "Scientific materialism upholds a belief in the objective world, independent of the contingency of its observers. It assumes that the data being analyzed within an experiment are independent of the preconceptions, perceptions and experiences of the scientist studying them."

> Science deals with that aspect of reality and human experience that lends itself to a particular method of inquiry susceptible to empirical observation, quantification and measurement, repeatability, and inter-subjective verification – more than one person has to be able to say, "Yes, I saw the same thing. I got the same results." So legitimate scientific study is limited to the physical world, including the human body, astronomical bodies, measurable energy, and how structures work. The empirical findings generated in this way form the basis for further experimentation and for generalizations that can be incorporated into the wider body of scientific knowledge. This is effectively the current paradigm of what constitutes science. Clearly, this paradigm does not and cannot exhaust all aspects of reality, in particular the nature of human existence. In addition to the objective world of matter, which science is masterful at exploring, there exist the subjective world of feelings, emotions, thoughts, and the values and spiritual aspirations based on them. If we treat this realm as though it had no constitutive role in our understanding of reality, we lose the richness of our own existence and our understanding cannot be comprehensive. Reality, including our own existence, is so much more complex than objective scientific materialism allows. (8)

A number of perceptive physicists and cosmologists have argued that the significance of the mind and consciousness of the experimenter is ignored by most scientists. Erwin Schrödinger: "Without being aware of it and without being rigorously systematic about it, we exclude the subject of cognizance from the domain of nature that we endeavour to understand." Sir Arthur Eddington also recognized that mind is the most primary and direct thing we experience and that "the substratum of everything is essentially mental in character."

> The entities of physics can from their very nature form only a partial aspect of the reality. How are we to deal with the other parts? It cannot be said that that other part concerns us less than the physical entities. Feelings, purpose, values, make up our consciousness as much as sense impressions. We follow up the sense impressions and find that they lead into an external world discussed by science; we follow up the other elements of our being and find that they lead not into a world of space and time, but surely somewhere . . . Consciousness as a whole is greater than those quasi-metrical aspects of it which are abstracted to compose the physical brain. We have then to deal with those parts of our being unamenable to metrical specification, that do not make contact into space and time. (9)

Leading-edge physicist David Bohm proposed a holistic model of the universe which incorporates all aspects of reality, including mind and consciousness. He held that the sense of an "undivided wholeness in flowing movement" is implied in the modern developments in physics, notably relativity theory and quantum theory: "Each relatively autonomous and stable structure (e.g., an atomic particle) is to be understood not as something independently and permanently existent but rather as a product that has been formed in the whole flowing movement and that will ultimately dissolve back into this movement. How it forms and maintains itself, then, depends on its place and function in the whole."

> Relativity and quantum theory agree, in that they both imply the need to look on the world as an *undivided whole*, in which all parts of the universe, including the observer and his instruments, merge and unite in one totality. In this totality, the atomistic form of insight is a simplification and an abstraction, valid only in some limited context. This new form of insight can perhaps best be called *Undivided Wholeness in Flowing Movement*. This view implies that flow is, in some sense, prior to that of the 'things' that can be seen to form and dissolve in this flow. One can perhaps illustrate what is meant here by considering the 'stream of consciousness.' This flux of awareness is not precisely definable, and yet it is evidently prior to the definable forms of thoughts and ideas which can be seen to form and dissolve in the flux, like ripples, waves and vortices in a flowing stream . . . In this flow, mind and matter are not separate substances. Rather, they are different aspects of one whole and unbroken movement. In this way, we are able to look on all aspects of existence as not divided from each other, and thus we can bring to an end the fragmentation implicit in the current attitude toward the atomic point of view, which leads us to divide everything from everything in a thoroughgoing way. (10)

The internal and subjective experience of consciousness is difficult to describe from a strictly scientific perspective. "Western philosophy and science have, on the whole, attempted to understand consciousness solely in terms of the functions of the brain. This approach effectively grounds the nature and existence of the mind in matter, in an ontologically reductionistic manner." For instance, no current scientific description of the neural mechanisms in the brain of colour discrimination can convey the actual subjective experience of perceiving the colour of green or blue. In the words of the Dalai Lama:

> The joy of meeting someone you love, the sadness of losing a close friend, the richness of a vivid dream, the serenity of a walk through a garden on a spring day, the total absorption of a deep meditative state – these things and others like them, constitute the reality of our experience of consciousness. Regardless of the content of any one of these experiences, no one in his or her right mind would doubt their reality. Any experience of consciousness – from the most mundane to the most elevated – has a certain coherence and, at the same time, a high degree of privacy, which means that it always exists from a particular point of view. The experience of consciousness is entirely subjective. The paradox, however, is that despite the indubitable reality of our subjectivity and thousands of years of philosophical examination, there is little consensus on what consciousness is. Science, with its characteristic third-person method – the objective perspective from outside – has made strikingly little headway in this understanding. There is, however, a growing recognition that the study of consciousness is becoming a most exciting area of scientific investigation. At the same time, there is a growing acknowledgment that modern science does not yet possess a fully developed methodology to investigate the phenomenon of consciousness. (11)

It is only through the human mind and consciousness that we can have a direct experience of an intelligent universe and our place in it. One meaning of the ancient dictum 'as above, so below' is that "Man is in the Universe and the Universe is in Man."

> What our scientists have discovered about ourselves and the Universe is so unfathomably complex and interconnected, both transcendent and immanent, that it is sufficient as proof of an unimaginable intelligence behind the pattern. The pattern follows Principles or Laws. The Laws must precede the pattern. As the manifestation of the greatest organizing intelligence, the Laws point to their origin as the 'space' beyond what exists – the place of No-thing. In the world outside, science has led us to the edge of the No-thing, just beyond the moment of creation at the limit of the known Universe. Inside it has led us to the place where ongoing creation comes from No-thing, currently called the "quantum foam," out of which appear and disappear "particles" of energy which ultimately bind together to form all and everything that is. Most likely, these two frontiers are the same 'place.' In the middle is Consciousness, the place of *reception* and *interpretation*. As we seem to be consciousness itself, we are thus part of the mystery inside the

> No-thing. To explore the Laws emanating from the realm of No-thing, we must also go inside ourselves. (12)

Cosmology and Spirituality

For much of human history the universe was regarded as conscious and alive, a vibrant web of interrelated energies and spiritual possibilities. In his *A Sense of the Cosmos*, Jacob Needleman describes this ancient conception of a living cosmos: "We are speaking of a conscious, living universe. Everything that lives transforms disorder into order. Everything that dies moves from order to disorder. This movement between order and disorder, between unity and dispersion, between energy and manifestation – movement in both directions – is precisely the sense and meaning of a living universe, what the ancient Hindus called a 'breathing cosmos'."

This traditional worldview is in sharp contrast to the scientific conception of the universe grounded in materialism and empirical fact. In the words of Dr. Christian Wertenbaker: "The sense of meaning, of the nature and purpose of life, the sense of communion with a living, conscious universe, has gone out of the enterprise."

> One meaning of the word "mystical" is "hidden." The great mystical knowledge which has existed since very ancient times has always been, in part, contrary to ordinary common sense and inaccessible to the ordinary mind. Not that modern science and mysticism are the same thing. Their methods are very different. Science regards knowledge as external, in a sense: it has to be demonstrable by manipulations of the external world. Mysticism regards true knowledge as graspable from within, by a specially trained, more inclusive, higher consciousness. This presupposes that we humans can be in tune with the essence of the cosmos. For many scientists this is an unproved fantasy, and certainly people can claim all kinds of revelations which are demonstrably hallucinatory. So scientists demand external verification. But, in both cases, special training is needed, and when you get right down to it, faith in logic and observation also presupposes a kind of being in tune with the universe. In my more optimistic moments, I think that science came about in its present form in order to bring a different kind of rigor to mystical knowledge, and that the two kinds of knowing are destined to join together . . . I think the real difference between modern science and true mysticism is that the scientist deliberately tries to ignore the role of the subject in understanding the world. But no understanding exists except within a conscious being; the understanding does not exist on paper, in the formulas and diagrams. Science also does not consider differing capacities for understanding, dependent not just on intellectual training but on an even more rigorous development of a higher capacity for consciousness – the aim of the mystical teachings. (13)

In many traditional spiritual teachings consciousness is seen as the unconditional, formless ground of existence prior to and supporting the manifestation of the world of matter and sentient beings. At the heart of these teachings is the thesis that consciousness is the primary experience of every human being: "The mystical truth that there is nothing but consciousness must be personally experienced in order to be truly understood."

