What We Can Say About Reality
A Comparison of New Physics and New Age Philosophy

by Klaas Pieter van der Tempel
3207692 Utrecht University
Independent Project, HCSSH
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Arthur S. Eddington
Introduction

How does the popular understanding of modern physics compare to that of its founders? Quantum mechanics is to this day a topic of disagreement amongst physicists. But while the specialists argue over the math, there is also a debate about the metaphysical implications of the quantum revolution. Scientists, New Agers, and New Age scientists have all contributed to this debate, leading to a seemingly irreconcilable mess of interpretations where the strangest things have been said about reality. Studying the writings of some of the top, Nobel-prize winning physicists of the twentieth century, we may be surprised to see that they express beliefs which are now associated with the New Age – beliefs about science, meaning, and reality. The purpose of this essay therefore is to study these new beliefs, their use by physicists and New Agers, and their implications for the current state of knowledge in Western society. In this investigation, versions of the philosophy and history of science are taken directly from the beliefs and opinions of the physicists in question. It is therefore historical, but not objectively factual.

The so-called “New Physics”⁴ - quantum physics and Einstein’s relativity - indicates a turn in science from purely rational, objective, and mathematical representations of reality to models based on our subjective, conscious experience. Paradox, uncertainty, and relativism were added to these new models, representing a fundamental shift in the metaphysics of modern science. And, for the first time, modern science did not reject religion. The subjective element in science – previously held at arms' length, as science is typically defined in opposition to art and religion – has come to the fore, and is feeding the popular search for a worldview combining science and a new spirituality.

The unusual characteristics of the New Physics have attracted everyone from philosophers, psychologists, postmodernists, religious and New Age followers, to the curious-minded, interested in learning more about the mysteries of existence. Concurrent with this external interest, the New Physics has stimulated an internal search – by physicists themselves – for inspiration, answers, and parallels. They have looked to illuminate the seemingly irrational nature of subatomic reality through ancient, contemporary, Eastern and Western mysticism and philosophy. To many of these physicists, science, nor mysticism was enough, and their writings show a curious blending of the two. This very trend was soon picked up by the New Age, after which the New Physics became a favorite model for New Age speculations about mind, body, and spirit.

Considering the fact that quantum mechanics is strange to all who investigate it, and that it is still undergoing reinterpretations a century after its earliest formulations, the search by physicists for understanding outside of their cultural space and time is a phenomenon worth investigating. Furthermore, the fact that they showed interests which are often dismissed as irrational – and, by connotation, inferior – is undeniable, and begs an historical understanding. I propose a history of the

¹ A term borrowed from physicists as well as New Age authors, and more or less equated to the Copenhagen interpretation of quantum physics
ideas of the New Physics and their relation to the New Age, investigating any continuities between the two. We can find out which links were made by the first quantum physicists to ‘alternative’ forms of knowledge – whether from the East or the ancient past – to supplement the most modern realms of science, and how these linkages have been integrated. What was their conclusion – what can we say about reality according to modern physics? And how different is it from the New Age?

*Putting the New Age into Context*

Tomas Vanheste, in his doctoral thesis on the New Age and modern physics, has pointed out that New Age thinkers appropriate the different interpretations of the New Physics to support their worldviews and philosophies. At the same time, they popularize esoteric sciences for a broad public and make them relevant to personal experience. The first so-called New Age parallelists, such as Fritjof Capra and Gary Zukav, made a large cultural impact by comparing the new sciences with diverse spiritual doctrines. In their writings they called attention to similarities between what modern science says and the scriptures of Buddhism, Taoism, Hinduism, and the ancient Greeks. Their parallelist arguments, further popularized by non-specialist New Age authors, are often represented as belonging to a single New Age doctrine: a doctrine which *equates* science with mysticism or spirituality. For this transgression, they are often stigmatized by those seeking to isolate science from New Age appropriation. In this essay, such claims and counterclaims on the nature of New Age knowledge will be nuanced by focusing on the earliest, most conservative parallelists and their direct forebears in the physics community.

The realm of interpretation of the New Physics is something of a battleground. Ambiguous and esoteric as it is, it has been (mis)appropriated by some and sequestered by others. Fritjof Capra, for one, who is referred to by an otherwise critical Ken Wilber as “one of the most careful of the New Age writers,” makes the point that science and mysticism are describing fundamentally the same thing – unity in nature – and that the language being used is more and more the same. In other words, although it lends itself readily to such an interpretation, physics is not mystical. However, much bolder claims have become all the more common in the decades since Capra’s *The Tao of Physics* was published.

The ‘parallels’ provided by the New Agers are notably linked to some of the exclamations of the founders of quantum physics, such as Niels Bohr, Werner Heisenberg, and Wolfgang Pauli. These highly-respected scientists were treading in uncharted waters, and used untraditional sources – very much the same sources which informed the New Age – to supplement their theorizing. As philosopher Ken Wilber writes, their “sustained use of critical intellect” had led these physicists “beyond physics altogether.” The realms beyond physics – or metaphysics – are of course not confined to Taoism, Buddhism or mysticism; but, as we will see, the traditional monotheistic religions of the West, as well as the dominant, positivistic philosophy of the time were not as fruitful to their speculations. Hence the need for the multicultural, ‘exotic’ sources which have since been reduced to banalities in popular culture.

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2 Vanheste, *Copernicus is ziek*, p.19.
3 Wilber, *Quantum Questions*, p.28
4 For this paper, a dictionary definition of mysticism will do: it is the “Immediate consciousness of the transcendent or ultimate reality or God.” The American Heritage Dictionary of the English Language, Fourth Edition, Houghton Mifflin, 2009
5 See, for example, Arntz, *What the Bleep Do We Know*
6 Wilber, p.x
The New Age in and of itself, combining science and spirituality, is not an entirely new or uniform phenomenon. As such it is difficult to find the moment of its birth, or decide which streams are most important for study. Moreover, its incursion into the domain of science feeds into the “science vs religion” debate at a point where the definition of science is far from undisputed. With the limited sources provided here, an attempt will be made to show the development in science of a new, underlying metaphysics, one which has informed and therefore connects much of the New Physics and the New Age.

Part I

Metaphysics and Physics

Fundamental challenges to the scientific worldview begged the question – is quantum theory true science? Is science moving away from pure rationality, and worse, does it support mysticism? No more can we ascertain absolute knowledge; we cannot predict even the next split-second of an atom's behavior. Subatomic particles, the basis of matter and the focus of quantum physics, are too chaotic for scientists to do more than make probabilistic predictions about. And the conclusions taken from any experiment, it seems, are true relative only to that experiment. The “dream of determinism,” in the words of Stephen Hawking, is over.8 The attempt to fill this void in our metaphysical foundations has led to the resuscitation of an ancient approach, where science and metaphysics, fact and imagination are reunited.

Metaphysics is roughly divisible into epistemology and ontology, or the nature of knowledge and the nature of being. The epistemology of science is the scientific method9 – the tools which justify its claims to knowledge. The ontology of science is commonly considered the domain of materialism – that which is physically verifiable.

This categorization is not unanimous. Wilber, for one, contends that the metaphysical or immaterial is not necessarily “non-scientific.” The “dividing line between 'scientific' and 'non-scientific' is not between the physical and metaphysical,” he writes; “the dividing line is between experientially testable and non-testable (or merely dogmatic) pronouncements. If 'science' were restricted to 'physical-sensory' object-domains, then mathematics, logic, psychology, and sociology could not be called 'scientific.'”10 Conservative thought, however, such as that of Ian Barbour, still maintains that metaphysics is purely the province of the philosopher, rather than the scientist or the theologian.11 Vanheste also justifies his critique of the New Age by holding that science should be kept isolated from the cultural domains of religion, metaphysics, and the creation of a worldview, just as our Enlightenment ancestors asserted.12

What these opinions on the borders between the scientific and non-scientific, physical and metaphysical seem to miss is the fact that science is a creative endeavor; that it takes imagination. As

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7 Albert Einstein, for example, was convinced of the incompleteness of quantum mechanics as a physical theory. See for example, Whitaker, p.xiii
8 Hawking, A Brief History of Time, p.72
9 E.g. experimentation, observation, measurable evidence, analysis, repeatability
10 Wilber, p.13
11 Barbour, Religion and Science, p.103
12 Vanheste, pp.23, 228-9
Einstein wrote, “Science is the attempt to make the chaotic diversity of our sense-experience correspond to a logically uniform system of thought.”\(^ {13}\) To enable this correspondence, physicists such as Einstein had to “invent a language” to talk about the world. And, since there is no absolute relationship between scientific theories and the world,\(^ {14}\) this language – science, physics, math – is what C.G. Jung calls an “ephemeral attempt to explain facts and not an everlasting truth in itself.”\(^ {15}\) In Freudian terms then, scientific theory is in part a projection onto reality; it is the charging of reality with meaning. And meaning is ephemeral, context-based, and metaphysical.

Both metaphysics and physics attempt to describe the nature of reality using language, words, and symbols. As psychologist Timothy Leary has written, “Metaphysics is subjective physics.”\(^ {16}\) It is where the individual creates – or assumes – a system of meaning in reality. Whether it is based on empirical evidence or not, one's interpretive system is usually experienced above the facts of any physics. However, words in themselves are only the shadows of that which they represent. In physics, for example, the math translates reality, and words interpret the math. By calling into question the words, or the meaning given to reality, physicists consciously engage in metaphysical speculation. In a nutshell, “Physics deals with shadows; to go beyond shadows is to go beyond physics; to go beyond physics is to head toward the metaphysical or mystical.”\(^ {17}\)

Metaphysical speculation is ongoing, even in the age of science, says Toulmin, because the “ambition to find a cosmic sanction for ethics, a natural foundation on which our human superstructure of right and wrong may safely rest, is an enduring one.”\(^ {18}\) We, like our ancestors, are still trying to write the final story about 'the truths of the universe.' However, the large-scale dismissal of the Catholic sanction for ethics – the previous attempt at a universal truth – has left behind a “metaphysical hunger.”\(^ {19}\) This hunger has often been looked at as a root cause for the consumption of science by the New Age. The fact is, writes Wilber, that every generation has tried to use physics to both prove and disprove Spirit and morality.\(^ {20}\) It is a Western pedigree.

Still, Plato wrote, physics is no more than a 'likely story' of the changing, or ephemeral forms; the “truth,” he claimed, is in the transcendental (meta) forms.\(^ {21}\) This metaphysical truth is experienced subjectively, but is not necessarily irrational. According to Toulmin, therefore, we can “distinguish between those metaphysical beliefs which have provided a fertile background” – or a likely story – “for scientific theorizing and those which have not.”\(^ {22}\) In other words, the search by quantum physicists and New Agers for meaning beyond the physical theories, and amongst the 'perennial' wisdoms of mysticism and metaphysics, may quite possibly prove to be a rational pursuit.

Whether or not it is agreed, however, that physics and metaphysics are related in any way, it is clear that some people will try to unite them somehow. There are those scientists, as we will see, who concern themselves greatly with the metaphysics of science. But quantum questions are not asked on a daily basis in society. Apart from the scientists themselves then, who are these people of the New Age

\(^{13}\) Einstein, *Out of My Later Years*, p.98

\(^{14}\) Gregory, *Inventing Reality*, pp.v, p.178

\(^{15}\) Jung, *Man and His Symbols*, p.92

\(^{16}\) Leary, *The Politics of Ecstasy*, p.37

\(^{17}\) Wilber, p.10 By this reasoning, then, a study of quantum physicists may also called be a study of mystics.

\(^{18}\) Toulmin, *Metaphysical Beliefs*, p.37

\(^{19}\) Planck, *quoted in Wilber, Quantum Questions*, p.154

\(^{20}\) Wilber, p.3


\(^{22}\) Toulmin, p.ix
movement who apply the New Physics to their daily life? An introductory philosophy book provides a clue: it says that twentieth century philosophy, like its counterpart in the Middle Ages, has refrained from developing a metaphysics or worldview. Instead, logical positivism – a school of philosophy which rejects metaphysics, because it is scientifically unverifiable – dominates philosophy. And it goes further, saying that it is still “amazingly attractive to those who need an excuse not to have to think about metaphysics.” The New Agers then are people who, like the logical positivists, have dropped all the other known 'truths' and found them to be 'likely stories;' but, unlike the logical positivists, have used this void advantageously to create their own new story. These connections between philosophy, science, and metaphysics need to be investigated before we can turn to the New Physics itself.

**Classical Physics: The Rise of Objectivity, Materialism, and Determinism**

Werner Heisenberg, the physicist who invented quantum mechanics, writes that in the development of the modern, secular age, “One was not so much interested in nature as it is; one rather asked what one could do with it. In this way, finally, the nineteenth century developed an extremely rigid frame for natural science which formed not only scientists' but also the general outlook of great masses of people: classical physics.” Epistemological and ontological – or metaphysical – beliefs about space, time, matter, causality, and utility created a cultural drive that was narrow and rigid, leaving almost no place for mind, soul, and life. Instead, writes physicist Werner Heisenberg, there was only mechanism and causality.

**The Influence of Monotheism: Dualism and Realism**

As Ian Barbour, author and contributor the field of relating science and religion, writes, there is convincing historical evidence of the contribution of Christianity to the rise of modern science. The dominant paradigms of classical physics, secular though they may be, certainly developed out of an era when religion was still dominant – whether in antithesis to or as analogues of their predecessors. One fundamental characteristic of classical physics, which it shares with monotheistic religion, is a metaphysical basis in dualism. In religion, dualism is expressed in the ontological division between good and evil, God and nature, God and man, etc; whereas in science, God has been excised and we divide between Nature and man, matter and mind, subject and object. Both systems operate on the faith that there is an outer reality separate from an inner reality. This is known as philosophical or metaphysical realism.

Christian theology had professed a division between moral absolutes, or good and evil, associating spirit with good and matter with evil. Modern science, however, based itself partly on a duality between subject and object: perceiver and perceived, nature and scientist. This division led in the nineteenth century to the

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23 King, *Honderd Filosofen*, pp.45, 138
24 Heisenberg, *Physics and Philosophy*, p.197
25 Barbour, p.90
26 E.g. materialism, or the belief that matter is the foundation of reality; determinism, or the belief in causality as a law of nature; rationalism; objectivity
27 The inner reality is also, because of its inherent subjectivity and irrationality, regarded as less 'real' than the outer.
polemical differentiation of the “exact science of nature” from the “philosophy of nature;” as science and religion scholar Kocku von Stuckrad writes, they became mutually exclusive aspects of a metaphysical duality. In this dichotomy, it became the task of science to study the material world, the object, because it could be known objectively, while the role of the subjective perceiver (and the Christian God) was reduced, ignored, or negated.

In the development of science, this empowered the mechanistic philosophy of materialism and determinism which we have seen Heisenberg deplore. Matter, it says, is the foundation of reality, and, as it operates like clockwork according to the mechanistic laws of science, life itself is a mechanism. Rene Descartes’ formulation of mind-matter dualism in the seventeenth century (Res cogitans and Res extensa) allowed the scientific mind to treat matter as ‘dead’, and investigate its machinelike properties separately from subjective influence and interpretation. The properties which were discovered by men like Isaac Newton were invariable laws of God as written in nature, and increased the fragmentation between man, nature, and the creator. Science uncovered the word of God – “the laws God used in fashioning the Universe” – and was not recognized as a product of the human mind, but as an objective truth.

The laws of classical science grew in number, adding to a confidence that everything could be known to science. According to Bruce Gregory, “the success of Newton’s language was so dramatic that it seemed to be a conclusive demonstration of the fundamentally mechanical character of nature.” As the explicit notion of God decreased in the scientific community, materialism as the ultimate notion of reality took its place, and metaphysical or speculative notions were disavowed. However, as even Barbour notes, materialism itself was a metaphysical standpoint based on certain assumptions. Indeed, materialism was still wedded to the metaphysical conviction of cause-and-effect which had previously been symbolized by an all-powerful God. According to this determinism, as affirmed by Aristotelian physics, the trick was finding the definite cause and effect of physical phenomena, and the laws of God were thus renamed as the laws of nature. One might think of this underbelly of science as performing a similar function as that of religion: to provide, through metaphysical assumptions, the comfort of certainty in an incomprehensible world.

According to Joseph Felser, professor of religious studies, the conceptual framework of classical science – where reality is subject to certain immutable laws – has been taken over directly from Christian theism. As Felser writes, summing up a contemporary criticism, “The postmodernist sees the interchangeability of ‘God’ and ‘Nature’ as unintentionally ironic: it turns out that there isn’t a dime’s worth of difference between Science and Religion. Postmodernism abjures the metaphysical realism at the heart of both.” To say what nature is – in this case, instead of God, the root of reality – and what it is not is beyond the ken of science or religion, and yet strong claims are made on both sides. Unlike the agnosticism of Socrates and Kant, the assumption is that reality must be knowable with certainty.

Even now, according to Heisenberg, “every research scientist feels that he is looking for something that is objectively true.” Objectivity and materialism are thus still amongst the metaphysical presuppositions of many scientists. And a higher power, operating through 'mechanistic

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28 Von Stuckrad, Interferential Patterns, 2006, p.1
29 Gregory, Inventing Reality, p.26
30 Gregory, p.26
31 Barbour, p.79
32 Heisenberg, p.14
33 Felser, Was Joseph Campbell a Postmodernist? pp.398-399
34 Heisenberg, p.82 My italics
determinism’ – though usually not recognized as such by atheistic or agnostic scientists – is a logical requirement in this framework.

Science and the Absolute

Whitaker, an advanced physics author, relates that it was “unthinkable” to challenge Newton's science by 1900. According to Heisenberg, classical science, having become more or less equated to common sense, became the “general human way of thinking;” and, in twentieth century science, it wasn't transcended until the extremely advanced and esoteric investigations of subatomic physics.

Still, the ideal of objectivity and the search for absolute knowledge are trademarks of physical science, even though, as we will see, quantum physics seems to contradict them. “In classical physics,” wrote Heisenberg, “science started from the belief – or should one say from the illusion? – that we could describe the world or at least parts of the world without any reference to ourselves.” This, he said, is actually possible to a large extent, but not when making absolute statements about “reality.” The description of the absolute is exactly what theology had been doing. And, as a historian of science and religion, Barbour deplores it: “Surely,” he writes, “it would be more accurate to say that science does not deal with divine purpose; it is not a fruitful concept in the development of scientific theories.”

The fundamental division of “God-World-I” was, to Heisenberg’s mind, the basis of modern science. This long-lasting “metaphysical confusion,” inherited from Christian theology, marginalized mysticism – which communicates the interconnectedness of self and nature, or ‘absolute reality’ – in Western science and religion. Heisenberg’s authoritative summary of the metaphysics of classical science was later reiterated by New Age authors, seeking to explain our current ecological crises. Many of these have expressed the belief that a ‘fundamentalist materialism’ is the reason why Western society has dissociated from nature, allowing it to spiral uninhibitedly towards cultural, social, and ecological crisis. Calling to mind the visibly destructive side-effects of scientific progress, for example, Fritjof Capra sought to qualify his New Age, parallelist agenda as a search for a balance between activity, rational thinking, competition, and aggressiveness on the one hand, and intuition, ecology, religion, and pacifism on the other. This stance, as we will see, grew (at least in part) out of the philosophy of the New Physics and its revision of classical science dogmas.

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35 Barbour, p.90
36 Vanheste quotes Dijksterhuis' *De mechanisering van het wereldbeeld* in arguing that 'mechanization' refers to the mathematization of nature. Metaphors of the mechanistic, robotic “machine” of modern science are thus said to be misplaced: a machine presupposes a creator, and this assumption has never been part of the foundation of physics. The argument presented here however is that the assumption is, though not explicit, implied.
37 Whitaker, *Einstein, Bohr, and the Quantum Dilemma*, p.12
38 In Einstein's words, “Common sense is nothing more than a deposit of prejudices laid down by the mind before you reach eighteen.” *Quoted in Bell, Eric Temple, Mathematics, Queen and Servant of the Sciences*, 1952
39 Heisenberg, p.55
40 Even then, traditionalists stood out. Victor Weisskopf for example, a wartime nuclear physicist, still believed that “Science is the search for the absolute, for fundamental laws, for basic truth in nature.” *(quoted in Rozental, p.261)*
41 Heisenberg, p.55. As Gregory notes, randomness and chance were seen as illusions in classical physics. At the same time however, classical physics itself was unable at all “to explain how there can be any stable world at the subatomic level.” *(Gregory, pp.86, 117)*
42 Barbour, p.80
43 Heisenberg, p.78
44 Capra, *The Tao of Physics*, p.22
45 Capra, p.148
When we say what is real, and what is not, we preach a metaphysics. Classical physics and mainstream religion are charged with having done just this: creating beliefs, not objective truths. This simplified description of classical physics, elements of which are easily found within the New Age, seems to condemn it for its unquestioned assumptions. Indeed, Vanheste concludes that there is “no appreciation” for classical physics to be found in the New Age, as if it has simply been cast off for a new skin. However, the conclusion is inaccurate. While it does accord with the views of certain New Agers, this analysis of classical physics has not relied on any New Age sources, but rather that of scientific and religious professionals. Furthermore, authors like Capra, himself a physicist, have recognized the success, usefulness, and necessity of classical physics – at least dialectically – in getting to our next topic: the New Physics.

