Think Outside the *Bang*

Beyond quantum theory and hidden dimensions to a holistic account of consciousness, mind and matter

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by

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Prologue

A remarkable legacy of the pursuit of total knowledge of the laws of nature has been achieved in modern science. However, gaps between even the most successful theories—quantum, relativity, and evolutionary theories—exemplify its current fragmented account. And its emerging most fundamental theory—unified field theory—logically necessitates that the gaps be bridged. Three core topics are examined: cosmology, consciousness, and evolution. A testable holistic alternative is introduced that bridges the gaps, with immense theoretical and practical implications.

In modern science the pre-eminent means of gaining knowledge has been the objective approach from the outer third-person perspective. This approach has produced a massive body of reliable knowledge and rigorous standards of validation, allowing us to progress quite a ways out of the shadows of superstition to a more accurate account of nature. We are now at the doorstep of the ultimate unification in unified field theory, truly a profound achievement.

However, unification remains a most daunting task. Indeed, fundamental dilemmas in the most successful theories in modern science still reflect a deeply fragmented account of nature. And a subtler, more integrative view of the link between matter and mind is needed to bridge the gaps. In this book three core topics that reflect current gaps and dilemmas are addressed in a straightforward analysis and synthesis: cosmology and the origin of the universe, consciousness and mind, and evolutionary theory. It leads directly to a more coherent, unified scientific understanding of nature.

With respect to cosmology, the consensus inflationary big bang theory posits that the universe emerged from fundamental randomness, disorder and chaos such as possibly from a black hole, and most fundamentally from *nothing*. This is in distinct contrast to the universe emerging from the lowest (zero) entropy and highest order in a completely unified field as the *source of everything*.

With respect to consciousness, in the mainstream physicalist view there is no ontologically real place for conscious mind, and no account of how the closed physical chain of cause and effect could unlink and insert a causally efficacious mental intention. The logical conclusion is that human agency and free will are illusory.

And given this view, with respect to evolutionary theory there is no adequate account of the origin of life. Similarly there is no account of how an intention or value favoring survival entered into fundamentally random, inert, valueless physical processes in the purportedly closed causal chain.

Resolving these dilemmas requires deeper integration of theoretical knowledge and empirical experience, which this book overviews. It focuses on a coherent, testable holistic alternative—a unified field-based account—toward which evidence-based theories are clearly progressing.

In this prologue the stage will be set by summarizing the reductive approach to smaller time and distance scales, as a platform to contrast with the alternative holistic approach that goes far beyond the current fragmented account. Each chapter then brings out more integrative views of our place and role in nature that perhaps surprisingly are increasingly consistent with ancient traditions emphasizing holism and the ultimate unity of nature. In other words, rather than thinking

reductively of a big bang emerging randomly from literally nothing, it will be shown to be useful to *think outside the bang*.

Investigating deeper levels and higher dimensions

In modern science nature is viewed as structured in layers or levels from concrete macroscopic to microscopic, molecular and more abstract atomic, nuclear, and sub-nuclear levels. Objective investigation of the physical world has primarily involved a reductive strategy of probing and measuring smaller and smaller time and distance scales and higher and higher energy and temperature states, in search of the essence of matter. The range of scales as theorized can be characterized simply as follows:

Ultramacroscopic levels	Infinity to cosmic expanse
Macroscopic levels	cosmic expanse to ~10^{-3} cm
Microscopic levels	~10^{-3} cm to ~10^{-8} cm
Ultramicroscopic levels	~10^{-8} cm to ~10^{-33} cm
Unified field level	~10^{-33} cm (Planck scale) or infinitesimal to Infinity

The resolving power of our ordinary senses for direct sensory observation is in the comparatively limited macroscopic range. The wavelength of visible light, for example, is in the range of 10^{-4} cm, too wide to observe directly anything smaller than a cell. Visual observation has been extended with the aid of probing tools such as the electron microscope to about 10^{-8} cm, still larger than an atomic nucleus. In other words, no one yet has seen an atom, but indirect evidence for it is considered extensive.