> We must consider that consciousness is present in the universe in some way from the beginning. The mathematical order in the structure of the atom, for instance, is a sign of an intelligence at work in matter. In the ancient world, Aristotle and the Arabian philosophers considered that the stars were intelligences, an idea with which the teachings of Sri Aurobindo is related. Responsible for introducing the theory of evolution into Vedantic philosophy, Sri Aurobindo maintained with all Vedantic philosophers that Ultimate Reality is also pure consciousness. It is *satchitananda*, or absolute Being (*sat*) in pure consciousness (*chit*) which is experienced as perfect bliss (*ananda*). This is the ideal state of being according to all Vedantic philosophy, the state of being in pure consciousness. But according to Aurobindo, the Absolute Being becomes "involved" in matter. It withdraws its consciousness and allows matter to appear as being, without consciousness. As matter evolves through the *shakti*, the energy inherent in it, and develops more complex organisms, the divine consciousness manifests itself as life. (14)

Physicist Amit Goswami, who is conversant in the fields of both science and spirituality, presents the concept of 'monistic idealism' which posits that matter is secondary to consciousness, which itself is the foundation of all being. "In materialistic philosophy, consciousness is an epiphenomenon of matter. According to monistic idealism, objects are already in consciousness as primordial, transcendent archetypal possibility forms."

> In the idealist philosophy, consciousness is fundamental; thus our spiritual experiences are acknowledged and validated as meaningful. This philosophy accommodates many of the interpretations of human spiritual experience that have sparked the various world religions. From this vantage point we see that some of the concepts of various religious traditions become as logical, elegant, and satisfying as the interpretation of experiments of quantum physics. 'Know thyself.' This was the advice through the ages of philosophers who were quite aware that our self is what organizes the world and gives it meaning; to know the self along with nature was their comprehensive objective. Modern science's embracing of material realism changed all that; instead of being united with nature, consciousness became separate from nature, leading to a psychology separate from physics. (15)

At the heart of traditional Eastern spiritual teachings is a 'perennial philosophy' that recognizes consciousness and creative intelligence as the primary attributes of existence, including both the phenomenal and transcendental realms of reality. The Dalai Lama: "According to Buddhism, a deep philosophical analysis of reality reveals its ultimate emptiness. Reality is

considered to be a series of momentary phenomenal events. Moreover, these phenomenal events do not originate purely from the side of the external world alone but rather are contingent on a complex causal nexus that includes the mind."

> Although the various schools of Eastern mysticism differ in many details, they all emphasize the basic unity of the universe which is the central feature of their teachings. The highest aim for their followers – whether they are Hindus, Buddhists or Taoists – is to become aware of the unity and mutual interrelation of all things, to transcend the notion of an isolated individual self and to identify themselves with the ultimate reality. The emergence of this awareness, known as 'enlightenment,' is not only an intellectual act but is an experience which involves the whole person and is religious in its ultimate nature. In the Eastern view, then, the division of nature into separate objects is not fundamental and any such objects have a fluid and ever-changing character. The Eastern worldview is therefore intrinsically dynamic and contains time and change as essential features. The cosmos is seen as one inseparable reality – forever in motion, alive, organic; spiritual and material at the same time. (16)

Throughout human history, traditional conceptions of the universe were expressed in a wide variety of allegorical and symbolic terms designed to resonate with higher human capacities and perceptions. In *The Theory of Celestial Influence*, Rodney Collin describes how symbols can serve as a language which reaches the higher emotional and intellectual functions in order to convey spiritual truths: "Symbols are based on an understanding of true analogies between a greater cosmos and a smaller, a form or function or law in one cosmos being used to hint at the corresponding forms, functions and laws in other cosmoses. This understanding belongs exclusively to higher or potential functions in man, and must always produce a sense of bafflement and even frustration when approached by ordinary functions, such as that of logical thought."