Part II

The New Physics

Common Sense Challenged

If a starting date has to be found for the New Physics, we might point to the year 1900, when Max Planck first formulated his quantum hypothesis. Addressing contemporary problems in the theory of black-body radiation, Planck proposed that energy, such as light, radiates in discrete quanta – units - as opposed to a continuous flow. The unexpected association was that any quantum of light used to measure a particle will disturb it and change its speed in an unpredictable way. This was a novel situation in deterministic physics.

Until the theory of relativity and then quantum physics came to the fore, most scientific theories seemed straightforward and logical, as they fit comfortably into the classical framework. The implications of the New Physics, and especially quantum theory (“probably the most successful physical theory of all time”), however, transcended the classical framework. An impression of its strangeness is given by Gary Zukav, an author with lay interest in physics, who writes that the first time he heard physicists discussing quantum physics amongst themselves, it “sounded like theology.” This brings to mind a vision of esoteric discussion and vigorous disagreement. These quantum physicists, says Zukav, departing from the popular anti-philosophical opinions of logical positivism, were deeply aware that science was inseparable from philosophy. This had been clear to Heisenberg as well, who was shocked to realize that they were asking some of the oldest questions about nature and reality.

By rejoining physics and philosophy through their quantum theorizing, the founders of the New Physics simultaneously exposed the fact that classical physics itself has a philosophy. As we have seen, there are several metaphysical assumptions at its base. More importantly, classical physics and its deeply ingrained metaphysical philosophy were now contradicted, and physicists were “forced to

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46 Vanheste, p.231
47 Hawking, p.71
48 Whitaker, printed on sleeve
49 Zukav, The Dancing Wu Li Masters, p.23
50 Heisenberg, p.187
51 Whitaker, p.272
abandon more and more” of its concepts. Capra believes that in the first three decades of the twentieth century, classical notions of absolute time and space, elementary particles, the strictly causal nature of physical phenomena, and the ideal of an objective description of nature were “destroyed.”\textsuperscript{53} Having entered the atomic and subatomic world, physicists, like mystics, were suddenly dealing with a non-sensory, non-rational experience of reality.

Before the availability of modern technology – think particle accelerators and cloud chambers – Newtonian physics abstracted laws from sensory experience into the atomic realm. In Capra's notion of history, atoms were pictured as billiard balls or marbles interacting with each other; and, though pre-quantum theories of the atom were not yet testable, they were generally not questioned either.\textsuperscript{54} Heisenberg called this an “illusion,” as it is impossible to accurately extrapolate from sensory experience into the atomic range.\textsuperscript{55} Max Born called it a “primitive point of view.”\textsuperscript{56} Even now we can only see the consequences, not the atomic phenomena themselves.

Einstein's theories of relativity, what Capra calls “the pyramids of modern civilization,”\textsuperscript{57} provided the first major shock to the classical viewpoint. Time, the fourth dimension after the three of Euclidean space, was theoretically found to be inseparable from - and relative to - the location of the observer. 'Spacetime,' as it was dubbed, has since been of great value to both astrophysics and subatomic physics. However, the common notion of absolute time, independent of and constant for all observers, is still “deeply ingrained in our habits of thought.”\textsuperscript{58} Furthermore, the idea that space and time are \textit{fundamentally the same} “violates our intuitions.”\textsuperscript{59} It has therefore proven difficult to reconcile the relativity of time to everyday experience.

The common perception of space was also in for a drastic blow. Einstein's relativity proposed that space is perceived differently according to relative velocity and location; length, weight, etc are not absolute for all observers. Decades later, in atomic physics, the notion of absolute space would be turned completely upside down by the discovery that the atom is mostly empty space. The solidity of matter, a matter of common sense, was suddenly in question.

The problem with common sense, and the “old” language which informs it, was soon found, is that it isn't always functional in discussing modern physics.\textsuperscript{60} The famous 'twin paradox' for example is still debated; it defies common sense. Our intuition and language cannot visualize the reality of relativistic physics: while we can see a three-dimensional object projected into its two-dimensional shadow, we can only sense a three-dimensional image of what is in fact (at least) a four-dimensional world.\textsuperscript{61} Similarly, the common idea that mass is 'stuff' contradicts Einstein's finding that mass is energy (e=mc\textsuperscript{2}). Energy is described as no more than a “dynamic quantity associated with activity;” it is a process.\textsuperscript{62} Gravitational

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Illustration 2: Albert Einstein
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52 Restivo, \textit{The Social Relations of Physics, Mysticism, and Mathematics}, p.37
53 Capra, pp.61-62
54 Capra, p.50
55 Heisenberg, p.145
56 Born, \textit{The Restless Universe}, p.1
57 Capra, p.62
58 Capra, p.64
59 Gregory, p.64
60 Heisenberg, p.174
61 Capra, p.170
62 Capra, p.77
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fields, another of Einstein's research topics, are four-dimensional, endless, unponderable and unblockable distortions of spacetime, which led him to comment: “I see a pattern, but my imagination cannot picture the maker of that pattern. I see a clock, but I cannot envision the clockmaker. The human mind is unable to conceive of the four dimensions.” Still, according to Gregory, Einstein demonstrated the power of talking about space and time “as though they were a unity,” and, in the process, he showed that such concepts are part of our language, not reality itself.

Perhaps the greatest challenge to common sense was the conclusion made by an international team of atomic physicists (Bohr, de Broglie, Schrödinger, Pauli, Heisenberg, and Dirac) that the physical world, contrary to experience, is not substantive. Even more strangely, we “cannot say what” an elementary particle, the foundation of the physical world, 'is': it exists only as abstract potential. Sometimes, when you look, it’s there, and sometimes it isn’t. According to Max Jammer, a physicist and philosopher of physics, the recognition of the physical relativity of truth – as matter is solid to common perception, but ephemeral at higher magnification – has had “the most profound impact on human thought in the history of science.” The result, says Heisenberg, was a trend in atomic physics moving away from the materialistic assumptions it had integrated into its metaphysics in the nineteenth century.

Challenges Incorporated

Quantum mechanics was as novel in epistemology as it was in ontology. Stephen Hawking, a physicist known for popularizing theoretical physics and cosmology, notes that it took more than twenty-five years from the first idea of the existence of energy quanta by Max Planck in 1900, to the understanding of its full impact on determinacy, namedly, the introduction of potentiality (probability) and indeterminacy into mechanics. Heisenberg and others have considered this mixing of chaos and order to be a “real break with the past,” as it led to fundamental changes with respect to the very “concept of reality.”

The emergence of contradictions, or paradox, in atomic physics, begged a novel approach. Heisenberg recalls that when Niels Bohr devised his first working model of the atom, physicists for the first time “learned to ask the right questions;” specifically, those questions which targeted the apparent contradictions between experimental results. Perhaps the most famous paradox is the wave-particle duality. In basic experiments on how light travels, it was found sometimes that light is a wave, and other times that light is a particle. It looked as if the light was waiting for the experiment to decide how it was going to travel. Soon enough, even before understanding these experiments, physicists knew what results to expect. In a major breakthrough, Heisenberg had developed a mathematical representation of

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63 Einstein, As quoted in The Expanded Quotable Einstein, Princeton University Press, 2000 p. 208. Most physicists, however, understood relativity rather quickly. Whitaker believes the historical context may have played a part: delving into relativity theory provided distraction from the recent events of the First World War. Whitaker, p.2
64 Gregory, 70
65 These and other physicists, according to Zukav, were only the newest members of a sizable group – including Hindus and Buddhists – who hold similar views; but in the West they were practically alone. Zukav, p.105
66 Heisenberg, p.70
67 Jammer, The Philosophy of Quantum Mechanics, p.5
68 Heisenberg, p.59
69 Hawking, p.69
70 Heisenberg, p.24
71 Heisenberg, pp.28-29
particle behavior called Matrix (or quantum) mechanics, allowing the calculation and systematization of this unpredictable realm. Interestingly, the Newtonian mechanics of classical physics was still derivable in his math. However, the contradictions and paradoxes of quantum physics were “hidden,” and had not yet been solved. Physicists had not yet grasped the quantum process. But, says Heisenberg, it changed their minds “in such a way that they somehow got into the spirit of Quantum theory.”

Paradox, says physicist Jack Sarfatti, is an “essential part of quantum theory, the new physics.” The particle-wave paradox is a primary example. When physicists first looked at the implications of quantum mathematics, it shocked their imaginations: subatomic energy was particle and wave, abstract, and nothing like classical solids. But this was only paradoxical to the classical, dualistic idea of reality, where energy must travel either as a particle or as a wave. So, to solve this paradox, the “very foundation of the mechanistic world-view – the concept of the reality of matter,” was called into question. Quantum mechanics simply calculated the probability factor for subatomic reality; wavelike patterns of probability – not of things, but of interconnections between things – were measured. It is, says Heisenberg, “a strange kind of physical reality just in the middle between possibility and reality;” in other words, forgoing the classical either/or logic, the chair you are sitting on might actually be a chair.

It was found in the wave-particle experiments that the preparation of experiments and the subsequent measurements were directly related. Depending on the experimental setup, for example, light either travels as particles or as waves. Quantum theory thus seemed to reveal the fundamental interconnectedness, or “oneness,” of the observer and observed; that they are constituent parts of one system. Capra’s conclusion, which he shares with Schrödinger and other physicists, is that when “speaking of nature,” we necessarily “speak of ourselves.”

In the search for the fundamental particle, it was hoped that when high velocity collisions occurred between particles, they would fragment into smaller observable parts. However, paradoxically, the collisions were found to produce more, equal-sized particles. By demonstrating that particles can appear and disappear randomly ‘out of the void,’ Einstein’s equating of energy and matter was thus vindicated. What we have here, wrote Heisenberg, “is actually the final proof for the unity of matter.” Subatomic particles are destructible and indestructible at the same time, filling all forms and changing into and out of matter and energy. The smaller you go in quantum mechanics, the more apparent Oneness becomes: all parts in an experiment can only be understood in relation to the whole. This Oneness, what Honner calls ‘transcendental holism,’ thus arises from the recognition of a paradox; namely, the complementarity of opposites – the dual existence of light as wave and particle – and

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72 Heisenberg, pp.39-40
73 Heisenberg, pp.35-36
74 Quoted in Schwartz, Stephen, The Universe, As Seen from North Beach, n.p. As Sarfatti says, “If you think quantum mechanically, you just accept the paradox as part of the way things are.”
75 Capra, p.67
76 Capra, p.68
77 Heisenberg, p.41
78 Capra, p.68
79 In spite of knowing of over two hundred “elementary particles” many physicists are now still looking for these basic building blocks of matter. Capra, p.75
80 Heisenberg, p.160
81 Capra, p.78
82 Capra, p.131
indeterminacy, which we will explore below in the Copenhagen Interpretation of quantum physics.\textsuperscript{83}

\textit{Beyond Common Sense: Language, Metaphysics and Reality}

While the mathematical formalism of quantum mechanics is commonly acknowledged, its verbal interpretations are not.\textsuperscript{84} There is no clear metaphysical model, and there are nowadays as many interpretations as there are prominent atomic physicists. At first the most accepted one, however, was the so-called Copenhagen Interpretation, first formulated in the 1920s by Niels Bohr and Werner Heisenberg. Its starting point was the division of an experiment into observed and observing systems: particles and atoms versus apparatus and scientist. While the observer was therefore kept in a classical frame, that which was observed was recognized as a non-classical phenomenon. However, Bohr and Heisenberg were stuck with the language of classical physics, logic and common sense to describe the non-classical phenomena. Since the language of classical physics is a refinement of our everyday language and sensory experience, it was, Capra states, inadequate for describing the subatomic realm.\textsuperscript{85}

This did not mean that Newtonian physics is wrong, while quantum mechanics is right: it meant that “they are both,” like language itself, “approximations of reality” suitable for particular realms.\textsuperscript{86} For example, classical physics can calculate the motion of a car, but not the strength of its metals or the energy provided by its petrol; nor could it understand electric properties or enable the invention of computers. This, says Whitaker, is the task of quantum mechanics.\textsuperscript{87}

Bohr and Heisenberg, by consciously rejecting the epistemology and language of classical physics, heralded what Jesuit philosopher of science Patrick Heelan calls the “crisis of objectivity” or the “crisis of realism.”\textsuperscript{88} Until this rejection, physicists had treated all aspects of experiments deterministically, save one: the physicists themselves. The metaphysical assumption was that they simply have free will, and do not affect the outcome of experiments (recall that 'reality' is classically treated as independent of subjective experience).\textsuperscript{89} How this free will was tied to physical phenomena was anathema to classical understanding; but now it had become unavoidable.

As physicist Henry Stapp writes, the basic problem of objective observation in atomic physics was that an “observed system requires isolation to be defined, yet interacting to be observed.”\textsuperscript{90} This implied that there can be no absolute separation between subject and object, or objectivity, as was assumed in classical physics.\textsuperscript{91} Observation, according to Heelan, affects reality in at least three ways: a physical way (a change in the object, namely the character of the particle), a psychological way (as there is a discontinuity in our knowledge of the object), and a logical way (as the mathematical representation changes from wave to particle picture).\textsuperscript{92} According to Heelan, this new understanding of the observer, called “psycho-physical parallelism,” is now key to the philosophy of many modern physicists.\textsuperscript{93}

\begin{itemize}
\item \textsuperscript{83} Honner, \textit{The Description of Nature}, p.119
\item \textsuperscript{84} Jammer, p.v
\item \textsuperscript{85} Capra, p.132
\item \textsuperscript{86} Capra, p.42
\item \textsuperscript{87} Whitaker, p.5
\item \textsuperscript{88} Heelan, \textit{Quantum Mechanics and Objectivity}, cover page
\item \textsuperscript{89} Whitaker, p.221
\item \textsuperscript{90} Capra, p.136
\item \textsuperscript{91} Honner, p.94
\item \textsuperscript{92} Heelan, p.50
\item \textsuperscript{93} Heelan, p.57
\end{itemize}
Perhaps the simplest argument against objectivity is presented by Rozental: “The non-objectivity of a quantum system,” he says, “is shown by the fact that it is known only to the extent that it interacts with an observer.” Objectivity, which can be restated as ‘the point of view of having no point of view,’ is still a point of view – and, with this “inescapable presence of subjectivity,” it can be argued that physics, according to Zukav, has become a branch of psychology.

Nature and ourselves are inherently connected in quantum physics, and the rejection (or misunderstanding) of this interpretation is, according to Heisenberg, “traceable to the Cartesian partition;” the objectivist, mind-vs-matter metaphysics of classical physics. The loss, or at least the serious calling into question of objectivity, challenged common sense just as classical science and the Enlightenment had centuries before.

The Uncertainty Principle, Quantum Logic, and Complementarity

Unlike the ‘illusively' absolute and objective knowledge of classical physics, all that is known in quantum physics is probabilities. This is not because of a shortcoming in our knowledge, but because probability – or chaos, chance, uncertainty, indeterminacy – is a fundamental feature governing the existence of matter. Heisenberg for instance noted that the momentum and velocity of a particle cannot be known at the same time. This inherent epistemological limitation in knowing atomic reality was formalized in 1926 in Heisenberg’s Uncertainty Principle, which, simply put, stated that you cannot know everything at once about a particle. The idea of a complete clarification of quantum activity, therefore, “cannot be achieved.”

Stephen Hawking, in his book A Brief History of Time, says the Uncertainty Principle ended the “dream” of total determinism. The more precise we get in our measurements, the more the particle is disturbed; the more precise we get on one measurement, the less we can know about another. This, says Hawking, is a fundamental property of the world, from which nothing is exempt. After more than fifty years (seventy by now), he laments, there are still those who resist the paradigm shift in our scientistic metaphysics; many philosophers can’t judge its value correctly, and its consequences still lead to controversies.

Heisenberg himself had to confront the implications of his Uncertainty Principle. It applied directly to his own contributions to quantum mathematics, since there were at least two answers – which both work – to solve the equations. In Schrödinger’s Cat paradox, for example, it was famously asked if a cat in a probabilistic death-trap is dead or alive only once an observer opens its box and looks. Irrationally, this is what quantum physics seemed to imply. The illogical suggestion is that the cat is dead, alive, or somewhere in-between until someone observes it – whereas classically it should be either dead or alive, independent of any observation. There are two basic approaches for finding ‘the' answer; the first, quantum mechanics, devised by Heisenberg, describes the behavior of subatomic particles. The second, wave mechanics, devised by Erwin Schrödinger, describes the behavior of subatomic waves. Heisenberg at first rejected Schrödinger’s math, until Bohr, his mentor, recognized

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94 Rozental, Niels Bohr, p.52
95 Heelan, p.79
96 Zukav, p.56
97 Heisenberg, p.81
98 Capra, p.133
99 Heisenberg, p.22
100 Hawking, p.72
101 While Matrix mechanics was seen as probabilistic, Wave mechanics was generally deemed deterministic. Max Born however disagreed, saying they were both probabilistic models of electron behavior (in Gregory, p.85)
that both systems, like the wave-particle duality of light they are based in, are partial truths describing one and the same phenomenon. Each part is needed to get a fuller description, as the complementary accounts help minimize Uncertainty and indeterminacy – or the chance that the Cat is anything other than dead or alive. This famous 'solution' to the paradox of quantum reality is known as the Complementarity principle of opposites.  

Heisenberg was not the only one troubled by this interpretation of quantum paradox. “The notion of complementarity,” says Honner, “certainly defies ordinary experience, asking us to hold two mutually exclusive concepts together, shattering our usual framework. Ordinarily, for example, we find it intolerable for two competing accounts to be offered of the same event – one must be wrong, we instinctively declare.” But such contradictions disappear when the limitations of each isolated description is taken into account. Heisenberg's quantum mechanics demonstrated this neatly, as he found that Newtonian mechanics is still derivable from it; as stated, the two work in different, complementary realms – the microscopic and the macroscopic. Complementarity is therefore a metaphysical framework with a “higher viewpoint.” It is 'more true,' because it brings together more truths. To physicists, says Heelan, learning this higher viewpoint was extreme: it was “an experience like that of a conversion.” Turning inward to critique their classical beliefs, the architects of quantum theory shared a conviction that “man had reached a new level of consciousness about the world, himself, and the horizon of human knowing.”

Bohr’s Complementarity principle, often said to be his greatest contribution to science, caught on quickly, even becoming a word of fashion. Most scientists, says Hawking, were accommodating because it worked with experimental findings; vocal dissenters such as Einstein could only criticize it from a distance for abandoning determinacy. In approaching events from multiple, seemingly contradictory perspectives, physicists were encouraged to use classical concepts and language in an ambiguous, vague manner. According to Heisenberg, even though this led to the use of language in a way similar to in “daily life or poetry,” it was a satisfactory situation. Any problems that were met could be ignored by withdrawing into mathematical language. Gradually, the language thus produced by physicists became less precise (and, arguably, more realistic), with 'abnormal' logic and only a vague connection or “tendency” towards reality.

At the same time, thinkers such as John von Neumann and Garrett Birkhoff attempted to develop a new, precise language that extended or modified classical logic. They tried to systematize and incorporate the abnormalities of quantum physics. Pure mathematics, it had become clear to them, can be based on different logical systems, supporting the relativity of logic. The first consequence of applying the concept of the relativity of logic to quantum physics was the renunciation of the validity of the traditional Aristotelian logic – the so-
called law of bivalence, which recognizes only the two values of ‘true’ and ‘false.’ The Aristotelian, or dualist logic that something is either true or false (Tertium non datur: ‘there is no third possibility’), was transcended by quantum logic. This new logic was based not on how we think, but on how we experience; our thinking, and the classical language in which it often takes place, was discovered by Von Neumann to project illusory restrictions onto the real world. It molds ‘reality’ according to its own axioms, instead of empirically deducing how reality operates. Aristotelian logic deals with certainties, and in the lack of certainties throughout most of life, it subliminally programs us to invent fictitious certainties. Hence Von Neumann's expansion of logic is an expansion of awareness structured into language, forcing us to recognize degrees of certainty about our own beliefs.

In the complementary duality of wave and particle physics, the and which makes them both true is a metalanguage of physics: that is, a language which speaks about the language of physics. Not the object, but the possible descriptions of the object are referred to. By allowing more than one true answer, the Complementarity principle asked the philosophical question: what can we say about reality? To philosopher of science Hans Reichenbach, this question put physics in the realm of the philosopher again.