With indirect methods such as particle accelerators, however, research has gone far beyond evidence obtained directly through the ordinary senses. The results of indirect methods are macroscopic phenomena observed via the ordinary senses that are predicted by and dependent on conceptual models of events theorized to occur at smaller unobservable scales. But at tiny ultramicroscopic scales, probing and measuring tools are thought to influence and even significantly alter the theorized objects being investigated. This makes objective investigation of theorized independent objects much more challenging.

Analyses of theorized objects at unobservable scales increasingly rely on conceptions about what is being measured and what the process of measurement means. Cognitive processes of logical reasoning are relied upon more than sensory perception; and it is increasingly recognized that what is observed depends on subjective processes in the observers. This is evident in the current prominent role of mathematical models based on logical reasoning in formulating and evaluating theorized events beyond ordinary direct sensory observation. A prime example is string theory, an elegant mathematical theory that is a main focus of contemporary physics but as yet has virtually no empirical support.

A major change from the classical to the quantum paradigm is that these issues are now recognized as core to the *measurement problem* and the influence of the subjective observer in *creating* what is observed. Heretofore tacit assumptions about the object of investigation, the probe, evidence of their interaction, as well as the observer now need to be considered explicitly in investigating the essence of matter. Historically such subjective-tinged issues were the purview of

philosophy—and to some degree also religion—associated with the *mind-body problem* and more recently the *hard problem* of consciousness. These issues are now prominent in quantum physics. They also are core issues in psychology and neuroscience, associated with the *explanatory gap* between brain, mind, and consciousness.

To protect against unreliability in ordinary sensory and reasoning processes, the basic means of gaining knowledge in modern science, the objective approach relies on consensual validation or public agreement among investigators. But it is important to recognize that consensus is based on the level of functioning of those who contribute to it. The level or state of functioning of the minds of investigators—the scientists—defines and delimits the scientific consensus. For the most part, this point has been overlooked throughout objective modern science as it has been practiced.

Reasoning and sensory processes are common functions of the ordinary waking state of consciousness. This state is a representational mode of knowing characterized by experience of a separation or duality of the inner observer and outer objects. It is the phenomenological basis for the pretheoretical assumption of the independence of observed and observer, objectivity and subjectivity, held to be essential to objective science. The entire enterprise of modern science is based primarily on reasoning and sensory experience shared by scientists in the ordinary waking state.

The notion of *scientific naturalism* also can be understood to be based on the same fragmented picture of nature from the ordinary waking state. In scientific naturalism the experience of nature as outside and independent of the observer is assumed to be what is given by nature. But as we will consider, from a deeper perspective it is rather

that this dualistic view of subject-object independence is imposed upon nature via the observer's ordinary waking state experience.

When outer objects appear to be independent based on ordinary sensory experience, a reasonable assumption is that there is a separate objective reality existing outside the observer. But of course appearances can be deceiving (Earth appears flat; the Sun appears to travel across the sky). Given this epistemological framework, it is not surprising that the view of nature in modern science is fragmented, and that unification—including of objectivity and subjectivity—is a most daunting task.

It also is not surprising that modern science will need to go beyond this subject-object duality in order to achieve a completely unified account of nature. It will be shown that recent advances are clearly in this direction.

As indirect investigations have gone from macroscopic tangible localized matter to theorized underlying abstract nonlocal fields, the *interdependence* of object and observer increasingly has encroached upon scientific objectivity. Matter and mind, object and subject, physics and psychology, can no longer naively be considered independent, given the advances in modern science toward a more integrated picture of nature.

With progress from the classical to the quantum paradigm, critical challenges to the assumption of object-subject independence have emerged, especially as indirect methods have probed theorized limits of the physical universe. This progress is leading to new approaches to the old mind-body problem and related deep issues of ontology recalcitrant in objective modern science that had not been explicitly addressed—even in the major successes of relativity and quantum theories.

Reduction to the expanded non-physical

As a brief summary of this progress, classical physics conceptualized matter as atomic particles interacting in force fields via a mechanistic unbroken causal chain of measurable physical events—the local particle interaction or 'billiard ball' model of causality. Objects were viewed as localized in space and time, existing independently of each other and of the observer, and influenced mainly by the forces of gravity and electromagnetism that decrease according to the inverse square law. Atoms were held to be the 'uncuttable' constituents of nature. In this view nature is fragmented into atoms, forces, space, time, and conscious mind not directly addressed in it.