> The most astonishing thing about these ancient 'models of the universe' arising in widely separated ages, continents and cultures, is precisely their similarity. So much so that a good case can be made out for the idea that *higher consciousness always reveals the same truth*, solely on the basis of a comparative study of certain existing models of the universe which seem to derive therefrom – for example, the Cathedral of Chartres, the Great Sphinx, the New Testament, and the Divine Comedy . . . The more complete 'models of the universe' created by schools in the past aimed at combining formulations of what they wished to express in many languages, so as to appeal to several or all functions at once. In the cathedral, for example, the language of poetry, posture, ritual, music, scent, art and architecture were successfully combined; and something similar appears to have been done in the dramatic representations of the Eleusinian mysteries. Again, in certain cases, for instance in the Great Pyramid, the language of architecture seems to have been used not only for the symbolism of its form, but in order to create in a person passing through the building in a certain way, a quite definite series of emotional impressions and shocks, which had a definite

> meaning in themselves, and which were calculated to reveal the very nature of the person exposed to them. (17)

To fully comprehend the higher dimensions of reality one needs to develop a more evolved level of spiritual knowledge and understanding. Traditional spiritual teachings affirm that self-knowledge and self-cultivation are the keys that open the door to a more expanded and inclusive understanding of both the inner and outer worlds of man. The Dalai Lama: "There are modes of experience or phenomena that emerge through the power of a contemplative's own transformed mind, and they don't exist without that. If you empower your mind by various contemplative practices, a certain realm of reality arises through the maturation of your contemplative insight."

> The primary concern of virtually all spiritual traditions, Eastern and Western, and in particular the Buddhist tradition, is self-knowledge: understanding and realization of the self through the science of spiritual exercises and the art of self-cultivation. In this sense, philosophy is a way of life, consisting of spiritual exercises to explore the inner landscape. The focus of science is to explore nature, the outer landscape. (18)

Harmonization of Spirituality and Science

Science has revolutionized our understanding of the external world of sensory phenomena and fundamentally changed human civilization through rapid technological advances. It has also contributed valid approaches to illuminate the inner world of human consciousness and experience.

Both the scientific method and the timeless principles underlying the world's spiritual traditions embody an impartial, objective approach and perspective based on observation, exploration and experiment. Dr. Keith Buzzell proposes a complementary relationship between these two methods of understanding our inner and outer worlds: "If there is to be a reconciling impulse appropriate to and sufficient for the present age in the life of humankind, it must contain a level of understanding, and a potency that can incorporate scientific principles *and* all of the core values and purposes of the Great Traditions."

> During the past four centuries, one singular perspective on reality has been dominant above all others. The entry of the scientific method into Western Europe in the 16th Century represents the most powerful two-edged blade ever to enter the life of man. Science, in all its branches and with all of its technological by-products, has transformed the physical world of man and all other life. It has opened multiple doors into man's inner worlds as well, bringing into question the underpinnings of each and all of the forms, values and functional manifestations of every spiritual teaching. How profound and far reaching the influence of science has been and will be, and even in the 21st Century, is only barely perceived. For the most part,

> humankind, individually and collectively, is still in a reactionary state characterized by denial, opposition, opportunism, redefinition or dismissiveness. Each of these reactions has failed to *digest the spiritualizing* potential of the scientific perspective. What science has brought, in its methods, its relative objectivity and its verifiability, is a treasure of infinite value. What humanity has learned concerning the laws that underpin our physical world is more than astonishing, it is a *seeing* that is the realization of one of the highest capacities; the ability to image cosmic or higher law in the physical world. With the progressive levels of seeing into the nature of physical law has come the application of that knowledge to all of humanity's activities. (19)