Aristotelian bivalence, or dualism, which had virtually monopolized (Western) ways of thinking for over twenty centuries, was being replaced by Von Neumann's three valued logic of true, false, and indeterminate. Alfred Korzybski, the philosopher, scientist and logician, said this shift marked the transition from an Aristotelian civilization – dogmatic, monistic, authoritarian – to a non-Aristotelian civilization – relativistic, pluralistic, and libertarian. F.S.C. Northrop, legal scientist, explains:

“...When such empirically verified philosophies of the true in the natural sciences is identified with the criterion of the good and the just in the humanities and the social sciences, one has natural-law ethics and jurisprudence. I.o.w., one has a scientifically meaningful cognitive criterion and method for judging both the verbal, personal, and social norms of the positive law and the living ethos embodied in the customs, habits, and traditional cultural institutions of the de facto peoples and cultures of the world.”

This legalistic statement denotes a multi-disciplinary concern for the human implications of the New Physics, well before the New Age. But the “scientifically meaningful” implications, such as an expanded logical framework, were first actively created within the scientific community.

Bohr's Complementarity seemed to tell philosophers and scientists that both-and is preferable to Aristotle's either-or, allowing multiple truths to be recognized beside the purely – and dominantly – rational. Restivo, like other positivists, criticizes this ambiguity. However, there are two things to keep in mind, says Zukav: one, that the ambiguity was intentional, and two, that it worked. Zukav counts it as an acknowledgment of that part of our psyche which science had subdued since the 1700s; namely,

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113 Jammer, p.341 More accurately, says Jammer, it should be called Chrysippean logic as Chrysippus was earlier to state it than Aristotle. Gregory asks, how do we know the law of bivalence is true? And he answers: “In fact, of course, we don’t. The law is a convention – a way we use language.” (p.172)
114 For example, that either Heisenberg’s or Schrodinger’s maths were correct, but not both.
115 Zukav, pp.27, 296
116 Reichenbach, Rise of Scientific Philosophy, pp.175-176
117 Jammer, p.342
119 Heisenberg, p.25
120 Honner, p.214
121 Restivo, p.28
122 Zukav, p.62
our irrational side, and the chaos that lurks within it.\textsuperscript{123} With a bit more nuance, this seems to say that what physicists realized was that while rationality is natural, we cannot expect all of nature to be rational in turn.

The problem of \textit{what we can say} about nature is perhaps the fundamental problem of quantum theory. It took a long time even for physicists to accept paradoxes in nature as intrinsic to the structure of atomic reality, and to realize that paradoxes arise whenever atomic events are described in the language of classical physics.\textsuperscript{124} Even in the 1980s, Restivo refers to the wave-particle duality as an "alleged" paradox.\textsuperscript{125}

The 'orthodox' Copenhagen interpretation, with its recognition of the subjective observer, has been accused of leading to solipsism.\textsuperscript{126} This is a taboo amongst scientists, as it posits that the only thing we can say is real is one's own mind, and not matter. As Toulmin writes, "It arouses not only objections, but fear: that things like fundamental materialism are not only a theory but a myth."\textsuperscript{127} Conceding the end of objectivity is believed to point to solipsism, the other extreme, which is absolute subjectivity. If the outside world isn't really real, but a myth created by our senses and symbols, one fears to ask, then what is real? And what does this mean for the very notion of science? However, this accusation arises from a misunderstanding of complementarity: if one remains in a dualistic framework, then yes, if one extreme - objectivity - is false, the other must be true. But complementarity negates the finality of both. Instead, an honest balance must be found. Meditating over such distortions and misunderstandings of the Copenhagen interpretation, Heisenberg considered this confused moment in history to have experienced "the greatest degree of violence in a scientific controversy ever."\textsuperscript{128}

\textit{Not Everybody Agrees to Change}

The Copenhagen interpretation has certainly not left all scientists satisfied. One of the main stumbling blocks lies in the fact that it doesn't relate what "really" happens in an atomic event;\textsuperscript{129} Bohr only gave a qualitative description of what happens in the electron, not quantitative.\textsuperscript{130} However, say Heisenberg and Zukav, "pure reason," which in classical physics would aim to satisfy this question, will never be able to arrive at an absolute understanding of reality, whether in atomic physics or elsewhere.\textsuperscript{131} The Copenhagen interpretation, therefore, which grew out of the complementarity principle, "is in no way positivistic;" its claims to knowledge through a materialist, rational approach are too limited, Heisenberg admits, to deduce any absolute truth.\textsuperscript{132} This inherent limitation on knowledge left physicists feeling that the ground would be cut from under science.

\begin{itemize}
\item \textsuperscript{123} Zukav, p.62
\item \textsuperscript{124} Capra, p.66
\item \textsuperscript{125} Restivo, p.30
\item \textsuperscript{126} Heelan, p.96 To my knowledge, in solipsism only the self exists, as it is all that can be 'proven' to exist; the self or mind is all that is known to be real and everything else is rather mechanical, lifeless. Therefore the solipsist materialist lives in a dead and lonely universe. The atheist materialist, interestingly, seems to express the same belief except from the outside, instead of the inside, making matter the only verifiable reality as opposed to the self.
\item \textsuperscript{127} Toulmin, p.68
\item \textsuperscript{128} Heisenberg, p.167
\item \textsuperscript{129} Heisenberg, p.50
\item \textsuperscript{130} Heisenberg, p.38
\item \textsuperscript{131} Heisenberg, p.92, Zukav, p.63
\item \textsuperscript{132} Heisenberg, p.145
\end{itemize}
As Northrop writes, physics is neither epistemologically nor ontologically neutral.\textsuperscript{133} So, when a theory of physics is assured to be verified, it is assumed that the metaphysical reality is confirmed as well. As there had been no major ‘paradigm shifts’ to upset the materialist consensus for centuries, the “illusion” somehow persisted among physicists that they were all talking about the same thing in essentially the same way. Colodny therefore notes evidence of a “dogmatic” resistance in twentieth century science.\textsuperscript{134} Dogmatic resistance to the new epistemology and ontology stems, according to Zukav, from the fact that “it is difficult to relinquish the sense of security,” or certainty, that came from the long and rewarding acquaintance with the classical world view. Accepting that nature is fundamentally irrational – as it is governed by chance, or probability, which is the “essential” statement of quantum mechanics – was too “powerful [a] blow” to the intellectual.\textsuperscript{135}

Whitaker notes a divide amongst those who wished to overcome this uncertainty and irrationality, between those who thought Copenhagen needed entirely new mathematical features, and those who thought it needed adjustment in its interpretation.\textsuperscript{136} Heisenberg, however, noted three distinctly antagonistic approaches to Copenhagenism. The first group wanted to change the philosophy, but not the physics. The second group wanted to alter only a few mathematical points, because they realized it worked. The third and final group, however, hated the whole thing – without offering counter proposals. Einstein, Schrödinger,\textsuperscript{137} and Von Laue belong to this third group; all three agreed on a return to the ontology of materialism – the metaphysical concept of matter as reality in classical physics.\textsuperscript{138}

Albert Einstein, a fervent rationalist, wanted to uphold determinism, realism, and locality.\textsuperscript{139} His famous statement, “God does not play dice” (reportedly countered by Bohr with “Albert, stop telling God what to do”), reveals a deterministic, if not theocratic view on chance. Furthermore, although recognizing that physics is a creation of the human intellect, which, if humans have free will, is subjective, he denied that quantum theory marked the end of objectivity.\textsuperscript{140} According to Heisenberg, Einstein critiqued the fact that while the Copenhagen interpretation may work statistically, it does not say what happens independently of or between the observations.\textsuperscript{141} It remains aloof of claims to ‘objective’ metaphysical knowledge. Einstein’s critique itself thus stemmed from the assumption in classical physics that experiments can be done objectively. After the Einstein-Rosen-Podolsky (EPR) debate in 1935 had challenged the early formulation of quantum theory, however, he withdrew from the debate, and failed to create an alternative to Bohr’s non-deterministic physics. Bohr’s eventual victory in the debate was, to Einstein, a Pyrrhic victory, paying a price “which science could less and less afford.”\textsuperscript{142} Especially as he never devised an alternative to Bohr’s non-deterministic physics, Einstein’s

\textsuperscript{133} Quoted in Heisenberg, p.25
\textsuperscript{134} Colodny, Paradigms and Paradoxes, p.132
\textsuperscript{135} Zukav, pp.210-211
\textsuperscript{136} Whitaker, p.326
\textsuperscript{137} Schrödinger later turned to biophysics, and in a 1944 book called What is Life? he gave the first mathematical definition of the difference between living and dead matter, casually noting the idea that life, or living matter/energy, is negative entropy (the opposite of chaos). This later became part of the basis for the science of cybernetics.
\textsuperscript{138} Heisenberg, p.128
\textsuperscript{139} Locality denotes the idea that only near-by, or local objects can influence each other. Non-locality on the other hand posits instantaneous connections between objects over large distances; information without location. This is a monistic metaphysics, which says there is no separation in the universe; we’ve simply created the illusion of separation in our minds through our habit of analysis. It is however only one of many interpretations of quantum mechanics.
\textsuperscript{140} Whitaker, p.272
\textsuperscript{141} Heisenberg, p.144
\textsuperscript{142} Honner, p.108
role decreased in defining what science itself is, let alone what it costs.

Although Einstein himself was inspirational in noting the epistemological qualities (or shortcomings) of classical physics, he resisted Bohr's interpretation of quantum mechanics. This was rather disheartening for the latter.\textsuperscript{143} Others, like de Broglie, Schrödinger and Wigner, students of Einstein, shared traditionalist motivations and also disagreed with Bohr's new approach to physics. They became the leading dissidents against quantum mechanics. Still, Bohr's universally recognized prestige as a result of his atomic research helped assure the widespread acceptance of his word. Elder physicists like Planck and von Laue were also largely ignored because of their age, and only the dissent of Einstein formed a threat – though with its lack of alternatives to Copenhagen, it remained a minor one. Bohr and his model had, in a way, become the new dogma.

David Bohm, while writing an orthodox textbook on quantum theory in 1951, also grew dissatisfied with its conclusions. After befriending Jiddu Krishnamurti, the spiritual philosopher, he began to publish on the nature of science and its relation to human knowledge and language, even proposing a new mode of using existing language so as to maintain classicist perspectives.\textsuperscript{144} Something of a modern renaissance man, he was what Barbour calls a “creative physicist,” at one point postulating an 'implicate order' of reality underlying – and undetectable by – the observable world.\textsuperscript{145} Bohm wrote on science, both orthodox and unorthodox, mathematics, philosophy, psychology, neuroscience, biology, linguistics, and theory of art. He seems to have followed the path which Bohr envisioned for the Complementarity principle, by applying his insights from physics around the different disciplines. However, he did so without explicitly using Complementarity, and, importantly, without the support of the physicist community.

Einstein and others hoped for the redeeming discovery of a Hidden Variable, a deterministic yet purely theoretical force controlling the seemingly indeterminate quantum anarchy.\textsuperscript{146} John S. Bell was another Einsteinian dissenter, who – “wrongly,” according to Whitaker – thought that Complementarity was ill-defined, unsatisfactory, and bizarre. Wrongly, because Complementarity overcame paradoxes, allowing all experiments to be actively discussed; and as Whitaker points out, even Bell owed his doubting questions to this metaphysical framework.\textsuperscript{147} He formulated Bell's Theorem in 1964, a famous investigation of the Hidden Variable theory and Einstein's charge of incompleteness of quantum mechanics. However, seemingly impossible, a-causal – or nonlocal – connections were in fact detected between widely separated particles. As Whitaker writes, “anybody who's not bothered by [Bell's Theorem] has to have rocks in his head,”\textsuperscript{148} since it, and various subsequent tests, showed the interconnectedness of matter regardless of distance. It indicated that Einstein's dream of maintaining a local realist theory with Hidden Variables was misguided, and, through later empirical evidence, also came out in favor of quantum mechanics. Bell's Theorem (and similar investigations, such as Alain Aspect's experimental proof of so-called 'spooky action at a distance') suggests that mainstream science has a strong materialist bias, while in fact modern physics has already disproved a purely materialist metaphysics. Bell's failed attempt is said to have underscored the veracity of some of the

\textsuperscript{143} Rozental, p.131
\textsuperscript{144} Whitaker, p.266
\textsuperscript{145} Barbour, p.97
\textsuperscript{146} Hidden Variables were even sought in metaphysical explanations (the Hand of God), and in consciousness itself
\textsuperscript{147} Whitaker, pp.323-324
\textsuperscript{148} Whitaker, p.259
Copenhagenist’s conclusions. However, while one could go so far as to defend the idea that materialism has been disproved – seeing as eighty years of quantum physics has failed to prove otherwise – it is more conservative to say that materialism, or the reality of matter as ‘stuff’, is only part of the truth of reality.

No list of quantum theories would be complete without Bryce Seligman DeWitt’s Many Worlds Interpretation of the 1960s and 70s. It has been made famous in science-fiction. Like the Copenhagen interpretation, it overcomes all paradoxes, except it does so by positing that every single probability predicted by quantum mechanics comes true, somewhere; that there are nearly infinite multiple universes. This interpretation is seen as economical by some, and over the top by others; and through this controversy, it draws in many commentators.

While both the traditionalist and creative dissenters of the Copenhagen interpretation are largely represented by the rationalist stream, this is not to say that their opponents were mostly irrational. Furthermore, among those who did accept the arbitrariness of physical reality, and the loss of total determinism, there is no exclusive trend pointing to mystical interpretations. Jacques Monod for example, a materialist and a molecular biologist, found that the realization of pure chance transferred into biology “has proved that there is no purpose in nature. Man knows at last that he is alone in the universe's unfeeling immensity, out of which he emerged by chance.” Monod also maintains a strict mechanistic reductionism, contributing to an extreme, nihilistic form of metaphysical realism where consciousness has no place.

The 'dissenting' models and approaches illustrate, amongst other things, the continuing struggle for metaphysical clarity. The outlandishness of some proposals is no greater than the discoveries upon which they are based; and indeed, they can all make a truthful claim to satisfying the mathematical implications to some degree.

**Continuing Challenges**

Rupert Sheldrake, one of the more controversial scientists in the media today, sums up the state of physics in *The Credit Crunch for Materialism*:

“First, some physicists argue that quantum mechanics cannot be formulated without taking into account the minds of observers; hence minds cannot be reduced to physics, because physics presupposes minds. Second, the most ambitious unified theories of physical reality, superstring and M theories, with 10 and 11 dimensions respectively, take science into completely new territory. They are a very shaky foundation for materialism, physicalism or any other pre-established belief system. They are pointing somewhere new.

Third, the known kinds of matter and energy constitute only about 4% of the universe. The rest consists of dark matter and dark energy. The nature of 96% of reality is literally obscure.

Fourth, the cosmological anthropic principle asserts that if the laws and constants of nature had been slightly different at the moment of the Big Bang, biological life could never have emerged, and hence we would not be here to think about it. So did a divine mind fine-tune the laws and constants in the beginning? Some cosmologists prefer to believe that our universe is one of a vast, and perhaps infinite, number of parallel universes, all with different laws and constants. We just happen to exist in

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150 Whitaker, p.277
151 Monod, *Chance and Necessity*, in Barbour, p.80
the one that has the right conditions for us.”

One of the continuing challenges of post-Copenhagen physics is reconciling relativity and quantum physics into a complete theory of the particle world. One proposed, but incomplete solution was the quantum field theory, which posits that all physical interactions involve creation and destruction of particles, and a basic symmetry between particles and antiparticles, as well as the ‘directions’ of time. Normal causation, where A leads to B, is mirrored in time by B leading to A. Later experiments, such as John Bell’s nonlocality experiments, seemed to indicate that particles which had interacted at some point (which they theoretically all did, in the Big Bang model), will remain connected across the entire universe: what’s more, they are organically connected, with instantaneous knowledge of each other and the decisions they make. It is as if event A ’causes’ B, C, D, and E, but B also ’causes’ A, C, D, and E, and so on. Mysticism, it is said, confronts one with the same notion, albeit through direct experience. Beyond the spacetime manifestation of the particles, causation works in every possible direction; everything is connected all the time, or even before or outside of time. In relativity, the speed of light is the only universal constant, and a plateau of possible speed; but quantum particles seem to know instantaneously, as if beyond transmission.

So-called nonlocal quantum theories therefore posit information without location. The central mystery of quantum theory then, according to physicist Henry Stapp, is ‘How does information get around so quick?’ Nonlocality (or subatomic physics in general) seems to be one branch of science which says there is a realm which we can’t perceive. We can’t see this “place” beyond space and time where all information exists at once; but it fits Occam’s Razor, and without it our science makes less sense. Quantum physics therefore seems occult in some of its implications, postulating “things” which we cannot know, see, or touch; things we can’t prove or disprove absolutely.

Integrating consciousness through quantum physics, as Sheldrake has warned, is perhaps the greatest challenge for certain physicists. This was a virgin enterprise for physical science, the need for which Arthur Eddington already described in 1929: “Physics most strongly insists that its methods do not penetrate behind the symbolism [of mathematics]. Feeling that there must be more behind, we return to our starting point in human consciousness – the one centre where more might become known. There we find other stirrings, other revelations than those conditioned by the world of symbols. Surely then that mental and spiritual nature of ourselves, known in our minds by an intimate contact transcending the methods of physics, supplies just that...which science is admittedly unable to give.”

Since classical physics had previously failed to account for any subjective experience, Eugene Wigner, a friend and colleague of Einstein, in The Scientist Speculates, decided that 1) the mind is not subject to quantum mechanical laws, 2) that the mind can influence the course of nature by its acts, and 3) that the linear mathematical equations of the quantum theory are unsatisfactory. Heisenberg also did not believe that quantum theory itself contains “genuine subjective features” such as mind. John Von Neumann and Niels Bohr were similarly conservative, both requiring classical observers in their interpretations.

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153 Zukav, p.72
154 See, for example, Capra, p.204
155 Quoted in Zukav, p.87
156 Eddington, Science and the Unseen World, Quoted in Wilber, p.10
157 Wigner, p.294
158 Heisenberg, p.55
159 Whitaker, p.278
Others, however, weren't quite as reticent. Sir James Jeans, physicist and astronomer, declared that “The old dualism of mind and matter, which was mainly responsible for the supposed hostility [between science and metaphysics], seems likely to disappear...through substantial matter resolving itself into a creation and manifestation of mind.”

Similarly, Carl Jung and his patient and friend Wolfgang Pauli, a Copenhagen physicist, decided that “physics is the study of the structure of consciousness.” Freeman Dyson, a physicist from the same generation who is still active in the field, was moved to write that “Being a scientist, trained in the habits of thought and language of the twentieth century rather than the eighteenth, I do not claim that the architecture of the universe proves the existence of God. I claim only that the architecture of the universe is consistent with the hypothesis that mind plays an essential role in its functioning.”

David Bohm and John Bell, who did not agree with the Copenhagen interpretation, also saw physics approaching the inclusion of consciousness. Bell thought that consciousness was important, but not yet to the current state of physics. Bohm, together with neuroscientist Karl Pribram, went further and developed the Holonomic Brain theory of consciousness. Later models by other thinkers include the Many-Minds and Quantum mind theories, which seriously discuss the correlations between non-determinism and nonlocality in physics with the mystery of consciousness. Perhaps one of the most contentious, exciting, and misrepresented changes in the metaphysics of science is revealed in all these scientists and their theories, a change which in turn led directly to its New Age appropriation: that in studying the web of physical and mental relations between observer and observed, the participation of human consciousness in the creation of reality is being addressed in science – just as in mysticism.

What we have in this nowhere near comprehensive history of theories in the New Physics, with its open questions, dogmas, and dissenters, is a picture of a playground for metaphysical speculation where nobody really knows the rules. As we will see later on, however, physicists and lay writers have traversed this morass to discover ways in which the different approaches and philosophies can be reconciled. One of them is known as parallelism.

**Part III**

**Niels Bohr's Philosophical Outlook: its Sources and Relation to Parallelism**

Parallelists repeatedly quote the architects of the New Physics in their metaphysical speculations. Who better to speak for the meaning of quantum physics than its inventors? For a historical comparison, we may in turn benefit from their insights as an empirical starting point on the history of parallelism. More importantly, it will reveal an unmistakable shift away from strict
determinism, rationalism, and materialism. For this reason we turn to Niels Bohr, a Nobel prize winning physicist and mentor for many top physicists, who worked on the atomic structure, the Copenhagen interpretation, and the Manhattan project, and was perhaps the central contributor to quantum theory.

Bohr, a highly respected Danish physicist who lived from 1885 to 1962, founded the Institute of Theoretical Physics – later renamed in his honor – in Copenhagen in 1921. Most major physicists of the time, including Heisenberg, Pauli, Kramers, and Dirac, came there to learn his approach, which became known as the Copenhagen interpretation. According to historian John Honner, Bohr’s approach cannot be linked to any other philosophy; it was “sui generis.”

Certainly Bohr’s ideas were novel in the world of physics, but we should not agree with Honner, nor the parallelists who link him to the East, until we have taken a closer look.