Subsequent research led to theories of subatomic and even more elementary particles at deeper levels of physical structure and smaller time and distance scales. In particle-scattering experiments using indirect methods of observation, a plethora of 150 or more elementary particles have been posited, classified into three groups according to the concept of mass. As levels of nature have been further unveiled, matter has been conceptualized more abstractly as excitations of theorized quantum wave fields. The wave fields are envisioned as comprising packets of potential energy with particle-like properties that form physical objects or localized, bounded structures at grosser levels of nature.

In quantum field theory a force is an effect on a matter particle mediated by a virtual or exchange particle that passes between interacting matter particles. The notion of a virtual particle can be thought of as sort of a half-step away from concepts of ordinary physical objects toward more abstract wave fields. But quanta are also conceptualized

even more abstractly as unbounded force fields, the model of particle-wave duality—somewhat akin to object-subject duality. The particle is a stable propagating wave state of a field.

Quantum wave functions are amplitude distributions that model wave potentials as fluctuating at discrete energy states. They are multiples of the Planck scale (10^{-33} cm, 10^{-43} sec), the fundamental unit of ordinary space and time mathematically derived from light-speed, Newton's gravitational constant, and Planck's constant. The quantum field also is conceptualized as inherently dynamic, continuously exhibiting zero point motion or 'quantum jitter' whether in its particle, force, vacuum or ground state. The basic principle of activation is assumed throughout nature as the *inherent dynamism* of the underlying quantum field. In this quantum view, nature is fragmented into quantized particle-forces, space and time, and conscious mind in a crucial but unknown relation.

As smaller time and distance scales have been probed, the theories involve more abstract, intangible conceptions. The more intangible conceptions include both smaller time and distance scales and unbounded fields simultaneously. It is extremely difficult to model reduction to the tiniest and expansion to the unbounded at the same time—especially given the reductive dimensionless point as axiomatic in the mathematical framework imposed on an unbounded wave field of possibilities.

This progress is all well and good; but in the quantum paradigm the question of how the intangible, probabilistic, mathematical quantum wave function results in a classical, discrete, deterministic, tangible sensory object in the objective physical world has become a major issue. And this is where quantum theorists reluctantly

concluded that the conscious mind of the observer must be a necessary part of the picture in order to build a coherent account of even physical reality.

The original orthodox interpretation of quantum theory held that there is no quantum level of nature; the only level is classical reality, composed of real particles that can be modeled using mathematical quantum wave functions. It further held that nature is not a completely deterministic, precisely calculable causal chain as in the classical 'billiard ball' particle interaction model. This also is frequently interpreted to mean that nature is *fundamentally* random. Most dramatically it held that a conscious observation is necessary to get to classical objective reality from the probabilistic quantum model. As we will see, recent quantum theory interpretations go beyond these core aspects of orthodox interpretations.

Further, as deeper levels of nature have been indirectly probed, increasing unification has been revealed. The universe is now theorized to be fluctuations of four quantized particle-force fields (gravitational, (strong and weak nuclear, electromagnetic). Mathematical theories are being developed to unify these abstract fields into a single unified field. The 'Standard model' unifies them into three (electroweak, strong nuclear, gravitational), and the 'Grand Unification model' into two (strong-electroweak, gravitational). But where the mind fits in still remains a mystery.

In Einstein's relativistic theories we now have unification of gravity and spacetime, and in quantum theory we now have unification of the other three forces—as well as at least recognition of the conscious mind of an observer in some unknown relation. However, the gravitational field has resisted all attempts to be expressed within quantum theory to connect it to the other three

quantum fields in a unified field theory. In relativity theory ordinary space, time, and gravity are unified with each other, but not with the picture in quantum theory. Also, in quantum theory the relationship of the relativistic spacetime gravitational field and the other quantum fields to the conscious mind of an observer is recognized as crucial, but remains unknown and has not been directly addressed.

Mathematical models attempting to unify quantum and relativity theories concern *quantum gravity*. This is generally considered to be a key step toward a coherent theory of a single underlying field. The mathematical model of *string theory* is believed by most all physicists to be the best direction for developing a consistent theory unifying relativistic gravity and quantum theory.