A number of scientists have recognized that a comprehensive understanding of the universe must include a spiritual dimension as well as a material dimension. For instance, Fritjof Capra argues that "mystical thought provides a consistent and relevant philosophical background to the theories of contemporary science, a conception of the world in which scientific discoveries can be in perfect harmony with spiritual aims and religious beliefs." Science can expand its horizons by incorporating the insights of traditional spiritual teachings. Princeton professor of Astrophysics Piet Hut: "We can have knowledge of a much broader range of phenomena than science has traditionally allowed. This includes knowledge based on lived human experience, both of the outer world, accessible to the senses, and the inner world, opened by reflection and contemplation. In other words the scope of science can indeed become more encompassing and vaster in a way that is neither reductionistic nor strictly quantitative, and yet it can remain true to the essential values of scientific inquiry."

> There is a strange and wonderful *mathematical* order in physical phenomena, and this has moved the minds of some of the most thoughtful modern physicists away from the crude materialism which ruled their science in the nineteenth century, and has made them aware of a transcendental reality. Even when traditional religion, which ascribed to God "the kingdom, the power, and the glory," remained unacceptable to them, they could not fail to recognize supreme mathematical talent somewhere in the construction and management of the Universe. Thus there has been, from the scientific side, a significant movement toward closing the infinitely harmful rift between natural science and religion. Some of the most advanced modern physicists would even agree with René Guénon's claim that "the whole of nature amounts to no more than a symbol of transcendent realities." (20)

The Scientist as Mystic

Many of the world's leading physicists and scientists have expressed a sense of profound spiritual connection with the universe. In their writings they reveal a deep understanding of life that transcends mere physical existence and touches the mystical dimensions of reality:

God reveals himself in the harmony of all that exists.

Albert Einstein

Man stands on this diminutive earth, gazes at the myriad stars and upon billowing oceans and tossing trees and wonders. What does it all mean? How did it come about?

Albert Einstein

For me, there is room for both a spiritual universe and a physical universe, just as there is room for both religion and science. Each has its own beauty, wonder and mystery.

Alan Lightman

The scientist as such must recognize the value of religion as such, no matter what may be its forms, so long as it does not make the mistake of opposing its own dogmas to the fundamental laws upon which scientific research is based.

Max Planck

I believe that our physical universe is somehow wrapped within a broader and deeper spiritual universe, in which miracles can occur. The scientific picture of the world is an important one. But it does not apply to all events.

Owen Gingerich

Mysticism, which is equally at home in both East and West, endeavors to experience the unity of things, in that it seeks to penetrate beyond multiplicity, which it treats as an illusion. At the endpoint of the mystical experience the soul is entirely divorced from all objects and united with the divine.

Wolfgang Pauli

A spirit is manifest in the laws of the universe, a spirit vastly superior to that of man, and one in the face of which we with our modest powers must feel humble. In this way the pursuit of science leads to a religious feeling of a special sort.

Albert Einstein

In my scientific and philosophical work, my main concern has been with understanding the nature of reality in general and consciousness in particular as a coherent whole which is never static or complete, but which is in an unending process of movement and manifestation.

David Bohm

What is the ultimate truth about ourselves? There is one elementary unescapable answer. *We are that which asks the question*. Whatever else there may be in our nature, responsibility towards truth is one of its attributes. This side of our nature is aloof from the scrutiny of physics.

Arthur Eddington

The scientific worldview contains of itself no ethical values, not a word about our own ultimate scope or destination, and no God, if you please. Whence came I, wither go I? Science cannot tell us a word about why music delights us, and why and how an old song can move us to tears.

Erwin Schrödinger

My religious feeling takes the form of a rapturous amazement at the harmony of natural law, which reveals an intelligence of such superiority that, compared with it, all the systematic thinking and acting of human beings is an utterly insignificant reflection.

Albert Einstein

The root of truth is love.