Bohr resolutely declared that quantum physics, in its incompleteness, was complete. No major changes were necessary to its structure and interpretation, he said – a claim which seems dogmatic if not arrogant to skeptics. This conclusion was made not as a preconception, however – biased neither by pure rationality nor mysticism – but as the fruit of long and fair empirical inquiry. Clifford Hooker and others therefore defend Bohr’s conclusion of completeness; it wasn’t dogmatism, says Hooker, but realism about what we can say.

The dogmatism in twentieth century science, if anything, was on the dissenting side of quantum interpretation, says Jammer, as the classical physicists adhered to their idea of what it means to interpret a physical theory.

Indeed, Bohr himself recognized the difficulty of speaking on the behalf of nature: “There is no Quantum world,” he said, “There is only an abstract quantum physical description. It is wrong to think the task of physics is to find out how nature is. Physics concerns what we can say about nature.”

But Bohr did not revel in vagueness. As he said, he was “trying to learn afresh how to use language.” The admitted difficulty in saying what he wanted to say – a problem shared with mystics, as they attempt to translate the expansion of consciousness – and his attitude towards classical physics, appeared to some critics as mystery-mongering. They did not, says Honner, recognize the circularity of his approach, linking language and reality, classical physics and quantum physics. If he seemed vague and ambiguous, it was because people were still retaining the one-sided, dualistic illusions of classical physics instead of opening up to the many-sided approximations of Complementarity.

The same descriptive task befalls mysticism and philosophy, and Bohr has the following to say on the apparent clash between these approaches: in speaking of nature, he writes,

“It is not a question of what one could do, but what is necessary. I am quite prepared to talk of the spiritual life of an electronic computer; to say that it is considering or that it is in a bad mood. What really matters is the unambiguous description of its behavior, which is what we observe. The question as to whether the machine really feels, or whether it merely looks as though it did is absolutely as meaningless as to ask whether light is “in reality” waves or particles. We must never forget that “reality” too is a human word just like “wave” or “consciousness”. Our task is to learn to use

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166 Honner, p.74
167 Quoted in Colodny, p.160 Whitaker agrees, p.176
168 Jammer, p.9
169 Quoted in Petersen, The Philosophy of Niels Bohr, p.12, My italics
170 Quoted in Whitaker, p.180
171 Honner, p.73
Bohr learned that this stated task – overcoming ambiguity in the exploration and description of nature – required more than just the hoarding of empirical fact. One of the first things Bohr recognized about what we can say was the need to abandon determinism and naïve realism – to abandon fixed values about reality. Whereas Cartesian and Newtonian science implied that a complete knowledge of the present world and its laws would allow us to determine what the future would be (determinism), Bohr realized it would only give statistical, probabilistic knowledge of the future (indeterminacy). Einstein, the acknowledged but mostly absent leader of the physicists' community, disagreed; hanging on to traditional determinism, he disapproved of what he thought was an incomplete quantum theory. The debate Bohr and Einstein held, in a “battle for the soul of physics,” was thus on the very nature of scientific theory and what it can say. Significantly, Einstein's classical convictions were defeated.

Complementarity and the Copenhagen interpretation were Bohr's contribution to a meaningful physical understanding of the mathematical processes. By themselves, the “immensely successful and unproblematic calculational aspects of the theory” gave no existential problems; but Bohr, a dedicated physicist, not a mathematician, understandably felt their deductions were illegitimate without questioning their implications. As a recognizable leader in the field, Bohr transcended the mathematical formalism and added a philosophical and linguistic approach alongside the physical. For this transgression, ironically, he has been both championed as a positivist, a realist, a materialist, an idealist, and a pragmatist, and criticized for the same.

Contextualizing Bohr's legacy, Whitaker notes that even today, most physicists readily accept the mathematical approach to quantum theory; but they are “unaware or even dismissive” of any conceptual worries about working with it. Except for the few, reinterpreting our picture of reality seems “uninteresting,” and Bohr's attempt little more than “pedantic.”

Navigating Duality with Complementarity

Bohr recognized the need to first understand classical physics before approaching quantum physics. While the realms they describe are fundamentally different, and classical terms and concepts become ambiguous when applied to the quantum realm, they are still continuous with each other. He therefore saw quantum physics as a refinement of classical physics, and so decided to keep alive classical notions by restricting their use and applicability. This was a revolutionary act, necessitated, he thought, by the reality of the state of physics. He believed this act – assigning symbolic systems to different domains of nature – reflected an epistemological lesson beyond the confines of atomic physics. It was a refutation of the universality of the laws of science. More of a philosophical move than scientific, Bohr has since been treated more respectfully by philosophers than by physicists; but

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172 Quoted in Rozental, p.234
173 Honner, p.183
174 Whitaker, pp.7, xiii
175 Whitaker, p.8
176 Whitaker, p.165
177 Whitaker, p.165
178 Whitaker, p.xiii
179 Whitaker, p.176
180 Whitaker, p.169
not surprisingly, as this was a time, says Toulmin, when “metaphysics was out.”

Some colleagues accused Bohr of leaving behind realism for positivism. Schrödinger for one thought that Complementarity, “if he didn't know Bohr was totally honest,” was “intellectually wicked.” However, says Whitaker, Bohr had merely renounced classical, naïve realism, and not realism itself. The charge is also denied by Bohr himself: “I can readily agree with the positivists about the things they want,” he says, “but not about the things they reject,” including, of course, the realm of metaphysics. Bohr tried to avoid both the extremes of universal mechanistic determinism, to which Einstein’s side tended, and that of anarchic subjective relativism.

Understanding the interrelationship of classical and quantum physics had forced Bohr to recognize a unitary philosophy and metaphysics, one which accorded a place to multiple vision above “single vision” – pluralism above polemics, non-duality above duality. Schrödinger's charge of “wickedness” then refers to Bohr's conviction that he could resolve the issues by “grabbing both horns at the same time;” that, as Honner writes, “Complementarity allows us to have our cake and eat it.” Science was now allowed, without being stopped by contradiction or paradox, to take advantage of two seemingly contradictory approaches. More accurately however, since he saw that one 'true' model would never fit, Bohr's multi-model approach allowed for multiple permutations (e.g. that light travels as wave and particle) and the recognition of a degree of truth on both sides of a duality. Aristotle's dichotomous 'true or false,' in which one claim to truth could trump another – as in the biblical truth over the reasoned, or the reasoned over the subjective – was thus relativized in the axioms of the New Physics.

The same criticism which is leveled against parallelists – that they speculate on pathways connecting the rational and irrational, the material and the spiritual – was leveled against the father-figure of quantum physics. Bohr's response was a sage-like restatement of Complementarity: “Materialism and spiritualism, which are only defined by concepts taken from each other, are two aspects of the same thing.” As such, writes Toulmin, it would be “inappropriate to talk in this context of truth and falsity in any black and white kind of way.” Whether we agree or disagree with Wilber that noting “different aspects of the same thing” is a “trivial tautology,” we cannot but recognize its importance for unitive metaphysics in the twentieth century.

The Extent of Bohr's Unitive Vision: Science, Religion and the East

Bohr's science, by stopping short of making absolute objective statements, provided an attitude

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181 Toulmin, p.vii
182 Positivism is a materialist philosophy, one which connotes a religious essence because it requires faith in rationality.
183 Whitaker, p.10
184 Whitaker, p.166
185 Quoted in Wilber, p.34
186 Single Vision is the poet William Blake's term for criticizing scientific materialism. Non-dualism is the recognition that while things appear different, they are ultimately not separate. Hence it is a unitary philosophy, different from the separateness upheld in dualism.
187 Honner, p.174
188 Rozental, p.132
189 Quoted in Honner, p.186
190 Toulmin, p.59
191 Wilber, p.26
of openness and harmony in the encounter with nature and nature religions.\textsuperscript{192} He acknowledged no boundaries in the range of rational investigation. This gave him the freedom to, through personal interest, gain knowledge of orthodox religion and mysticism.\textsuperscript{193} His notes in this broader investigation of metaphysics are said to betray a restlessness on the relationship between scientific knowledge and religious belief, finding that the epistemological problems of his time recalled the common problems of religion.\textsuperscript{194} His epistemological woes were indeed deep: his view as a physicist researching the fundamental nature of matter, trying to obtain an understanding of physical reality, had uncovered its own limitations. Simply put, the classical observer, by 'standing under' or outside of reality, cannot see what it looks like from the top; thus, Bohr said, “We may have to learn what the word 'understanding' really means.”\textsuperscript{195}

And so he looked outside of physics to complement his knowledge. “I am forcing myself these days with all my strength to familiarize myself with the mystics of nature,” he said.\textsuperscript{196} His familiarity with Eastern philosophy is well known, as is the fact that he chose the Chinese Yin-Yang symbol for his coat of arms – well before Eastern philosophy had become a trend. Reflecting on the role of the observer in quantum physics, he often quoted to his friends and colleagues a revealing Chinese wisdom, according to which “we are all both spectators and actors in the drama of life.”\textsuperscript{197} To “parallel the lesson of atomic theory,” and harmonize this two-sided position of the observer, he said, we must turn to other branches of science, such as psychology, or “even to that kind of epistemological problems with which already thinkers like Buddha and Lao Tzu have been confronted.”\textsuperscript{198} In other words, the role of the individual as agent and victim of reality had become a central issue in physics; all of a sudden, the assumptions of theocratic determinism and Aristotelian metaphysics became outmoded. Now, this is not to say that mysticism took its place: though “well aware” that the subject-object distinction is removed in mystical union, neither Bohr nor any of his colleagues believed that quantum mechanics did the same.\textsuperscript{199}

Bohr attributed the great advance of science in his time to the increasing accessibility of knowledge across national frontiers and cultures.\textsuperscript{200} Any contact with a foreign culture or society was for him a source of inspiration, and, “in his own words, an opportunity for contemplating one's own personal prejudices.”\textsuperscript{201} Bohr, says Rozental, particularly referred to Lao Tzu and Buddha for their ability to encourage and give consolation. These ancient sages had emphasized the futility of

\textsuperscript{192} Honner, p.186
\textsuperscript{193} Rozental, p.236
\textsuperscript{194} Honner, p.180
\textsuperscript{195} Quoted in Capra, p.219. In Heisenberg's eyes, “understanding' in truest sense is mathematical.” In the Platonic sense, it is ideal, metaphysical. In other words, while we are 'standing under' reality, seemingly hovering over some unknown abyss, we are always standing on top of something numinous and metaphysical: symbols, language, ideas. Heisenberg, quoted in Wilber, p.49. Note that in the Rastafari religion, for example, "Overstanding" replaces "understanding" to denote a different perspective altogether: that of enlightenment.
\textsuperscript{196} Quoted in Honner, p.176
\textsuperscript{197} Rozental, p.178
\textsuperscript{198} Quoted in Honner, p.94
\textsuperscript{199} Wilber, p.7
\textsuperscript{200} Rozental, p.185
\textsuperscript{201} Rozental, p.232
demanding an answer to the question of the meaning of existence. “They understood,” he said, “That any use of the word 'meaning' implies a comparison, and with what can we compare the whole of existence?” Deeper than this, however, he refuted the solipsism that meaninglessness can bring about; the statement 'existence is meaningless,' he recognized, is itself devoid of meaning. Bohr therefore provided metaphysical consolations himself, diminishing the 'abyss of subjectivity,' nihilism and solipsism which classical adherents feared they would fall into. His metaphysical-linguistic philosophizing was recalled by his student Paul Dirac:

“For reasoning about abstract philosophical questions Bohr was very conscious of the limitations imposed by possible ambiguity in the meaning of words. This ambiguity may govern the truth or falsity of a statement. Bohr considered that the highest wisdom necessarily involves words whose meaning cannot be defined unambiguously. Thus the truth of a statement of the highest wisdom is not absolute, but is only relative to a suitable meaning for the ambiguous words in it, with the consequence that the converse statement also has validity and is also wisdom. Bohr illustrated this with the statement ‘There is a God’, a statement of great wisdom and truth, and the converse ‘There is no God,’ also a statement of wisdom and truth.”

Clifford Hooker writes that “it is no accident that Bohr was well read in philosophy, especially ancient oriental philosophy.” Such parallels as the unity of nature and the distortion of 'objectivity' figure prominently both there and in his own work. However, this does not yet imply any causal link between his own theories and those philosophies he studied from the East. What exactly did Bohr gain from these incursions beyond physics?

Bohr’s son Aage recalled that the story which perhaps best expressed his father’s view of life was the one about the three Chinese philosophers tasting vinegar, which in China is called the water, or essence of life. The first philosopher says: “it is sour,” the second says: “It is bitter,” but the third, possibly Lao Tzu, exclaims, “It is refreshing.” For Bohr, it was a happy encounter to find a “profound understanding and an echo” of his own ideas in the countries whose culture had such a different background from his own. This then is our answer to the above question: Bohr found a profound understanding and an echo, perhaps even a parallel, to his own ideas. This is not incongruous with that which Capra has alleged through parallelism – that physicists can find insight into Eastern philosophy by relating it to their own research, and vice versa.

**Contextualizing Bohr: Sui Generis?**

Regardless of his interests, Bohr was not a mystic – a simple conclusion, as he did not seek

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202 Quoted in Rozental, pp.237-238. The meaningless of meaninglessness can be a profound realization; with it, it seems, the nihilism and solipsism of the modern age can be pushed aside. A popular New Age interpretation, for example, stated nowadays in films such as *What the Bleep Do We Know*, is that 'we create our own reality.' Had they followed Bohr, quantum physics, and Eastern philosophy more closely, however, they might more accurately say that the creation of meaning is co-dependent on our subjective self, language, and objective matter. That we are both 'actors and spectators'.

203 Quoted in Rozental, p.309

204 Hooker, in Colodny, p.200

205 Rozental, p.328

206 Rozental, p.338
mystical experience. Nor, says Honner, can his approach to physics be characterized as mystical, even though peers like Pauli tried to get him to admit to a kind of mysticism. This interpretation differs from that of Ken Wilber, a philosopher and a mystic himself, who finds that all of the major physicists were mystics because of their ideas, not their experiences. Indeed, Bohr was uncomfortable with others calling his ideas mystical, but admitted that he subscribed to a “contemplative openness to the paradoxes and deep mysteries of human existence.”

By all accounts, Bohr was a no-nonsense kind of scientist. What may have set him apart was his concern for the misuse of concepts in language. For example, he rejected crude vitalism, “the assumption that a peculiar vital force, unknown to physics, governs all organic life.” Instead, he regarded the concepts of “life” and “detailed mechanical analysis” as complementary; you can’t have one without the other. They are mutually exclusive, and necessarily ambiguous, as he illustrated by asking, “When is an oxygen particle still part of the environment, and when is it part of the body?” There is no definite answer. Clarity in the use of concepts, not a struggle about the meaning of reality, was therefore a core issue for Bohr; his Complementarity represents not dualism (such as between vital force and mechanics) but a balanced conceptual analysis. What Wilber scoffingly calls the “most banal of all philosophical tasks,” linguistic analysis, is therefore the primary issue in transmitting the New Physics.

The only philosopher Bohr liked, William James, author of The Varieties of Religious Experience, wrote about the ineffability, or indescribability, of spiritual insight. Bohr, like the parallelists in his wake, similarly recognized that communicating clearly in the “straitjacket” of one preconceived logical framework, be it scientific or mystical, would be impossible. Keeping these two extremes separate is “essentially ambiguous,” he wrote; only a recognition of the variety of symbols in both, and their relationships, could help maintain clarity. By way of example: Wolfgang Pauli, who also found inspiration for his science in mysticism, regarded as mystical the same vision – namely, that of the unity of everything – which Bohr described as logical. So, depending on who you are talking to, and what type of logic you are using, the words may mean the exact same thing.

How, then, should we perceive Bohr’s unitive vision? Was he a positivist, a mystic, a proto-parallelist, a relativist, or sui generis? Honner explains that “In a thoroughly relativist account of knowledge, there are neither foundations, nor claims for absolutes. In foundational epistemologies, on the other hand, two extreme positions are possible (e.g. Marx and Hegel). [In both extremes], we are assured that our conversations are anchored in objective reality. So, also, in scientific practice, we have a guarantee that we are getting closer to the whole truth and that there is a truth that we can seek. But Bohr does not give himself solely to either of these positions. Bohr leaves several philosophical issues unresolved.” Bohr's apparent indecision shouldn't come as a surprise; in his own words, Bohr seriously acknowledged “those profound truths which defy articulation.” As such, he was a

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207 Honner, p.176
208 Honner, p.179
209 Honner, p.183
210 Whitaker, pp.190-191
211 Wilber, p.13
212 Honner, p.176
213 Rozental, pp.115-116
214 Quoted in Honner, p.184
215 Honner, p.185
216 Honner, p.188
217 Quoted in Honner, p.192
“descriptive metaphysicist” who analyzed not the reality of the world, but what our thought about the world is. Moreover, as a Copenhagenist engaging Complementarity beyond the domain of physics, he could easily utilize relativism, positivism, mysticism, etc. without adhering to any of them. In the grand scheme of what we can say about nature, Bohr left out as little as he could: only the absolute finality and singularity of truth perished in his philosophy.

This is the outcome of paradoxical thinking, a nondualistic framework which links the New Physics to Eastern philosophy and Western mysticism. “Unresolved issues” are seen to be inherent to each and every side which attempts to describe reality. Instead, agnosticism and openness towards other metaphors can, as Capra later implored, improve one's clarity in discussing the underlying issues. A conversation between Bohr, Heisenberg, and other physicists relates the exact same conviction.

Speaking against the restrictions of logical positivism, Bohr muses on the poet Schiller -

“This [positivist] sort of restriction of language doesn’t seem very useful to me either. You all know Schiller’s poem, ’The Sentences of Confucius,’ which contains these memorable lines: ’The full mind is alone the clear, and truth dwells in the deep.’ The full mind, in our case, is not only an abundance of experience but also an abundance of concepts by means of which we can speak about our problems and about phenomena in general. Only by using a whole variety of concepts when discussing the strange relationship between the formal laws of quantum theory and the observed phenomena, by lighting this relationship up from all sides and bringing out its apparent contradictions, can we hope to effect that change in our thought processes which is a sine qua non of any true understanding of quantum theory.”

Bohr hoped Complementarity would be used across the whole field of human knowledge, not just in quantum philosophy. With this breadth of vision, he operated as if he were the head of the “priests of a church,” and even had a major role in the creation of the political movement of scientists during nuclear proliferation. This exuberance, according to Whitaker, was a weakness, as Bohr's main problem – by lifting Complementarity to dogma – became his own stifling of the ideas of others. Priestly authority is exactly what we should beware of, says Toulmin, because scientists, like anyone else, can philosophize along their own prejudices. Rozental, however, disagrees. It is not entirely fair to call Bohr dogmatic, he says, because Bohr almost single-handedly broke down the dogma of generations of scientists.

While Bohr tried to spread his philosophy across the board, response was limited. Not only scientists, but professional philosophers simply weren't interested in the problems of atomic physics. Other disciplines similarly wanted to “keep the difficulties of physics” outside of their domains. Bohr's philosophy therefore may appear sui generis merely because of his relative isolation. He himself most probably would have denied it, since there is a continuity between the metaphysical systems he seemed to divide, classical and quantum physics – a continuity which expanded logic and allocated space for mysticism.

Bohr said most philosophers missed the point of Complementarity; the point being, that it was

\[\text{Honner, p.195}\]
\[\text{Bohr, quoted in Wilber, pp.34-35}\]
\[\text{Whitaker, p.192}\]
\[\text{Rozental, pp.262-263}\]
\[\text{Whitaker, p.324}\]
\[\text{Toulmin, p.67}\]
\[\text{Rozental, p.95}\]
\[\text{Rozental, pp.183-184}\]
the only possible objective description of nature. Of course, the 'difficulties' of Complementarity – such as its very basing in paradox, instead of in the certainty of dualistic logic – which classical thinkers did not integrate, were instead noted and glorified (at least in part) by postmodernists, parallelists, New Agers, etc. The transcendent approach to objectivity and truth of Bohr's New Physics thus seems to have fallen to these groups. First, however, there was Heisenberg's important philosophical contribution in Bohr's wake.

Heisenberg Takes Up the Torch

Werner Heisenberg, who lived from 1901 to 1976, initially disagreed with Bohr on the Complementarity principle. His mathematical system worked to describe quantum events, and that was enough. Eventually, however, Bohr, his mentor and friend, convinced him to recognize Schrödinger's wave mechanics as an equal-but-opposite mathematical approach to his own quantum mechanics. After this breakthrough in perception, Heisenberg explored its implications to an even greater depth than Bohr himself.