Basically the theory of strings replaces the reductive dimensionless point-particle notion in classical physics with an incredibly tiny filament or string. The mathematical point-particle is conceived as an imaginary dimensionless point with no internal structure or spatial extension, and only the capability of movement through space. A string is conceived as having spatial extension, allowing higher-order patterns of fluctuation which add explanatory power. The higher-order string fluctuations are significant at the ultramicroscopic scale, but otherwise can be treated in calculations as dimensionless points in classical physics.[1]

However, string theory generally requires mathematical *dimensions* in addition to the ordinary four dimensions of space and time. Sometimes they are conceptualized as hidden spatial dimensions curled up or *compactified* in the internal structure of the string. The classical four dimensions are described as the non-compactified or *unfurled* dimensions comprising the familiar classical sensory world in ordinary space and time.

String theory is so complicated that its exact equations have not yet been able to be determined. Approximations yield many models, but there are indicators of a smaller set of consistent ones. Recent advances pull them together into a mathematically encompassing framework called *M-theory*. This theory typically includes 11 dimensions: the ordinary four, plus seven compactified dimensions in mathematical space. In addition to one-dimensional strings, two, three, and higher-dimensional geometric 'objects' called *branes* are posited. But the higher-order dimensions are mathematical dimensions in conceptual, imaginary space—not the same as the four real dimensions of ordinary physical space and time. [1] This issue needs careful examination for its implications about subtler conceptions of space and time, as well as about the nature of the conscious mind.

Understanding and developing exact equations for string theory and M-theory are major current objectives. These remarkable theories integrate most all of the progress in physics over the past century. But there is debate whether they represent the right direction to develop a consistent theory of quantum gravity, as well as to what degree mathematical concepts of symmetry and super-symmetry, upon which they are based, can be said to exist at finite levels of nature.

An alternative theory, loop quantum gravity theory, further posits an underlying *pure geometry* or quantized *information field space*. Associated with the concept of information bits called *qubits*, this theorized abstract field is said to generate ordinary four-dimensional spacetime. To be discussed in Chapter 2, the theory more explicitly brings the conscious mind of an observer into the picture in an attempt to *relativize* quantum theory using new notions of space and time. [2]

These quantum gravity theories bear upon the dilemmas of the independence of objective and subjective aspects of nature and the associated age-old mind-body problem. They reflect more abstract, subtler concepts of space—a major theme in this book—leading to theories that have the potential to bridge the gap between matter and mind.

To summarize, matter is conceptualized as built of unseen atoms, composed of unseen elementary particle-forces, and theorized to be unseen potential quantum-wave fields of energy. Quantum gravity theories further posit unseen geometric patterns such as strings, branes, or other similar 'objects' in mathematical space, and even more abstract qubits of a real information field space.

The overall picture is of indirectly probing smaller time and distance scales to the ultramicroscopic Planck scale, hypothesized to be the ultimate limit of space and time as we ordinary think of them. This scale is so incredibly tiny as to be *almost* a dimensionless point. It is posited that compactified near about this smallest size are geometric 'objects' in hidden dimensions that form the particles generating all real objects in our familiar four-dimensional world.

These terms may give the impression, however, that the abstract geometric 'objects' are physical. They are mathematical objects described using spatiotemporal metaphors to help develop the theories. They don't yet bridge the gap between mathematical conceptions of quantum wave potentials and real physical space and time. But if these geometric 'objects' do have ontologically real existence in nature other than being just concepts in mathematical models, they would be fundamental curvatures of space and time beyond ordinary matter. Further, if they are generated from qubits in a *pure geometry* of information field space, they

could relate to real 'objects' in an underlying *non-physical* level of nature. Understanding them requires subtler conceptions beyond our familiar notions of space and time, matter, and cause and effect. That is where we are rapidly headed.

The reductive search for the essence of matter is now going beyond all forms of matter—beyond elementary matter and force particles and ordinary space and time—to a theorized non-physical level of nature. Conceptions of space are expanding from ordinary physical space to underlying information field space and beyond. The theories are progressing toward a *nonlocal* mind-like space or quantum mind that is quite different from, but also the basis of, our familiar ordinary physical space and time. We will see that these new theories are directly relevant to the mind-body problem. The mind now has to be accounted for in the theories, which deeply challenges the objective physicalist worldview associated with object-subject duality.