Andrei Sakharov

A critical level of confusion permeates the world today. Our faith in the spiritual components of life – in the vital reality of consciousness, of values, and of God – is eroding under the relentless attack of scientific materialism. On the one hand, we welcome the benefits derived from a science that assumes the materialistic worldview. On the other hand, this prevailing worldview fails to satisfy our intuitions about the meaningfulness of life . . . We have come to accept materialism dogmatically, despite its failure to account for the most familiar experiences of our daily lives. In short, we have an inconsistent worldview. Our predicament has fueled the demand for a new paradigm – a unifying worldview that will integrate mind and spirit into science. (21)

Amit Goswami

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There can never really be any real opposition between religion and science. Every serious and reflective person realizes, I think, that the religious element in his nature must be recognized and cultivated if all the powers of the human soul are to act together in perfect balance and harmony. And, indeed, it was not by any accident that the greatest thinkers of all ages were also deeply religious souls, even though they made no public show of their religious feeling. It is from the cooperation of the understanding with the will that the finest fruit of philosophy has arisen, namely, the ethical fruit. Science enhances the moral values of life because it furthers a love of truth and reverence – love of

truth displaying itself in the constant endeavor to arrive at a more exact knowledge of the world of mind and matter around us, and reverence, because every advance in knowledge brings us face to face with the mystery of our own being. (22)

Max Planck

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I would be the first to challenge any belief that contradicts the findings of science. But there are things we believe in that do not submit to the methods and reductions of science. Furthermore, faith and the passion for the transcendent that often goes with it have been the impulse for so many exquisite creations of humankind. Consider the verses of the *Gita*, the *Messiah*, the mosque of the *Alhambra*, the paintings on the ceiling of the Sistine chapel. Faith, in its broadest sense, is about far more than belief in the existence of God or the disregard of scientific evidence. Faith is the willingness to give ourselves over, at times, to things we do not fully understand. Faith is the belief in things larger than ourselves. Faith is the ability to honor stillness at some moments and at others to ride the passion and exuberance that is the artistic impulse, the flight of the imagination, the full engagement with this strange and shimmering world. (23)

Alan Lightman

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You can throw yourself flat on the ground, stretched out upon Mother Earth, with the certain conviction that you are one with her and she with you. You are as firmly established, as invulnerable as she, indeed, a thousand times firmer and more invulnerable. As surely as she will engulf you tomorrow, so surely will she bring you forth anew to new striving and suffering. And not merely 'some day': now, today, every day she is bringing you forth, not once but thousands of times, just as everyday she engulfs you a thousand times over. For eternally and always there is only *now*, one and the same now; the present Is the only thing that has no end. (24)

Erwin Schrödinger

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We all know that there are regions of the human spirit untrammeled by the world of physics. In the mystic sense of the creation around us, in the expression of art, in a yearning towards God, the soul grows upward and finds the fulfillment of something implanted in its nature. The sanction for this development is within us, a striving born with our consciousness or an Inner Light proceeding from a greater power than ours. Science can scarcely question this sanction, for

the power of science springs from a striving which the mind is impelled to follow, a questioning that will not be suppressed. Whether in the intellectual pursuits of science or in the mystical pursuits of the spirit, the light beckons ahead and the purpose surging in our nature responds. (25)

Arthur Eddington

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Science cannot solve the ultimate mystery of nature. And that is because, in the last analysis, we ourselves are part of nature and, therefore, part of the mystery that we are trying to solve. Music and art are, to an extent, also attempts to solve or at least to express the mystery. But to my mind, the more we progress with either, the more we are brought into harmony with all nature itself. And that is one of the great services of science to the world. Goethe once said that the highest achievement to which the human mind can attain is an attitude of wonder before the elemental phenomena of nature. (26)

Max Planck

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The most beautiful and most profound emotion we can experience is the sensation of the mystical. It is the sower of all true science. He to whom this emotion is a stranger, who can no longer wonder and stand rapt in awe, is as good as dead. To know what is impenetrable to us really exists, manifesting itself as the highest wisdom and the most radiant beauty which our dull faculties can comprehend only in their most primitive forms – this knowledge, this feeling is at the center of true religiousness. (27)

Albert Einstein

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