Wilber refers to Heisenberg as an “excellent philosopher, metaphysician, or mystic of the Pythagorean-Platonic variety.” He was also an excellent scientist. Though he was capable of rigorous analysis and empiricism, he nonetheless despised mere positivism – or the attempt to be only analytical and empirical. Wilber cites a conversation between Heisenberg, Pauli and Bohr to the effect of lamenting the attempt of philosophy to do just that. Here, and elsewhere, Heisenberg is harshly dismissive of positivism: “can anyone conceive of a more pointless philosophy,” he asks, “seeing that what we can say [through analysis] clearly amounts to next to nothing?”

Heisenberg published Physics and Philosophy in 1958 in a line of works sharing optimistic 'World Perspectives' with other leaders of thought. This was a joint intellectual project “dedicated to a fresh vision of reality” and a new consciousness for spiritual and intellectual leaders. As the preamble makes clear, the authors involved were concerned with the cultural “crisis in consciousness made articulate through the crisis in science.” More explicitly, they meant to produce a fusion of intuition and reason to bring together inner and outer realities – the respective realms of psychology or mysticism and science, although it is not mentioned as such. The lofty wording of the preamble promises a somewhat Utopian future, as “mankind can finally place its trust not in a proletarian authoritarianism, nor in a secularized humanism, both of which have betrayed the spiritual property right of history, but in a sacramental brotherhood and in the unity of knowledge.” This unity explicitly used the principle of Complementarity as its basis.

The introduction to this text, by Yale professor of philosophy and law F.S.C. Northrop, follows the preamble by placing Heisenberg's Indeterminacy amongst the most significant portions of physics “as pertaining to the revision of science.” And of course, Northrop writes, “No one is more competent

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226 Honner, p.23
227 Wilber, p.32
228 Heisenberg, quoted in Wilber, p.35
229 Heisenberg, Physics and Philosophy, p.ix
230 Heisenberg, p.x
231 Heisenberg, pp.xii-xiii by Ruth Nanda Anshen, 1958
to pass judgment on what it means than [Heisenberg].”

The judgment Heisenberg presents – that we must reconcile to the modifying of philosophical and scientific beliefs – took great courage. Even Einstein balked when faced with this reality. The New Physics, said Heisenberg, carrying the “spirit of science,” needed to be taught alongside the new philosophy “or the technology will be misused and society will demoralize.” “Hence the importance,” writes Northrop, “for everyone of understanding the new physics.”

The social and cultural message is clear: as physicists like Heisenberg learned to master nature and the eschatological power of the atom, a new accompanying philosophy and ethics was needed. And the progressives of the academic community, as represented by 'World Perspectives,' looked to the scientists themselves for guidance.

The underlying message, according to Heisenberg, was the re-introduction of potentiality, or chance, into physics through quantum mechanics. The problem was, how the new philosophy of physics was to be reconciled with moral, political, and legal science and philosophy. For his concern with these issues, he is referred to as “the most metaphysical of modern scientists.” Ironically, according to Rozental, this concern is also why he hasn't been widely studied – especially in British and American schools, as they put him “somewhere between mysticism and crossword puzzles.”

Commenting on Physics and Philosophy and other texts by Heisenberg, Rozental writes that he “shows an awareness of the mysterious element in scientific knowledge, far from the facile positivism of Bohr and others of his contemporaries.” Indeed, he came to the point that the elementary particles which are observed in atomic physics were “no longer real” to him, at least not “in the same sense as objects of daily life, trees or stones.” What Heisenberg called “the ontology of materialism,” referenced earlier as an 'illusion' which proclaims a certainty of solid nature “out there,” was ended, leaving the physicist suspended over the “unfathomable abyss” of his own subjectivity. If the 'real' world can no longer be trusted to be real by the human mind, then what does it mean to be real? An unfathomable abyss, indeed.

Recall Bohr's allusion to the example of an oxygen particle being ambiguously categorized as part of the environment or as part of the human body. Similarly, the ambiguity of perceiver and perceived – a mystical insight – was declared by Heisenberg: “The union between the observer and the observed,” like the oxygen particle and the living body, “is such that it is impossible to determine what part of a system belongs to one and what part to the other.” Any other claim, said Heisenberg, is a misuse of language. For this disruptive influence on our previously solid perspective of the world, Rozental considers Heisenberg as important as Copernicus. Certainly, as we will see, his impact can be felt in quantum philosophy in general and especially in the parallelism growing out of the spiritual movements of the twentieth century.

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232 Heisenberg, p.1
233 Heisenberg, p.17
234 Heisenberg, pp.27; 2-3
235 Heisenberg, p.4
236 Heisenberg, p.19
237 Rozental, p.x
238 Rozental, p.ix
239 Heisenberg, Physical Principles, p.58, 64, 67 (Quoted in Rozental, p.49) My italics.
240 Heisenberg, p.48
241 Rozental, p.23
Part IV

Pre-Scientific Parallels from West and East

Ancient Greeks and Modern Physics

Parallelists such as Capra express the belief that the sophisticated experiments and rigorous mathematical formalism of modern physics are reconnecting science with its beginnings, 2500 years ago.\textsuperscript{243} Capra provides the following history of Greek science which, as Vanheste has shown with much of New Age historical data, is neither original nor complete.\textsuperscript{244} The earliest ancient Greeks, he says, to which modern science traces its roots, studied the essential nature of things – the \textit{phasis}, root of the word physics. And yet we cannot call them physicists in the modern sense. They often did not distinguish between metaphysics, religion, philosophy, and logic.

The hylozoists ('those who think matter is alive'), such as Heraclitus, Thales, and the Stoics, for instance did not distinguish between animate and inanimate matter, but were monistic – believing that 'All is One,' united by a vital force. The Eleatics, such as Parmenides and Zeno, arose in opposition to the doctrines of the hylozoists, seeking to arrive at a dualistic knowledge of unity – still knowing that 'All is One’ – through the path of logic, analysis, and separation. After Aristotle systematized the ancient knowledge and science of his predecessors, favoring the later ones, Western philosophy focused on theology and mostly disregarded further investigations into nature. This Aristotelianism, which claimed to know truth from falsity through a method of pure abstract reasoning, not empiricism, was reportedly found “by scholars from Bacon to Whitehead” to be more of a hindrance to science than a help.\textsuperscript{245}

Heraclitus of Ephesus, belonging to the group of forefathers whom parallelists point to, is reported to have described existence as a process of perpetual change. In the metaphysical tension between the One and the Many, or subjectivity and objectivity, change is manifested as an eternal process of 'Becoming.' The appearance of nature as static and unchanging, he believed, was a deception of the senses; in one of his few surviving statements, he declares that “Nature loves to hide.”\textsuperscript{246} Heraclitus thus used the symbol of fire to depict the substance of change – as fire dynamically and cyclically causes interplay between opposite but united pairs such as hate and love, heaven and earth, up and down, being and non-being.

Heraclitus was a contemporary of his fellow-mystic philosopher Lao Tzu, originator of Taoism. According to Capra, their world-views exhibit a “surprising” similarity;\textsuperscript{247} the principles of dynamic change between the Many opposites, which are reflections of the One, mirrors the Yin-Yang of Chinese philosophy. Capra notes however that while Heraclitus is often mentioned in connection to modern physics, he is hardly mentioned together with Taoism. Other Greeks, particularly those who came after Heraclitus, had a much greater influence on classical science: static and geometric, deterministic and dualistic, classics such as Aristotle and Ptolemy informed natural philosophy as it became science. The non-dualistic “spacetime” philosophies of the East, Heraclitus, and a few other early ancient Greeks

\textsuperscript{243} Capra, p.18
\textsuperscript{244} Vanheste, Op.Cit.
\textsuperscript{245} Restivo, p.45
\textsuperscript{246} Heraclitus, quoted by Howard Stein in Colodny, \textit{Paradigms and Paradoxes}, p.367
\textsuperscript{247} Capra, p.116
were simply less relevant to empirical science – that is, until the New Physics.\textsuperscript{248}

Discussing Heraclitus and the imperishable change that renovates the world – where fire represents both matter and energy – Heisenberg claims: “We may remark at this point that modern physics is in some ways extremely near to the doctrines of Heraclitus.” If we replace the word fire by energy, he says, then Heraclitus's description of nature beyond a material cause is indeed impressive.\textsuperscript{249} Similarly, Aristotle's matter, or 'potentia,' is also interchangeable with the modern notion of energy.\textsuperscript{250} Physicist Gerald Feinberg substantiates Heisenberg's claim, in a direct quote from Aristotle's \textit{Metaphysics} saying: “Each thing is a kind of unity, and potentiality [energy] and actuality [matter] taken together exist somehow as one.”\textsuperscript{251} Another Greek, Anaximander, believed there was 'eternal motion,' a creation and destruction of worlds from infinity to infinity. His idea that there is no supreme fundamental particle – all is energy, water, flow – was especially convincing to Heisenberg.\textsuperscript{252}

Still, the most influential Greek, connecting math and religion, in Heisenberg's conviction, was Pythagoras and his mathematical-religious school. Bertrand Russell, in \textit{A History of Western Philosophy}, also lauds him as the most influential man on human thought in general, as mathematics was fundamental to scientific thought.\textsuperscript{253} However, Pythagoras, the 'father of numbers,' was also a mystic. This fact, as Heisenberg writes, “for us is difficult to understand.”\textsuperscript{254} Therefore he differentiates modern science from the ancient metaphysicians: “It may seem at first sight,” Heisenberg says, “that the Greek philosophers have by some kind of ingenious intuition come to the same or very similar conclusions as we have in modern times only after several centuries of hard labor with experiments and mathematics. This interpretation of our comparison would, however, be a complete misunderstanding.” There is a major difference: the modern empiristic attitude, which is more modest, but firmer in its ability to make claims about nature.\textsuperscript{255} Still, while there are differences in methodology and claims, Heisenberg admitted the similarities of metaphysics between the ancient Greeks and the moderns.

\textit{Eastern Epistemes and Mysticism}

Mysticism aims to resolve the tension between the One and the Many, a tension which before the crisis in modern science was confronted by Heraclitus in the West, and Lao Tzu, Buddha and others in the East. In a 1980s lecture by Pir Vilayat Khan, a contemplative Sufi mystic, attended by anti-parallelist Sal Restivo,\textsuperscript{256} Khan described the spiritual or mystical experience as “an awakening in which the physical world is out of focus.” The 'localized' self – one's body and ego, or the One fragmented into the Many – and the 'spread throughout the universe' self – the Many having united into the One – are both experienced by the Sufi mystic. Subjectivity and objectivity are somehow transcended, as one becomes both part and whole (often described as joining the mind of God – in

\begin{itemize}
\item Capra, p.173
\item Heisenberg, p.63
\item Heisenberg, p.160
\item Aristotle's \textit{Metaphysics} 2 1045b; in Colodny, \textit{Paradigms and Paradoxes}, p.33.
\item Heisenberg, pp.61-62
\item According to Billington, Bertrand Russell, “considered by many to be the most evil man of the Twentieth Century,” was the originator of the gnosticism and Taoism of men such as Bohr, Pauli, and Joseph Needham (Billington, n.p.)
\item Heisenberg, p.68
\item Heisenberg, p.74
\end{itemize}
Buddhist terms, from Little Mind to Big Mind). Linear causation (‘A’ leads to ‘B’ leads to ‘C’) is also transcended in the mystical state, as one awakens to the interrelatedness of everything beyond time. Whether this is the same interrelatedness that quantum physics points to – such as in Bell’s Theorem – or not, regardless, it has been referred to as the ultimate reality by everyone from Sufi’s, Kabbalists, Hindus, Buddhists, Gnostics, and Neoplatonists, to Aldous Huxley, Erwin Schrödinger and Carl Jung.

According to Capra, Eastern philosophies are more religious because they are both spiritual and material at the same time. They aim for “personal identification with the ultimate, transcended isolated self” through intellect and/or experience.257 This transcendence is achieved with the help of techniques such as meditation, fasting, celibacy, etc, all of which have a long history of development. Transcendence is also said to be ineffable, or indescribable. Rational thought and language cannot fully understand or describe it; it has to be experienced. However, as Wilber points out, ineffable does not mean noncommunicable. Witness, for example, Buddha handing down the way to enlightenment to his followers.258

The direct, mystical awareness of reality which transcends thought, language and the rational mind is aided by the ambiguous use of language. Metaphor, myth and poetry, full of paradox, are used in Eastern texts as psychological analogs of mystical doctrine – representing inner struggles through mythical gods and battles – as well as to convey inconsistencies in rational thought. Zen koans for example are “carefully devised nonsensical riddles meant to make the Zen student realize the limitations of logic and reasoning in the most dramatic way. They are designed to stop the thinking process.” As psychologist Lauren Slater notes, psychological research suggests that East Asian people experience much less distress in the face of paradox than Westerners. They do not feel the unstoppable need to solve them as we do. It is, as yet, unclear if this is a cause or an effect of the meditative techniques.260

In India the main religions may appear as different from each other as Christianity and Atheism do in the West. While Buddhism, for example, is a psychological framework originally without a metaphysics, Hinduism is a religion combining rich mythology and ritual. However, they both strive for the constant, so-called mystical sensation of the oneness of all life; Nirvana to the former, and moksha to the latter. Maya is their shared idea that in ordinary consciousness, humans are stuck in the illusion that creation, the material world with all its separations, is the ultimate reality – just as Heisenberg pointed to Western materialism as an illusion. Suffering and joy are both aspects of this fleeting illusion. The unitive vision expressed particularly by Advaita Vedanta Hinduism and Mahayana Buddhism is neither monist, dualist, or nihilist, but 'nondualist.' In nondualism, unity and difference, 'One and Many,' reality and illusion are both acknowledged, as also is their mutual dependence. Bohr's Complementarity, by recognizing the mutual dependence of concepts such as wave and particle, spirit and matter, is an iteration of a nondualist framework. The Buddhist nondualist doctrine of sunyata, or

256 Restivo, pp.16-17
257 Capra, p.24
258 Wilber, p.20
259 Capra, p.48
260 Slater, Opening Skinners box, pp.128-130. To philosopher Robert Anton Wilson, part of the reason that Easterners are not as distressed by paradox is to be found in the logic systems of the East, which coincide with Quantum logic in several ways. “No Chinese raised on I-Ching,” he says, “has ever found quantum mechanics puzzling. It’s only puzzling to people raised on Aristotelian logic, where things are either A or not-A. In the I-Ching things are A and not-A at the same time.” The I-Ching is the ancient Chinese symbol system which structures reality through a dynamic balance of opposites.
'nonqualifiability,' is perhaps the most extreme form: in it, ultimate skepticism is maintained towards all categorizing, even in metaphysics: Spirit is seen to be neither One nor Many, finite nor infinite. It is, says Wilber, the “negation of all negations.”

In China, according to Capra, Taoism and Confucianism functioned as more or less complementary opposites in philosophy, combining social structure and individual spontaneity, intuitive wisdom and rational knowledge as equally valuable goals. The resolution of opposites, such as the public and the private, wealth and poverty, was recognized as a part of nature, and excess was therefore discouraged; it would only rebound in the negative. The Chinese language also incorporates opposition and difference, allowing almost infinite complementary interpretations of the same terms through its looseness and suggestiveness. Zukav for example lists multiple meanings for Wu-Li, the Chinese word for physics: his preferred one, 'patterns of organic energy,' expresses “that thing without which physics becomes sterile.” Patterns, or laws, and energy (or matter) are linked by the word organic; it can be surmised from this translation that, unlike in Western science, where matter consists of constantly moving, vibrating, rhythmic, but inherently inanimate patterns, in the Chinese understanding, the inanimate world is also somehow organic. Taoists traditionally believe we can observe but not fully understand this animated reality through the intellect – because rationality is itself a limited, relative part of the whole of existence, and the parts cannot fully describe the whole. If it were not for this lack of analysis of observation, says Capra, it would have been science.

Ch'an Buddhism, known as Zen in Japan, is a blend of the previously mentioned Oriental philosophies and cultures. It has no dogma or religious doctrines, except the freedom from fixed beliefs. Everyday affairs are experienced as enlightenment; a meditative approach to washing the dishes, for example, can lead to “a liberation from time” and its sense of causality. Capra quotes the Zen Master Dogen saying “It is believed by most that time passes: in actual fact, it stays where it is.” There is only Now, and, as in Taoism, one must seek to balance oneself to the disposition of the now. The “absolute point of view” which Buddhists and mystics strive for – a non-dualistic oversight of the dynamic balance of good and evil, self and other, and all other polar opposites which we face in the now – may not be desired by all, but it is, as Capra says, valid. Capra admits it is a perspective “fundamental to reality,” but the dualism and separation of ordinary perception may be the more useful in daily life. Thus Capra's summing up of the relevance of mysticism echoes Heisenberg's opinion of classical physics: it is useful, but not final.

To many Western thinkers, the wisdom of the East seems more mystical than metaphysical, more religious than reasoned. Its link to modern science therefore seems entirely contrived, unless one is familiar with the New Physics and its own grasping search for the underlying harmony in nature.

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261 Wilber, p.19. According to Wilber, the parallelist or New Age idea of Unity is a positivistic error, which Capra makes as well: Unity, or Wholeness, is dual. It depends on parts. Instead, through sunyata, even Unity is denied: “not-two, not-one.” This seems like an endless game however, with not-not-two and not-not-one as the next step.

262 Capra, p.104
263 Zukav, pp.31-32
264 Capra, p.113
265 Capra, p.114
266 Quoted in Capra, pp.186-187
267 Capra, p.146
268 Capra, p.130
269 Heisenberg, p.82
270 Honner, p.212
Parallelism

Along with classically minded scientists, New Agers fear the implication of quantum physics that there is no objectivity in science. For, if not in science, where do we find it? How can we know truth beyond our indoctrinated frameworks, our mind and its mechanisms? The answer, it seems, was in changing our consciousness – to experience a “change in thought processes,” as Bohr wrote. And this is where mysticism comes in. As science defines itself by polemically distinguishing from mysticism, it cannot follow. In one reading of the New Age then, only those who use insight from mystical experience to illuminate Western science – the parallelists – can properly correlate the radical information from the New Physics with real understanding.

Parallelism is the generic, and often derogatory term used to describe popular literature comparing modern science and Eastern philosophy. Parallelists cite discussions between physicists and mystics, personal experiences, selected ancient quotes, and linguistic and conceptual similarities to argue for varying degrees of parallel. While there is no defining parallelist movement or doctrine, and the practice recalls a preceding history of religious appropriations of science, there is one major example which is most often referred to – Fritjof Capra’s The Tao of Physics. According to Vanheste, his was the first New Age attempt to analyze a concrete scientific theory and use it to support a holistic worldview.

Capra is himself a Harvard-trained quantum physicist and a materialist, and he will also be looked at most intensively here.

Sal Restivo performed an early sociological study of parallelism, using an admittedly materialist sociology of knowledge to critique its claims. Restivo sought to reveal the common social and motivational roots of science and religion, noting three different historical approaches: Contrast (e.g. the theological idea of the supremacy of revelation over analysis), Symmetry (e.g. the early classical idea, held by scientists such as Newton and Boyle, that science reveals God), and Similarity (e.g. empirical, critical interpretations). He further divides parallelism, which falls into the third category, into weak and strong versions: those which argue for the supplementary knowledge of the material and the spiritual, and those which argue for total complementarity.

No matter which side of the divide an author like Capra is on, says Restivo, parallelism has been inexorably linked to the New Age movement, and disregarded by the establishment, because it is peripheral to the mainstream history of ideas and because of its extravagant claims. There is, however, at least one argument to support the endeavor of parallelism – that it is good to gain knowledge in disparate fields, and “contemplate one’s own prejudices,” as Bohr wrote. But when claims are made beyond the facts, the legitimacy of parallelism must indeed be questioned.

The Legitimacy of Parallelism

As Stephen Toulmin, scholar of philosophy, noted fifty years ago, “Often enough, we tend to ask too much of science, and to read into the things the scientist tells us implications that are not there.”

\[^{271}\text{Vanheste, p.224}\]
\[^{272}\text{Restivo, p.7}\]
\[^{273}\text{Restivo, pp.vii-viii, 5}\]
\[^{274}\text{Toulmin, p.4}\]
Often these implications are metaphysical, if not spiritual, and wildly speculative without acknowledgment. Wilber, “the big critic of attempts in the 1970s for a scientific worldview,” thus casts out parallelism on principle: “If a popular writer makes some sweeping statement about the ‘new science’ and ‘spirituality,’” he says, “I have no idea whatsoever about what they might mean, and all I feel certain of is that they don’t either.”

Toulmin writes in the 1950s that “The ambassadors of the intellect in high places often express their regret at the ‘divorce’ between the natural sciences on the one hand and philosophy on the other. To them the divorce appears a sign, a symptom, perhaps even the cause of greater evils and more radical distresses.” He therefore calls for a synthesis, to provide a more comprehensive worldview than can be obtained in the specialisms alone. However, science and philosophy, having grown apart, are mutually suspicious; and those scientists who do attempt synthesis are looked at as an embarrassment. Case in point with the parallelist phenomenon.