These theoretical developments more clearly reveal that the picture we see when we look at nature (observed) necessarily depends on how we look at it (process of observing) and who we are (observer). As we will see further, they are pointing directly toward an alternative unified field-based account that has the potential to integrate them. And as we will see even further, in this completely unified picture nature gets turned downside up.

Practically speaking, in the outer-directed, *objectified* classical physicalist worldview the conscious observer was hardly even in the picture, and was not considered as fundamentally influencing what the picture looks like. In this view objective and subjective aspects of nature are independent, and no theory unified them. Because it contained no scientific recognition of any real form of existence beyond the physical, the view emerged

in this paradigm that necessarily mind is nothing other than matter. This implies that conscious mind has no causal power, and may not really exist at all. A careful look at scientific progress in the past century makes it increasingly clear that this view is not only untenable but logically has to be surpassed in order to build a coherent unified theory of nature.

One main point of this book is that the picture we construct of the world depends on what we are able to sense or observe and reason about it. Limitations of our ordinary sensory experience and reasoning shape the consensus about what the picture is. To be blunt, fragmented thinking creates fragmented pictures of the world—lived out in fragmented lives.

The current fragmented physicalist worldview still emphasizes atomism and the particle interaction model of causality. Quantum theory was a major step to a subtler view of discrete particles and abstract fields at the same time—particle-wave duality. Quantum field theory further viewed particles as nothing other than fluctuations of abstract quantized wave potentials. But to get to real particles from the quantum wave-field picture, it was concluded that a conscious observer is necessarily involved, leading to major dilemmas about object-subject independence—which is where physics was for most of the 20th Century.

In this picture the conscious observer was tacitly assumed to be a classical phenomenon in the physical brain. But it hasn't been found there; and logically consistent with physicalism, some argue it is illusory. If so, then how can it be crucial in the change from the quantum model to classical reality?

But now cutting-edge theories are positing an ontologically real nonlocal wave field. This requires a new picture of causality more extended and wave-like than the local particle interaction model, with

quite different dynamics. It also proposes a place where conscious mind might actually exist: a nonlocal field underlying and permeating the physical—including permeating the brain.

While these deep ontological issues are being addressed, new recognition also has emerged of ultimate unification in unified field theory. As noted above, this changes the picture completely. It turns things over from reductivism to holism. In the unified field picture the universe is not created from random quantum fields ultimately of nothing; just the opposite, it manifests from within a completely orderly unified field that is the *source of everything*.

As we proceed it will become clearer that modern scientific theories are progressing toward more abstract, subtler views of nature from matter to mind to consciousness—also now beginning to integrate holism with reductivism. It will be shown that, due to these major steps of progress over the past century, ancient *holistic* knowledge traditions that directly address the subjective mind are being re-examined, with immense theoretical and practical implications. The potential convergence of ancient and modern pictures of nature is starting to be appreciated.

A prime example is the ancient Vedic tradition. The term Veda can be understood to refer to total knowledge, which modern science also pursues. It describes three ontological domains or realms of nature: the gross physical domain that generally can be associated with point-particle, quantum, and atomic conceptions; a subtle nonphysical domain that can be associated with nonlocal wave-like quantum dynamics and with mind; and a holistic, completely unified field. How to hold together at the same time the reductive point of nothing—*Void*—and the holistic unity of everything—*Being*—is core to the Veda.

The ancient holistic picture provides a unified model of matter, mind, and consciousness that can advance our modern scientific pursuit of total knowledge of the laws of nature. It will be shown to have addressed the link between matter and mind which is now being explored seriously in cutting edge scientific theories.

In light of this summary we will now examine gaps and dilemmas associated with the major contemporary topics of cosmology, consciousness, and evolution. As we will uncover, the progress described on the forefront of modern science has revolutionary implications for understanding our relationship to the cosmos—as well as evolutionary implications for how to get out of the crazy ways we humans have been behaving toward each other.