Recognizing that most spiritually-minded Westerners who look to the East for knowledge mostly see science as evil and narrow minded, Capra states early on that his goal is to “improve the image of science.” The irony is tangible, as most scientifically-minded Westerners who look to parallelism denounce it as false. Nevertheless, physics, says Capra, elucidates mysticism. This, it seems, is in fact well short of saying that science gives physical support for mysticism, as Capra has often been accused of doing. Instead, Capra's main points are the common ideas of unity and dynamism in the traditional Eastern and modern Western worldviews. Other parallelists, such as Gary Zukav in The Dancing Wu-Li Masters: An Overview of the New Physics, have continued this exploration of “similarities,” without necessarily calling them parallels. It is often overlooked that the New Age is not a coherent movement, but an epithet: associating Zukav, Capra, and similar authors with this movement is not entirely accurate, as its gradations of scientific accuracy are diverse. Zukav’s work for example has been edited and footnoted by five well-known physicists who evaluated his claims before publishing.

As mentioned, Capra, who is a “reductionist materialist” and a Harvard-trained quantum physicist, notes parallels between basic elements of 'the Eastern world-view' (a term which he sometimes uses generally, and other times nuances regionally and denominationally) and those emerging from modern physics. This was not an unprecedented claim. As Wilber notes, the writings of many of the greatest physicists are “positively loaded with references to [Eastern and perennial philosophy].” Heisenberg for one, as we have seen, publicly noted a “certain relationship” between the philosophies of modern science, the East, and the ancients, a relationship which favored the ability of Easterners to understand modern science over that of Westerners.

In many general criticisms of parallelism and specific criticisms of Capra's work, the nuanced relationships they present are rarely discussed. Whitaker, a science author, for example calls it little more than wishful thinking and the ability to conjure analogies out of thin air. He supports his criticism with a quote from John S. Bell: “It seems to me irresponsible to suggest that technical features of

275 Vanheste, p.225
276 Wilber, p.12
277 Toulmin, p.57
278 Capra, p.25
279 Capra, p.179
280 See, for example, Vanheste, p.92
281 Zukav, p.25. Zukav's editing physicists include Jack Sarfatti, David Finkelstein, Brian Josephson, and Max Jammer
282 Stephen Jay Gould quoted in Wilber, p.28
283 Wilber, p.6
284 Heisenberg, p.202
contemporary theory were anticipated by the saints of ancient religions...by introspection.”

Capra's knowledge of mysticism has also been called into question – admittedly by Restivo, a self-stated positivist and materialist. But these criticisms seem to ignore two basic issues: firstly, that parallelism remains in the realm of speculative popular culture, making linguistic and conceptual claims in the market of ideas that do not, and cannot have the backing of mainstream institutions. And secondly, that Capra's claims are at least as idiosyncratic as those of individual physicists and mystics. When making an extreme reading of his necessarily dubious claims, exposing their weaknesses becomes easy. This dismissive attitude, shared by Restivo, Whitaker, Honner, Vanheste and others betrays possessiveness – towards a purely rationalist interpretation of science – in the realm of metaphysics.

According to Capra, the languages of philosophy and physics are becoming very similar. The popular idea, attributed to Capra and others, that mysticism and physics are saying the same things, however, is an overstatement. The key word is similar. The following metaphor, taken from John Honner, may be useful to clarify the difference. Honner sees an asymptotic connection between classical and quantum physics; that they come close in some ways, but don't quite touch each other.

They have their respective domains of applicability. We can say that the same relationship has developed between quantum physics and mysticism: that they are seen to take a different approach towards the same fundamental reality, but without quite touching it, or, like parallels, each other.

Parallelists may seem irresponsible in justifying their agendas through modern science, and it has been easy to accuse them of doing so. They are comparing two things, both of which are unfamiliar to mainstream Western society. A more dogmatic reaction ignores Capra's claim to improving the image of science, seeing a platform for mysticism instead. But this seems to be a cultural and generational bias. Parallels might not seem as strange to somebody from the East or a more recent generation immersed in global culture. When Zukav, for example, illustrates a point about Albert Einstein's genius with the help of Zen Buddhism – namely, their shared ability to look beyond common sense – the reference may not seem as contrived.

Authors like Capra have admitted, at least in lectures attended by Restivo, to selective quoting from Buddhist texts to strengthen their case. At the same time however, as Restivo recognizes, the “credibility of parallelism has been strengthened” by observations made by eminent scientists themselves, such as Robert Oppenheimer, Niels Bohr, Werner Heisenberg, Wolfgang Pauli, C.H. Townes and others. These observations were made after making contact with Far Eastern culture during lecture tours to India, China and Japan, modern Western sciences such as that of Carl Jung, and ancient Greek philosophy. Bohr for example visited China in 1937, and was reportedly struck by its ancient notion of polar opposites – a direct parallel to his notion of Complementarity. Bohr later used the Yin-Yang symbol on his coat of arms together with the text: Contraria sunt Complementa.

285 Quoted in Whitaker, p.179
286 Restivo, p.8
287 Restivo, p.59
288 Zukav, p.54
289 Honner, p.117
290 Disregarding schizophrenia, the fundamental reality that they study “is” the same.
291 Which presumably include education, and profit, if not self-aggrandizement
292 Zukav, p.141
293 Restivo, p.19
294 Restivo, p.6. Vanheste asks why New Agers turned to science, and concludes that their one and only motivation was power and authority (p.247). Certainly there is some merit in this conclusion; however, we must not forget that Capra, Bohm, Sarfatti, Bohr, Heisenberg, etc were initially scientists who turned to mysticism, not the other way around.
opposites are complementary.\textsuperscript{295}

\textit{The Language of Parallelism}

The fundamental challenge in finding parallels between any two forms of knowledge, complementary or not, is to compare the language used to express them. This is also the method which Capra proclaims to use.\textsuperscript{296}

In science, Capra says, the rational faculty is used to discriminate, divide, compare, relativate, measure, and categorize, so as to construct an intellectual map, or language, of reality. Placed sequentially, the abstract concepts and symbols made in this process become thought and speech. This abstract system, says Capra, can never describe or understand reality completely; it remains an approximation with limited applicability.\textsuperscript{297} This realization underscores the rest of his book, as both mysticism and quantum physics have offered the very same conclusion.

According to Capra, science – both classical and modern – is successful \textit{because} it gives good approximations. You cannot know all at once. In the words of scientist and inventor Buckminster Fuller, “Scenario Universe is non-simultaneously apprehended.”\textsuperscript{298} The All cannot be known in any one instant by a human mind. Heisenberg affirms: “the part of reality that has not been understood is infinite. We can only know parts at a time.”\textsuperscript{299} The comprehension or approximation of reality is therefore a matrix of interpretation that everybody contributes to in some measure.

Language itself is thus limited in describing subatomic and mystical levels of reality. It is always a creation of the mind, and therefore may say more about the mind than about the reality it is trying to describe. Einstein for instance recognized that “As far as the laws of mathematics refer to reality, they are not certain, and as far as they are certain, they do not refer to reality.”\textsuperscript{300} Heisenberg, father of indeterminacy, also pointed out that “the processes of science and art are not very different:”\textsuperscript{301} \textit{what you can say} reflects your level of understanding, and \textit{how you say it} reflects your artistic abilities and preferences. The parallelist endeavor is therefore legitimized by the very incompleteness of description on both sides of the parallel, just as Bohr foresaw in the principle of complementarity.

The representations of reality which we use are easier to grasp than the reality itself. As a result, we often confuse them for reality. Capra quotes Korzybski’s familiar adage: “The map is not the territory.”\textsuperscript{302} The only map that equals the territory is as large and complex as the territory itself; therefore absolute knowledge is not available to the reason and abstraction. Here Capra introduces the Eastern idea of the Tao – \textit{that which cannot be expressed or contained}. We can only approximate a notion of the Tao as a metaphor or ‘likely story’ for the All; and as soon as we have described it, it is no longer the Tao.\textsuperscript{303} The Tao is beyond symbols and words, which are bound to space and time, and so

\begin{itemize}
  \item \textsuperscript{295} Capra, pp.18, 160
  \item \textsuperscript{296} Capra, p.26
  \item \textsuperscript{297} Capra, p.28. The insight is not original to Capra but has been noted by other philosophers commenting on naïve realism - human languages, created by the mind, are twice-removed from the reality they describe.
  \item \textsuperscript{298} \textit{Quoted in Wilson, R.A., Maybe Logic - The Lives and Ideas of Robert Anton Wilson}, n.p.
  \item \textsuperscript{299} Heisenberg, p.201. This quote recalls a line from the Hindu Upanishads, which says that when, “From Infinity, Infinity is taken away, Infinity remains.”
  \item \textsuperscript{300} Einstein, \textit{Sidelights on Relativity}, p.28
  \item \textsuperscript{301} Heisenberg, p.109
  \item \textsuperscript{302} A reference to Alfred G. Korzybski’s \textit{General Semantics}. See note 299
  \item \textsuperscript{303} \textit{Tao te Ching}, attributed to Lao Tzu, chapter 1
\end{itemize}
direct experience of it is sought. Still, attempts have been made to describe it. One of these attempts, the ancient T'ai Chi symbol (Yin-Yang) – which Niels Bohr put on his crest – indicates eternal motion with its swirls. Restivo's comment that parallelism “is in part an unwarranted comparison of symbol systems separated in time and space” is therefore itself unwarranted; while the symbol systems do indeed change over space and time, what they attempt to describe is itself eternal, outside of space and time. Separation in time and space, or duality, is thus again confirmed as a bias of the purely rational faculty.

Zukav notes the Buddhist enlightenment philosophy that everything is a symbol until we experience it directly. We know objects through our symbols or ideas about them; and now science, like Buddhism, has realized that experience and symbols do not fully accord with each other – again, the map is not the territory; the word is not the thing. The new understanding of indeterminacy, probability and approximation, has since been worked into our language system under the “formidable title” of quantum logic. As we have seen, the inventor of quantum logic, John von Neumann, offered it as a solution to the problem of language: he decided that quantum physics is not difficult to explain because quantum physics is difficult, but because the words were inadequate. Finkelstein, one of Zukav's editors, similarly contends that “the problem is language;” it is the ancient problem of reconciling Mythos – experience – and Logos – symbol.

Central Issues of Parallelism – Relativism, Paradox, Unity

Capra argues that Eastern mystical philosophies and religions are a more appropriate background to modern physics than the models of contemporary Western philosophy. It has always been realized in the East, he says, that reality transcends ordinary language, logic, and common concepts. And, in spite of the constant increase of rational knowledge, we in the West are as unwise as we were two thousand years ago. Basic paradoxes of quantum physics, such as light's dual nature as wave and particle, daunted Western language and imagination. The reality of modern physics, as in mysticism, transcended ordinary experience and the ordinary language derived from that experience. The riddles of atomic reality therefore “required” the higher awareness of ancient and Eastern philosophies.

Science and mysticism are not inherently separate. Straightforward parallels come to mind. For example, science, says Capra, does not only rely on abstraction. Discovery, translation, dreams, spontaneous insights; these are all evidence of an intuitive element. The “real scientists,”

304 Capra, p.287
305 Restivo, p.118, my italics
306 Zukav, p.271. As with the adage quoted by Capra, quantum logic was incorporated into a language update called General Semantics by Count Alfred G. Korzybski, a mathematician, philosopher, semanticist, and logician. See Korzybski, Science and Sanity
307 Zukav, p.275
308 Quoted in Zukav, p.276
309 Capra, p.46
310 Capra, p.29
311 Restivo, p.19
312 Capra, p.49
313 Examples of intuitive insight: Otto Loewi, who discovered the chemical transmission of the nervous impulse in a dream; Francis Crick, who reportedly intuited the structure of the DNA molecule while under the influence of LSD; Rene Descartes, who deduced the scientific method from a dream; Frederich Kekule, who discovered the chemical structure of benzene in a dream; Albert Einstein's theory of relativity, which was inspired by a dream wherein he was going down a
distinguished from “technicians” by Zukav, are often motivated by rare intuitive flashes. However, says Restivo, this is not popularly taught in science classes. These introspective scientists, combining abstraction and direct experience, integrate approaches that seem too strange to most outsiders.

Furthermore, mysticism has a rational aspect, namely, the radical empiricism of experimental observation of the self. Other commonalities which Capra notes include the fact that science and mysticism are largely beyond the reach of laymen; that they aim for repeatability and exact preparation in their trainings; and that they have reliable and complex systems.

The only thing which doesn't seem to depend on the source of one's interpretation of quantum theory is the interconnectedness of the universe. According to David Bohm, one of the main opponents of the Copenhagen interpretation, it is the fundamental reality. It is also the reality which mystics have known and experienced for thousands of years. This interconnectedness extends to the observer in both quantum theory and Eastern mysticism: “Natural science,” says Heisenberg, “does not simply describe and explain nature; it is part of the interplay between nature and ourselves. What we observe is nature exposed to our method of questioning.” Simply stated, observing and defining requires humans. Physicist John Wheeler proposed the term ‘participator’ instead of ‘observer’ so as to actively differentiate from the classical concept. Mystics, taking interconnectedness a major step further, do not ontologically differentiate between the observer and the observed at all.

Capra lists several paradoxically unified concepts in modern physics, such as the indestructibility and destructibility of particles, the continuity and discontinuity of matter, space and time, particles and waves, force and matter, and even existence and non-existence. The latter stems from the fact that we can never say that an atomic particle exists at a certain place, nor that it does not – there are only probability patterns, the quantum eigenstate, between opposites. Confronting the existence/non-existence problem recalls Schrödinger’s Cat paradox, which Schrödinger invoked to highlight what he thought was the incompleteness of quantum theory; the paradox famously asked, is a cat in a probabilistic death-trap dead or alive only when an observer opens its box and looks, or before? Irrationally, quantum physics seemed to imply the former. Capra admits that this non-, or transrational contention about reality simultaneously existing and not-existing is “the most difficult” discussion point. Mystical teachers, recognizing the absurdity and paradoxical nature of such concepts, consciously (and necessarily) circumscribe them, allowing students to experience them by their own action.

Zukav centralizes the concept and importance of paradoxes. Physics, like Zen Buddhism, is

314 Zukav, p.36
315 Restivo, p.18
316 Capra, p.36
317 Quoted in Capra, p.137
318 Capra, p.149
319 Heisenberg quoted in Capra, p.140
320 “Participation,” says Wheeler, “is the incontrovertible new concept given by quantum mechanics; it strikes down the term ‘observer’ of classical theory, the man who stands safely behind a thick glass wall and watches what goes on without taking part. That can’t be done, quantum mechanics says.” Quoted in Misner, et al, Gravitation, Op. Cit.
321 Capra, p.141
322 ‘Transrational’ is Wilber's term for certain instances of what are otherwise called non- or irrational experiences of mind. It is meant to overcome the inherent bias of its predecessors. Wilber, Een beknopte geschiedenis van alles, op.cit.
323 Capra, p.149
replete with koans, or paradoxical riddles; “Picture a massless particle,” a physics professor might say. “Is it a coincidence,” asks Zukav, “that Buddhists exploring 'internal' reality a millennium ago and physicists exploring 'external' reality a millennium later both discover that 'understanding' involves passing the barrier of paradox?” As physicist Jack Sarfatti says, “If you think quantum mechanically, you just accept the paradox as part of the way things are.” This understanding – or acceptance – of paradox is, as we have seen, an important clue towards the mystical associations of quantum metaphysics.

We have also seen that as we expand our realm of experience – either through science or mysticism – our rational limits become apparent. The unification of space and time, a common mystical experience, is a revolution in the history of science; after two thousand years of linear time and Euclidean space (where nature is geometry, and geometry is not considered to be a mental product), the traditional separation of dimensions has been revealed to be a creation of the mind. Easterners, claims Capra, have always known this, and treated spacetime as relative, limited, and illusory. He therefore concludes that Eastern philosophies are spacetime, or relativistic philosophies, while the West for a long time inherited the static and geometric philosophies of the Greeks.

Capra believes that “Modern physicists should…be able to gain insights into some of the central teachings of the Far East by relating them to experiences in their own field. A small but growing number have indeed.” Heisenberg for one claimed he didn't know where old and new, East and West would go, but he was confident in his ability to “define the points from where the interaction of their ideas will start.” Bohr, it is said, “appealing neither to Kant nor to Aristotle,” draws a “modicum of support from the philosophies of the East.” Neither dualist nor monist, he accepted the paradoxical unity-in-difference, the One and the Many, as found in the Hindu Vedas, Buddhist thought, and Taoism. The way of paradox prescribed in the Tao te Ching, attributed to Lao Tzu, is, according to an otherwise anti-parallelist Honner, “redolent with anticipations of Bohr.” What, then, made it interesting for Capra and the founders of the New Physics to look to mysticism and the East?

Better than the West?

The metaphysics of mysticism and Eastern philosophies tend to have stronger analogs to theories of modern physics than Western religions, providing a clear and accessible source for parallelist arguments. The eternally expanding and contracting model of the universe – Big Bang and Big Crunch – for example, has its analog in Hinduism, but not in Christianity. The enormous time span calculation of the Hindus is, Capra claims, also unique in history; while Biblical exegesis determined the age of the Earth at some 6000 years, Hindu cosmologists calculated in the billions. Another example: black holes present radical mysteries, such as the theorized Event Horizon from which nothing can escape and where time seems to stand still; similarly, in higher, or mystical states of consciousness, time is paradoxically transformed into an “infinite dynamic present.” Describing either

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Zukav, p.224

Quoted in The Universe, As Seen From North Beach, n.p.

Capra, p.161. Relativity was already becoming apparent in astronomy before Einstein, as when we look into distant space, where light takes eons to travel from distant stars to Earth, we are looking into the distant past.

Capra, p.163

Capra, p.149

Heisenberg, p.188

Honner, p.211

Capra, pp.198-199
would not make sense in conventional language.\textsuperscript{332}

The metaphysics of matter is another point of similarity. In Einstein's General Relativity, the gravitational field, or curvature of space, is the mass of the object. Since fields exist throughout the universe, this means, says Capra, that everything we physically do as humans relies on the fact that there are distant stars and systems. In the quantum gravitational field, which is posited to exist everywhere in space, particles are merely condensations of the field. There is no matter, just a field of potential.\textsuperscript{333} This is a similar intuition, but not quite equal to, the Tao, which is empty and formless, with infinite potential to be filled. Like Ch’i, the energy of life, subatomic matter is continuous and discontinuous and eternally oscillating.\textsuperscript{334}

In the experiments of subatomic physics, particles were found to come into being spontaneously from the void. To Capra, this recalls the wisdom of Chang Tsai, which says that “there is no such thing as nothingness.”\textsuperscript{335} As linguist Dr. Irving Lee noted in 1941, “At the heart of the analysis of the atom - a 'universe in itself' - in modern physics is the sense of a perpetual, energetic 'mad dance;' a hurrying, oscillating, vibrating existence at submicroscopic levels.”\textsuperscript{336} All particles participate in and are a perpetual dance of creation and destruction, just as in Hindu mythology the gods Shiva and Vishnu dance an eternal dance of creation and destruction. The Hindu mythology in general, says Zukav, is a psychological projection similar to the metaphysics of submicroscopic scientific discoveries,\textsuperscript{337} but the metaphor of cosmic dance especially unites ancient myth, religious art, and modern physics; it is “Poetry, but none the less science.”\textsuperscript{338}

The scientist-inventor Buckminster Fuller famously mused that “I seem to be a verb.”\textsuperscript{339} On the subatomic scale, what we in speech refer to as nouns are indeed verbs, or events of activity. The so-called S-matrix of Heisenberg’s quantum mechanics uses this perspective to study 'Hadrons', a certain class of subatomic particles which are constantly colliding into non-existence and then re-appearing again.\textsuperscript{340} Similarly, the ancient Chinese I-Ching Hexagrams, a system of symbols for finding order in chaos, show process giving rise to the appearance of structured reality. In Buddhism also, seeing objects as events or processes is fundamental.\textsuperscript{341}

One of the implications of quantum math, that the basic structure of reality changes in accordance with our manner of observation, is also one of the fundamental tenets of Eastern philosophy.\textsuperscript{342} While many scientists are still embroiled in a search for a fundamental particle or law of nature, the Bootstrap hypothesis rejected the very notion that they exist. In the Bootstrap manner of observation, each particle is said to consist of all other particles in the universe in a web of interrelationships; the meaning of each particle can only be understood through its relationship to the whole.\textsuperscript{343} With this reasoning, no fundamental particles are needed, because all particles are fundamental, relative to each other. Named after the Baron Münchhausen story where the title character

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\textsuperscript{332} Capra, pp.178-179
\textsuperscript{333} Capra, p.209
\textsuperscript{334} Capra, p.211
\textsuperscript{335} Capra, pp.221-222
\textsuperscript{336} Lee, Language Habits in Human Affairs, p.73
\textsuperscript{337} Zukav, p.235
\textsuperscript{338} Capra, p.245
\textsuperscript{339} See Fuller, I Seem to Be a Verb
\textsuperscript{340} Capra, p.270
\textsuperscript{341} Capra, p.281
\textsuperscript{342} Capra, p.276
\textsuperscript{343} Zukav, p.96
claimed to have lifted himself off the ground by pulling on his bootstraps, the theory represents a “final rejection” of the mechanistic world view in modern physics. Moreover, it is touted by Capra as being especially in harmony with the Eastern worldview.

The “wider outlook on the relationship between mind and reality” implied by quantum physics, in the words of Heisenberg,\(^{344}\) was to be incorporated by Bootstrap. However, it seems Capra's enthusiasm for Bootstrap did not yield fruits. The theory has since been superseded. While Capra recognized that it still needed work, he (supported by Eugene Wigner, a Nobel-winning physicist\(^ {345}\)) hoped that consciousness – a qualitatively different and more complex notion than 'observer' – would be a part of its final formulation. Indeed, quantum physics would not work without it. If so, he said, a study of Eastern ideas might provide scientists with stimulating new viewpoints.\(^ {346}\) Finally then, Capra asks rhetorically, why do parallels exist? Regardless of the answer, his conclusion is that physics and mysticism do not need each other, but that man needs both; not as a synthesis, but as a dynamic interplay.\(^ {347}\)

Parallelism may skew certain factors to fit its model, but there is no side in the debate that can claim to have the whole truth. Subjectivity is necessary, and – necessarily – incomplete. One 'likely story' about reality is simply not enough. However, problems do arise when metaphysicians claim that 'quantum physics says.' Whether scientists or religionists, in full accuracy they should acknowledge that it is what they believe that quantum physics says; that it is “as if” reality is interconnected in one grand unity of the many. Nevertheless, transgressions and mistakes occur on all sides. The battle for the new metaphysics, therefore, seems to be not only about what we can say about reality, but who can say it.

Heisenberg recognized the privilege which Eastern philosophy holds in understanding modern physics. “It may be easier,” he wrote, “to adapt oneself to the quantum theory concept of reality when one has not gone through the naïve materialistic way of thinking that still prevailed in Europe in the first decades of this century,” and needless to say still prevails today. He bases this on the fact of “great scientific contributions” to theoretical physics by the Japanese.\(^ {348}\)

Why, then, did science arise in the West and not the East? This question has been studied vigorously, and I do not aim to put it to rest. Joseph Needham, the Sinologist, has in any case concluded that science demands working “as if Nature is profane.” This, as we have seen, is common in Western metaphysics, and is still called for by popular thinkers;\(^ {349}\) in the East, on the other hand, nature is said to have been kept sacred.\(^ {350}\) By detaching ourselves from Nature, and Nature from God, scientific civilization has been at liberty to do with nature as it pleases. This in turn makes the unitive view of parallelism, the New Age and the New Physics an important platform for ecological thought.

\textit{Anti-Parallelism}

Parallelism is predicated on an acceptance of multiple truths existing, at least linguistically, in a

\(^{344}\) Heisenberg, p.202
\(^{345}\) Restivo, p.14
\(^{346}\) Capra, p.300
\(^{347}\) Capra, pp.306-307
\(^{348}\) Heisenberg, p.202
\(^{349}\) See e.g. Steven Pinker, \textit{The Blank Slate}, p.224
\(^{350}\) Restivo, p.43 Restivo notes that TenHouten and Kaplan proffered a theory of advanced brain functions which are shared by physicists and mystics, p.40, while Paredes and Hepburn, in their study of hemispheric brain function, acknowledge an anomalous tendency towards the right brain (roughly speaking, the intuitive side) in China. pp.50-52
metaphysical domain. As such, Capra dismisses neither science nor mysticism, although there are New Agers, scientists, and mystics who do. Niels Bohr and Heisenberg are clear examples of scientists who, like Capra, did not. They recall instead the same attitude with which Zukav concludes his work, saying that Eastern religions have “nothing to say about physics, but they do have a great deal to say about human experience.”

Heisenberg optimistically believed that the influence of modern science would favor an attitude of tolerance. Thirty years later, however, Restivo’s attitude represents quite the opposite; his judgment, though unsupported in the text, is that the step from physics to Eastern mysticism “may be a step in the wrong direction.” This seems to underscore the common attitude of anti-parallelism, or protectionism against any perceived deviation from rationalism. What Restivo, in his search for the “rational roots” of mysticism, does recognize, is that innumerable stories are used to construct any single fact. He calls it the Rashomon effect – after a film by Akira Kurosawa, in which the witnesses and suspects provide conflicting accounts of the same murder – and applies it to the social fact of parallelism. Whether ‘true’ in an Aristotelian sense or not, science, mysticism, and parallelism all contribute to the story of reality. As Heisenberg writes, quite realistically, “modern physics is perhaps just one, but a very characteristic, part of a general historical process that tends toward a unification and a widening of our present world.” The coming together, or unification of the parts and stories, as in Rashomon, is at the center of a new understanding of ourselves, says Heisenberg, which, “if anywhere,” is where the New Physics has led us.

Apart from the anti-parallelist arguments of staunch materialists, however, there are adherents of mysticism who are equally opposed to it. Ken Wilber, who created his own framework relating the sciences and religions according to a holistic, but hierarchical system, argues that modern physics gives no positive support or proof for a mystical worldview at all. Any similarities, he says, are minor compared to the differences; indeed, although the idea that ‘physics-supports-mysticism’ had good intentions, it was actually misplaced, detrimental, and wrong, especially to mysticism. Although it did not intend to, it encouraged the belief amongst New Agers that in order to achieve mystical awareness, all one need do is learn a new worldview, instead of years of arduous meditation. The parallelists, then, “are trying to help mysticism but instead have sunk it.” The relevance of scientific theories always changes, and linking them to a body of perennial truth can only decrease the value of the mysticism, Wilber believes. For example, “does Buddha lose his enlightenment when Bootstrap is eclipsed?”

It seems the game of distancing one’s preferred specialism, whether science or mysticism, is
played by both sides. But Wilber does concede a valid point: that while physics doesn’t prove mysticism, it doesn’t 
disprove 
it either. Metaphysical speculation is now fair game, as long as the 
underlying physical theories aren’t cited as final proof one way or another. In other words, he thinks 
parallels themselves must be abandoned: “The same reason we have never and will never find the 
‘missing link’ between animal and man is the same reason we find so few links or parallels [between 
domains of Matter, Spirit, and in between],” Wilber writes. “Each higher level, to the extent it 
transcends its predecessors, to the same extent has no parallel in its predecessors.”\(^{361}\) In his ontology, 
matter is the farthest extension from Spirit. There can be only a few parallels, not because one is 
superior to the other, but because materialist science records only four forces, while in ‘higher’ domains 
of reality there are hundreds.

Wilber concludes that there is ‘pseudoscience’ just as much as there is ‘pseudoreligion.’ 
Presumably, those who claim parallels partake of both, and scientists doing the same belong to the 
former. Therefore, to anti-parallelists on both sides of the parallel, the battle for a new metaphysics is 
not between science and religion, but between genuine and pseudo:\(^{362}\) between maintaining separateness 
or developing a unity of knowledge.

Twentieth century physics has tended towards greater openness; but now that a new plateau has 
been reached, the hegemony of science is at risk. Science, says Zukav, has taken a leap by looking 
deeper at the ultimate nature of reality; a leap beyond rationality and into the (mystical?) awareness of 
facing the ineffable.\(^{363}\) It is quite suggestive that in the ongoing trend of linking science and religion, so 
much has recently focused on the introspective, non-dualistic philosophies of the East. Whether it is a 
trend or not, these novel forms of metaphysics are said to offer insights which mainstream religions 
cannot. However, as Toulmin writes, we cannot scientifically judge between the metaphysical insights – 
what he calls extensions – of science, as anti-parallelists do, for when we do so, it is “not for purely 
rational or scientific reasons, but our own presuppositions.”\(^{364}\)

The search for parallels between religion and science outside of the familiar, traditional 
doctrines reflects a cultural shift. The global mingling of cultures and creeds has brought the 
knowledge and ideologies of the world together; and, on a popular level, there has been a shift in 
postcolonial times towards cooperation, tolerance and understanding. The classical, theological and 
Aristotelian model of science did not facilitate such cultural relativism; its truth lies necessarily 
amongst its own ranks. Until the twentieth century then, buffers in our metaphysical beliefs ensured 
ethnocentrism in the realm of knowledge. The question is, did the shift towards open appropriation 
occur before quantum physics or after? To approach this question, we must look at what some of the 
physicists themselves experienced – well before the spiritual trends of the 60s, parallelism, and the New 
Age – by going beyond science into philosophy and mysticism.

Part V

Wilber’s Critique of Parallelism and The Mystical Writings of the World's Great Physicists

Having tackled the scientific theorizing and philosophizing

Illustration 12: Ken Wilber
of the founders of quantum theory and relativity, it is time to be confronted with their non-scientific
texts. Specifically, a compilation of writings collected by Ken Wilber (1949-) in the 1980s reveals
insights and beliefs usually not spoken of in the scientific or secondary literature; and for good reason,
as it confronts the reader with highly unpopular beliefs. But Wilber challenges the reader in his
introduction: “What does it mean that the founders of your modern science, the theorists and
researchers who pioneered the very concepts you now worship implicitly, the very scientists presented
in this volume, what does it mean that they were, everyone of them, mystics?”

Wilber’s central critique against parallels results from his purist view of mysticism. Mystical
experience, he writes, is direct and unmediated oneness, timelessness and spacelessness. It is
experienced as “Suchness, isness, thatness.” Science, if anything, is a continuous refinement of the
mediators between reality and ourselves; our language, instruments, tools, etc. There is no experience of
union or “suchness” for an atomic physicist in the laboratory. “What an absolute, radical, irredeemable
difference from mysticism!” Wilber concludes. At the very least, the misunderstanding of this
difference represents “a profound confusion of absolute and relative truth, of finite and infinite, of
temporal and eternal.”

It was this radical failure of physics to grasp reality as it is, directly, without mediation, and not
its supposed similarities to mysticism, that would paradoxically lead so many physicists to a mystical
view of the world. At this point a criticism of Wilber is necessary. He is essentially saying that these
physicists are mystics, but that their physics is itself not mystical. Following Wilber’s own rigid use
of terms, the first part of this contention requires revision: the fact that the following physicists had a
“mystical view” of the world, we should realize, is not necessarily to say that they were mystics.

These next paragraphs, gleaned from Wilber’s collection, are summarized directly from the
mystical writings of the ’world’s greatest physicists.’

Sir Arthur Eddington

Arthur Eddington, astrophysicist, goes quite far in enlightening the
attempts to supplement science with spiritual convictions. As he writes, “the
old-fashioned material body was not hollow enough to be a receptacle of
mental or of spiritual attributes. The result was to place consciousness in the
position of an intruder in the physical world...[However], our present
conception of the physical world is hollow enough to hold almost anything.” In
his own case, he conceived that “the nature of all reality is spiritual, not
material nor a dualism of matter and spirit.” The finding that matter is not quite
as substantive as it seems, made the putting together of the adjective ’material'
and the noun 'nature' mere nonsense to Eddington.

The approach to nature, or “base reality,” is therefore fundamentally through our direct knowledge of the mind. Psychology and mystical

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365 Wilber, p.x. As does this essay, Wilber asks what the founders of quantum physics thought about the nature of science
and religion. “This volume,” he says, “is a condensed collection of virtually every major statement made on those topics
by the founders and grand theorists of modern physics: Einstein, Schrödinger, Heisenberg, Bohr, Eddington, Pauli, de
Broglie, Jeans, and Planck.” Though diverse thinkers, still there is “a very general commonality in their worldviews.” p.4
366 Wilber, p.7
367 Wilber, p.8
368 Wilber, p.10
experience, where we find “that our minds are not apart from the world,” are the more direct realms of knowledge. They approach directly the mind, which was previously cast out as “the weaver of illusion,” but is actually “the only guarantor of reality.” Hence Eddington writes of seeking the mystical experience to “lift the veil,” and catch a glimpse of reality at the base of illusion: for “illusion is to reality as the smoke to the fire.”

If we maintain a purely materialist science, we are led “only into the cycle of physics, where we run round and round like a kitten chasing its tail and never reach the world-stuff at all.” Still, “It is difficult for the matter-of-fact physicist to accept the view that the substratum of everything is of mental character.” Eddington concludes that 1927, the year of the Solvay conferences to debate the Copenhagen interpretation, “will rank as one of the greatest epochs in the development of scientific philosophy,” because “religion first became possible for a reasonable scientific man in this year.” “If supernaturalism is tied to denial of strict causality,” he decided, “then that is what quantum theory brings us to.”

Albert Einstein

Einstein, Nobel laureate, declares in the extensive quotations which Wilber offers, that he “sees a dependence of science on the religious attitude.” He says that awakening the cosmic feeling of the mystics (“religious geniuses”), which knows no dogma and no God conceived in man's image, is the most important function of art and science. In other words, Einstein supports the role of science in refining “true religion” and making it more profound: the conflicts that arise in this endeavor, he says, arise only because of the misapprehension of domains.

Einstein's analysis of his own role is rather illuminating for the historian. We discern the conviction that science and religion have their own domains, but that they are not entirely separated. If so, the logical conclusion is that there must be a middle path which respects the boundaries of these domains. Whether parallelism satisfies Einstein's model or not, it is an attempt.

Wolfgang Pauli

Wolfgang Pauli, physicist and Nobel laureate, was one of the most outspoken supporters of supplementing science with the 'irrational.' It is well known that he was a friend and colleague of Jung, the coiner of the ‘unconscious’ of man's psyche. Pauli believed that rationality and pure logic had been confronted with their limits in quantum theory, and that this encounter with its own limits had opened the door to unifying with the transcendental through 'psychophysical monism.' “I believe,” he writes, “that to anyone for whom a narrow rationalism has lost its persuasiveness, and to whom the charm of a mystical attitude, experiencing the outer world in its oppressive multiplicity as illusory, is also not powerful enough, nothing else remains but to expose oneself in one way or another to these intensified oppositions and their conflicts... I consider the ambition of overcoming opposites, including also a synthesis embracing both rational understanding

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369 As Eddington poignantly asks, “if everything has a physical basis, what is the physical basis of nonsense?”
and the mystical experience of unity, to be the mythos, spoken or unspoken, of our present day and age.” With regards to parallelism, this last sentence speaks for itself. As Wilber comments, Pauli hailed the interpretation of quantum theory as a “new way of thinking,” where traditional metaphysics was sacrificed; the choice, as in the New Age follow-up, falls on the unity of being.  

*Louis De Broglie*

De Broglie, physicist and also a Nobel laureate, quotes Henri Bergson, the French philosopher, to elucidate the spiritual function of his own science. As Bergson writes, “the mechanism demands a mysticism,” and, as we grow in physical power, the spirit must grow too. Since physics “infinitely surpasses” daily experience, it provides an extension for the spirit to understand its earthly existence.  

*Max Planck*

Max Planck, originator of quantum physics and Nobel laureate, declares unambiguously that “science demands also the believing spirit” – faith. He quotes Einstein to explain this conviction: “As Einstein has said, you could not be a scientist if you did not know that the external world existed in reality, but that knowledge is not gained by any process of reasoning. It is a direct perception, and, therefore, in its nature akin to what we call Faith. It is a metaphysical belief.” In other words, to be a scientist, one automatically shares in the endeavor of metaphysics. The better one is, as a scientist, an artist, or a musician, “the more we are brought into harmony with all nature itself.” If anything, then, it seems Planck derived a hopeful, humanist message from the progress of science.  

*Sir James Hopwood Jeans*

The physicist and astronomer James Jeans commented extensively on the overcoming of the Cartesian dualism of mind and matter. He writes that he no longer thinks of the external reality as a machine; rather, the details of its operation as studied by science might be mechanical, but, in essence it is a reality of thought. Therefore, “knowledge is heading towards a nonmechanical reality.” “Mind,” Jeans muses, “no longer appears as an accidental intruder into the realm of matter; we are beginning to suspect that we ought rather to hail it as the creator and governor of the realm of matter – not, of course, our individual minds, but the mind in which the atoms out of which our individual minds have grown exist as thoughts.” And elsewhere: the objectivity of objects arises “from their subsisting in the mind of some Eternal Spirit.” The notion that our individual minds have grown out of an ‘overmind,’ or unity of consciousness, is a profoundly mystical one. However, Jeans does not abandon realism or materialism. Instead, the line of demarcation between realism and idealism (or science and metaphysics) is “little more than a relic of a past age,”

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and we no longer have the right to assume that objective reality is either 'real' or 'ideal.'

Erwin Schrödinger

Erwin Schrödinger, Nobel Prize-winning physicist, at least in my studies, had come across as the most skeptical and traditionalist of the quantum physicists. However, upon reading his text in Wilber, I had to reverse my opinion altogether. The following quote aided in this switch: “The reason why our sentient, percipient, and thinking ego is met nowhere within our scientific world picture can easily be indicated in seven words: because it is itself that world picture.” The mind, Schrödinger is saying, is identical with the whole which it experiences, and therefore cannot be contained in it as a part of it. This unity, furthermore, is to Schrödinger the only acceptable solution to the problem of the ‘One and Many.’ He notes that this is more easily accepted in the East, such as in the Upanishads and the Sufi texts. The alternative solution, however, solipsism, is something nobody wants.

Until understanding that “the overall number of minds is just one,” and that it is indestructible, since “it is always now,” one cannot understand that “mind is the artist who has produced the whole.” Mind, or consciousness, is always and only experienced in the singular. Hence the mind which constructs the whole is the whole mind; the “silly, distasteful” idea of an individual soul rests on the perception of a plurality of selves, which, Schrödinger quotes from the Hindu Upanishads, is a deception of Maya; an illusion. It is the same illusion which is produced in a gallery of mirrors. The fact that there are Many in perception is an illusion, because ultimately there is only One.

While, unlike Wilber, I defer from calling these scientists mystics, an exception is made in the case of Schrödinger. Like Bohr, Heisenberg and Pauli, it is well known that Schrödinger had a deep knowledge of Eastern philosophy and mysticism. Mysticism is based in experience; the higher awareness that “what is there, is you,” cannot be resolved logically, “because logic itself is part of the phenomena.” Since Schrödinger publicly states that “it is something that needs to be experienced,” it is clear that he has stepped beyond the realm of science. And at this point, Schrödinger admits, he is talking religion, not science: it is not a statement of scientific fact, because if it was it would become “wrong.”

Schrödinger recognizes that the mystical experience is seen as either “blasphemous and lunatic,” or as the “quintessence of deepest insight into the happenings of the world,” depending on where you have it. In the West, to say “Hence I am God Almighty” falls into the realm of blasphemy and lunacy, but in the East, “Tat tvam asi” (‘this is you’), a “sacred, mystic formula,” is a sign of enlightenment. Having thus revealed himself as both a mystic and a relativist, Schrödinger cannot but shock our understanding of twentieth century science.

Werner Heisenberg

Heisenberg, Nobel prize winning physicist, was also deeply confronted with the limitations of knowledge. His uncertainty principle he saw as the first fact of such limits. “New realms of

377 Uncertainty, of course, may still be updated in the future. It may only be a marker of the ‘incompleteness’ of quantum theory, although there is as yet no evidence to prove otherwise.
experience” had to be explored to circumvent these limits, and both quantum physics and Eastern philosophy/mysticism were among them; exploring them from a Western perspective entailed a search for “some equilibrium” between knowledge and creativity, objectivity and subjectivity. As Heisenberg asks, “who would dare to claim” one side to be more real than the other? With this realization in mind, what we need is a “balance between the two kinds of truth.” We are of course reminded of Einstein's quote that “Science without religion is lame, and religion without science is blind.” 378

The opinions summarized in these short paragraphs, while readily available, are hardly a matter of common knowledge. Secondary sources are also mostly silent on the topic of the mystical beliefs of scientists. What this does on a popular level, if anything, is uphold the stereotype of a purely rational scientist; entire books are written to explore why New Agers turn to science, forgetting that scientists also turn to religion and philosophy. Significantly, this taboo is held in place by those who maintain a strict separation between science and religion; those who declare physics off-limits for New Age speculation. However, when we turn to Heisenberg – despite the fact that he partakes of both – we still see the awareness of a separation. “The philosophic content of a science,” he writes, “is only preserved if science is conscious of its limits.” 379 With this attitude, Heisenberg and the other physicists covered here could study Eastern mysticism without compromising their science. They broke the taboo, and survived.

Wilber concludes that, while physics has once again opened the door to philosophy and religion, the philosophy itself need not be scientific. This view, he says, is “probably the strongest and most revolutionary conclusion vis a vis religion that has ever been 'officially' advanced by theoretical science itself.” 380 Basically then, any theorizing about what we can say about reality must be recognized as having gone beyond science, and into the subjective realm of metaphysics. Otherwise, the implications of scientific discovery are too easily overstated – as is often done by New Agers and scientists.

In viewing this situation historically, it is clear that we must be aware of the role of scientific knowledge, not just its limits. Science inspires speculation in anyone who confronts new knowledge: it may therefore be more fruitful to remember that it is certain scientists – people who speak as though they were mystics, and not science itself which is mystical. The domains of religion and science, while related, are not interchangeable. These people, involved in the frontiers of science, benefited from combining the language and insights of physics and mysticism. This is how Heisenberg, Bohr, Schrödinger and others – and later Capra, Žukav, and their populist offspring – dealt with the limitations of their knowledge.

Part VI

Summing Up

The Problem of Language: What we can’t say about reality

According to Bruce Gregory, who traces physics as an evolving language, “If we want to know what the real substance of the world is, we have to turn to the hard sciences, and physics is the hardest

379 Quoted in Wilber, p.73
380 Wilber, p.170
science of all. But [physicist's] answers have hardly reassured those of us looking for certainty...In our attempt to get to a world outside of language, we have apparently wound up squarely in the net of language.”

Niels Bohr continues in the same dramatic vein: “We are suspended in language in such a way that we cannot say what is up and what is down.” So we are suspended in a net of words, including the word 'reality' itself, just out of reach of the reality which our science aims to touch.

In other words, we cannot say what is real with any definitive or absolute certainty. This of course opens a can of philosophical worms, as the statement “we cannot speak the absolute truth” is itself not a statement of absolute truth. But strangeness and paradox seem to be intrinsic to the New Physics. The fact that atomic particles can’t be said, in common language, to exist as real objects before they are observed, but rather as waves of probability, makes the existence of matter itself seem like an irrationality, an illusion. Human knowledge, existence, certainty, these all become paradoxical in the terms of common language; “As a consequence,” said Bohr, “even words like “to be” and “to know” lose their unambiguous meaning.”

The metaphysics of physics – and the hope for a consensus on what it is “to be” and “to know” – is thus confronted with its own ambiguity. As Lee writes, the “myth of the one and only meaning” is dead.

Einstein, as a representative of classical science, said that the problem of language is that “our theory is too poor for experience.” Bohr on the other hand, representing the New Physics, replied “No, no! Experience is too rich for our theory!” As accepted in both the New Physics and the New Age, human language – for richer or poorer – is inherently a reduction of reality. While we normally tend to forget this, in the non-sensory realms of experience, such as atomic physics and mystical experience, this fact is inescapable. The problem for classical physicists – and the reality for Copenhagenists and others in the New Physics – is that physics, like art or music, is a language about the world and ourselves; and that like art, it is an idealization, different from reality, but necessary for understanding.

Wilber asks, does physics even deal with Reality (capital “R”), or is it necessarily confined to the shadows in the cave, the mathematical symbols abstracted from Reality? Sir James Jeans answers resolutely for the quantum physicists: “Our studies,” he says, “can never put us into contact with reality.” Eddington makes a similar point, albeit more lyrically: “We have learned that the exploration of the external world by the methods of physical science leads not to a concrete reality but to a shadow world of symbols, beneath which those methods are unadapted for penetrating.” So the great difference between classical and new physics, Eddington continues, is not that the latter is relativistic, non-deterministic, four-dimensional, or any of those things. “It is much much simpler and more profound; both old and new physics were dealing with shadow-symbols, but the new physics was forced to be aware of that fact.” It seems, then, that our scientific sense of reality, just as in any religion, is based in illusion, rooted more in language – shadow-symbols – than in objective truth.

How, then, are we connected to the physical world? This is a primary question which the New

381 Gregory, p.195
382 Quoted in Aage Petersen, The Philosophy of Niels Bohr, in Niels Bohr: A Centenary Volume, p.302
383 Bohr, Atomic Physics and the Description of Nature, p.19
384 Lee, p.35
385 Quoted in Zukav, p.20
386 Heisenberg, p.108
387 Wilber, p.4
388 Jeans, Physics and Philosophy, pp.15-17
389 Eddington, The Nature of the Physical World, p.282
390 Quoted In Wilber, p.9
Age seeks answer. The physical body, as part of the world of matter, interacts with that world. But at the root of this interaction is always the mind – information, or thoughts, overlooked by consciousness. Basically, then, our words, or models, describe what happens in the mind just as much as they describe what happens in physical reality. This interaction, says Gregory, need not be described as solely material or spiritual.\(^\text{391}\) Now this of course is exactly what the parallelists have deduced. Their descriptions of reality, following the principle of Complementarity, take into account both the material and the spiritual connection to reality. Popularizing quantum physics, it seems, is only a by-product of this goal.

To some, conceding objectivity – in other words, giving up the claim to absolute knowledge - dooms science. But in fact the damage is minimal. It is merely the first time that it has been admitted that modern science is not objective. Each scientific paradigm is experienced and communicated through “shadow-symbols;” while facts are known intellectually (or through observation in the lab), the lack of direct experience of the object maintains a level of detachment. In other words, giving up objectivity is one of the ways in which science distinguishes itself from mysticism.\(^\text{392}\)

Now, if there is no more objectivity in science, where do we find it? How can we know truth beyond our words? Subjectivity is the essence of our mind and its products; how then can we get beyond the mind and its mechanisms? Because mystical techniques launch the mind outside of subjective frameworks – beyond the ego, and into a sense of connectedness with everything – mysticism may actually be the closest thing to objectivity. This is highly speculative, but while not a scientifically defensible theory, it is what science presumed it had been all along.

While it is said that nobody really knows what quantum mechanics means, many seem to know what it doesn’t mean. But because of its inherent ambiguity, another limitation must be kept in mind: the relative meaning of words. As Carl Jung writes, “the mere use of words is futile if you do not know what they stand for. The way they are related to you is all-important.”\(^\text{393}\) Perhaps the most important example of this is that “the word reality and its bracket,” as Eddington says, “is different to all observers.”\(^\text{394}\) The new, relativistic language which must cope with the reality of quantum indeterminacy is as yet up for grabs, and may continue to change indefinitely; simply put, quantum mechanics will say what you want it to say, and it will deny what you want it to deny. As Vanheste writes, it is our expectations and idea of science which determine what we take out of it.\(^\text{395}\)

In this context, perhaps parallelists, at most, represent that branch of social consciousness which expects to find a sense of mystery and awe in science. The expectations of this group, as with the founding quantum physicists, go beyond the limits of physical theory; indeed, beyond the most powerful physical theory yet devised. As Arthur C. Clarke wrote in his science-fiction, anything complex or advanced enough is indistinguishable from magic; and, on the popular level, magic is more or less what quantum physics appears to be. Through movements like the New Age, what is “taken out of” the New

\(^\text{391}\) Gregory, p.198. The connection to 'reality' can be simplified as 1. Physical reality 2. Body 3. Mind (thoughts, language) 4. Consciousness. Keeping in mind that it is a two-way connection, it is not surprising to find that some people differentiate between the spiritual and the material.

\(^\text{392}\) Mysticism transcends commonly sensed reality, or the 'illusion' of space and time, through direct mystical experience. But while quantum physics also transcends common reality, it is not a personal transcendence so much as the creation of a new way of talking about reality.

\(^\text{393}\) Jung, \textit{Man and His Symbols}, p.96

\(^\text{394}\) \textit{Quoted in Wilber}, p.197

\(^\text{395}\) Vanheste, p.238
Physics is a regained sense of awe and kinship with the universe. Instead of being a machine that does what it does, it’s a mystery again.

*The Solution of Language: What We Can Say About Reality*

As Eddington writes, “If science is selective, it cannot claim that its picture of reality is complete.” Indeed, because it can only paint a picture, “Physics is an imaginative vision of how the world *might* be put together.” Bruce Gregory concludes therefore, that “There seems to be no 'right' way of talking about the world, just as there is no 'right' way of talking about physics.”

How then can a hierarchy of knowledge be constructed for the modern world? And what does science contribute to our worldview?

While language is a limit, it is also a frontier. We change our perception of physical reality by updating our scientific language – through analysis, codification, mapping, and so on. In turn, new aspects of reality are seen, and the language changes again; so the words we use, and the way we use them, help determine what we can see. Now, the domain of knowledge has expanded its frontiers to include the subatomic, and our language has changed. Here, what we can say in the old language reaches its limits: we can’t say what a particle ‘is,’ as the basis of material reality in modern physics is indescribable. In fact, it seems metaphysical. Is Schrödinger’s cat dead, alive, or something else altogether? We find that anything we say about reality is incomplete without including our own consciousness in our model.

Thus our common perception, where we think that we should know that the cat is either dead or alive, has been proven inaccurate, or incomplete. Mystics have experienced this same revelation – that what we see is not entirely as it seems – for thousands of years. Their metaphysical, linguistic, and ethical systems were structured accordingly. These in turn are useful precedents which have been used in parallelism to help describe the frontiers of reality. Or realities, plural, because as we have seen, the Copenhagen framework is about being able to see multiple realities at once. Atomic and subatomic, classical and quantum, deterministic and non-deterministic, wave and particle, the One and the Many, and all as real as your method of observation allows. Even cynicism, or the skeptical mode of observation, can be integrated into this paradoxical framework. So, in the face of outright nonsense, this all-encompassing framework requires a relativistic way of thinking; an openness to the relativity of truth.

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396 *Quoted in Barbour, p.88*

397 *Gregory, p.201*

*Illustration 17: While language is a limit, it is also a frontier, because the words we use help determine what we can see.*
If you cannot relate your knowledge to others, you isolate it. But the point here is that different languages – forms of knowledge – can be critically compared, translated, and used to highlight each other's shortcomings. Modern physics and mysticism are only two examples. All extant languages are functional to some degree: their comparison, whether intended or not, facilitates unification into a new, multi-functional language.

As Ian Barbour writes, “if we seek a coherent interpretation of all experience, we cannot avoid the search for a unified world view.” To do so, we cannot remain satisfied with a plurality of unrelated languages. Instead, a *metalanguage* is needed to allow the description of all possibilities; a metalanguage which A) is informed by an awareness of what we can and cannot say, and B) gives multiple 'likely stories' of the same event. In other words, while there are new limits, there must also be new frontiers. Comparing multiple 'likely stories,' then, translates to the recognition of multiple realities: objectivity and subjectivity, the One and the Many. The attempt by New Age parallelists to combine the stories of physics and mysticism, though seemingly vague, is therefore more broadly relevant than that of strictly-physics. Parallelism, it seems, is a new, comparative specialism which, with the failure of mainstream physics to follow the philosophical advice of Bohr, Heisenberg and the like, has shifted the job of comparing realms of knowledge into the popular realm.

For the orthodox Copenhagenist, as with Fritjof Capra, physics-mysticism relations enrich the field (truth) of interpretation (what we can say) about reality. As the psychologist Carl Jung writes, “in the scientific age,” it is “not necessary to deprive of helpful views to give meaning to our existence.” Indeed, he said, there is an empirical reason not to: different views are known to be useful for the psyche, and what's more, they tell us how our mind works. The coming together of “helpful views,” as exemplified by the New Physics and New Age, seems to have led to the building up of a dynamic, multi-layered vocabulary for interpreting, understanding, and influencing our world. As Bohr says, there is no finality, but an “Abundance of concepts,” and Von Neumann's expanded logic gives it space to be heard.

Beyond the institutions which declare an understanding of reality, whether scientific, religious, or otherwise, it is the individuals who embody the link between the two. Heelan has called the learning of a higher viewpoint, the new understanding, a sort of conversion. Bohr was so inspired, he tried to share a new understanding of understanding itself; the recognition that through subjectivity, which his science could not escape, you are yourself the foundation of reality. The individual, by observing, is the feet on which it stands. Each individual, therefore, is free to choose the instruments and interpretations they wish. In other words, what we can say about reality is, basically, anything; an anarchy of subjective interpretations, where it seems 'anything goes'.

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398 Barbour, p.89
399 As Vanheste writes, “We must conclude that the [New Age] holistic philosophy gained little incisiveness from the inclusion of quantum mechanics.” (p.237) Note that the search for certainty or incisive truth may be a projection by the author.
400 Jung, pp.87-89
This is an extreme freedom, but two simple caveats come to mind. First, it is not a call to irresponsibility. As Gregory writes, “Just because all we have are stories does not mean that all the stories we have are equal.” It is their purpose which determines their value. For example, if you're studying human biology, the story of Adam and Eve isn't likely to help you. Second, the lack of absolute certainty is not a call for a total uncertainty in our knowledge. As philosopher Robert Anton Wilson has pointed out, determining the probability of truthfulness is relatively easy: a 1-10 probability is a good enough scale, as is Von Neumann's three-tiered logic of yes-no-indeterminate, Rapoport's four-tiered logic of yes-no-indeterminate-meaningless, Fuzzy Logic, Alfred Korzybski's infinite valued logic, and so on. Basically, while total certainty has been dropped, total uncertainty need not be its replacement. With these two caveats we have come around and said that, just because 'anything goes,' it does not mean we have to go just anywhere.

Let us take an example to explain how 'anything goes.' We shall start with the contentious statement that “physics is mysticism.” First of all, we can 'prove' it through common logic. To make it true, we can say that materialism is spiritual: materialism assumes that the basis of reality is matter, and that everything is material or comes from it – including mind, or spirit. Assuming life 'comes from' a special chemical situation, then, we are also saying that a chemical, or matter, has life, or consciousness. Studying matter – physics – is thus a study of life, consciousness, spirit. However, we can also make the statement false because we believe, on principle, that matter is different than mind; that it is irrational to think otherwise. So, judging the statement with dualistic logic, where only one answer can be true, we end up having to choose whether we believe it or not. But now comes the important step. We can test the statement against quantum logic to show that 'anything goes.' Here there are multiple answers instead of one: it says that, at the same time, the statement is true, not true, possible, and meaningless. Wrap your mind around it slowly, and you can see what the logic is saying: that it is true that physics is mysticism, that it is true that physics is not mysticism, that it is true that physics might be mysticism, and that it is meaningless to say that physics is mysticism. Anything goes, but we don't have to believe anything we say about reality – even if it's 'true' – because it's just words.

The aim of the founding physicists, whom Wilber calls philosophers and mystics besides, “was to find physics compatible with a larger or mystical worldview – not confirming and not proving, but simply not contradicting.” Contradictions, of course, are only dictions; they are words, or interpretations, imposed on reality. A comparative history has shown that mysticism recognizes that words are interpretations, and not absolute; that Christian theology, on the other hand, thinks it speaks the truth; that classical science thinks it discovers 'facts'; and, finally, that the New Physics again 'knows' that its theories are only words. This is a fundamental shift in metaphysics.

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401 Gregory, p.198
403 The same can be concluded about the fear of solipsism. This is more or less equal to the fear of objectivity in science 'means' that we will enter absolute subjectivity. This is only true in a two-valued logic, where a whole spectrum of meaning is left out. “To some people,” writes Gregory, “not saying that the world is the subjective creation of individual observers;” but, he reassures us, “there is nothing subjective about the methods of physics.” Basically, “we are so enamored” of our idea of objectivity, “that being asked to give it up seems like being asked to give up reality itself.” (Gregory, p.96)
404 Wilber, p.26
405 Ideally, of course, any New Age thinker who quotes physics should also know that they are quoting metaphors, not truths, and that 'physics does not support mysticism'.

Wilber devotes a lot of attention to the different domains of knowledge, and to whether they can be studied scientifically or not. But the different domains are not so easily distinguished any more. As Bohr asked, how do you determine when an oxygen particle is part of the environment or part of a body – and at what point can we determine when something is ‘nonsense’ or fact? In the Chinese concept of physics, Wu-Li, oxygen and body are an organic whole. Distinction is mostly a matter of linguistic differentiation. Similarly, the purported return to ancient Greek science, shown by the fact that after two thousand years, logic has been taken in a circle, back to illogic, or paradox, underscores the return to a paradigm where physics and metaphysics function hand-in-hand. So where do Wilber’s different domains end and begin?

Now, on the matter of parallelism, Bohr says that materialism and spiritualism are “two aspects of the same thing.” If so, then it is remarkable that physicists have brought the two together. And Bohr and his followers were not the last to follow this line of reasoning: “In the new physics,” Sarfatti says, “just as we see the breakdown of the split between the two cultures, science and the humanities, we also see the split between West and East breaking down, with rationalism and mysticism reconciled as well.” With this tendency to open-mindedness, modern physics enters the field of knowledge as a unifying bridge.

So what can we say about parallelism in general? Science, metaphysics and mysticism are all expressed through language; and they all provide words about the same ‘thing’ around which the parallels stand – reality, existence, nature, the Self, or consciousness, all of which have been considered to be interchangeable words by quantum physicists. Languages can all borrow from and be translated into one another, and so can these. For Heisenberg, and others who worked on atomic weapons, this task is crucial; “If we – as the positivists do – may no longer speak or even think about the wider connections, we are without a compass and hence in danger of losing our way.”

New Age and New Physics: A New Myth of Reality

Our myths, or metaphysical interpretations of reality, which are getting more and more precise, are still hitting a wall of ambiguity, vagueness, and paradox. Speculating on a nonlocal realm – or the subatomic realm in general – for example, is akin to science saying that there is a realm which we can't perceive. Even with our instruments, we can't see this 'place' beyond space and time, where all information exists at once, but without it, our most successful science may not make sense. Similarly, physicists create new particles rather than discover them. “At the threshold of the 21st century,” concludes Sarfatti, “in what we call the information revolution, the information age, in the end, the whole of reality is simply a pattern of information.” Quantum physicists then, using words like ‘consciousness', 'mind,' 'energy,' 'matter,' and 'information' interchangeably, are also metaphysicians; myth-makers.

Sir Jeans says that the great philosophical realization of the New Physics is not spacetime, the negation of causation, or that things aren't what they seem: instead, “It is the general recognition that we are not yet in contact with ultimate reality. We are still imprisoned in our cave, with our backs to the

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406 Compare to the distinction of when an infant becomes human: at conception, in the embryonic stage, birth, etc.
407 Quoted in The Universe As Seen from North Beach, n.p.
408 Honner, p.187
409 Gregory, p.145
410 Quoted in Schwartz, The Universe, As Seen From North Beach, n.p.
light, and can only watch the shadows on the wall.”\(^{411}\) The good news is, the shadows on the wall, the myths used for relating to reality, are made by humans – scientists included. Indeed, linguistically, we have found, anything goes, which is a realization made in both modern science and mysticism. It points to a need for clarity of meaning and a consciousness of uncertainty – knowing that your truth isn't the whole truth. And, just as importantly, it points to the option of \textit{rewriting} our myths.

As our investigation has shown, whereas the old science inspired a mechanistic philosophy, the New Physics has found itself allied with an organic, holistic, even 'spiritual' language. For the old myth then, which we may term 'fundamentalist materialism', the New Physics may be the beginning of the end.\(^{412}\) A new myth has come forth in its stead, based in a different experience of reality; and the newly generated myth, later embellished by the New Age, is unity. All of nature, of which we are a part, is one.

Common sense and mainstream philosophy – including religion – failed to account for quantum mechanics and relativity. The new language to cope with its worldview is both similar to, and cross-culturally informed by a coming together of mystical, Eastern, and ancient Western philosophies. Even amongst respected, Nobel-prize winning physicists, all manner of statements have been made on the spectrum between materialism and mysticism. At the same time, Restivo's materialist investigation of parallelism, written before the explosion of popularizations by the New Age movement, can do no more than dismiss the premise of parallelism because of its methodology; the \textit{contents} are not actively refuted. Indeed the content of the New Physics, he concedes, is a “therapeutic and unifying force” in contemporary thought.\(^{413}\) The human psyche, which on the one hand sees its new physical theory create atomic bombs, is at the same time inspired towards a new way of thinking. Creating a myth of unity, or oneness, then – functionally speaking at least – provides a new moral counterpart to the destructive potency of science. It is moral because, if everything is united, then what you do to others, you do unto yourself. And because, as the adage goes, “with great power comes great responsibility.”

Metaphysical assumptions dating back over two millennia – such as determinism, materialism, and realism – still prevail in science. But there are signs of significant change. Instead of abstracting from common sense, which leads to a misuse of language and naively realist statements, the New Physics is informed by experience. And experience of course finds that nothing can be predicted with 100% accuracy. To a traditionally deterministic culture then, the death of an absolute guiding force in science – especially after the previous death of God in religion – is discomforting. Anyone searching for existential certainty in quantum physics is likely to come up empty-handed.\(^{414}\)

\(^{411}\) Wilber, p.10

\(^{412}\) Responding to this threat, the skeptic-turned-nihilist fears that we're now suspended over an abyss: that if the outside world cannot be said to be real, then we are floating in nothing. But Bohr, Heisenberg and the parallelists go further, and say that we are suspended in a net of language in a universe which is both co-experienced and co-created. As Bohr loved to quote from Chinese philosophy, we are both “actors and spectators.”

\(^{413}\) Restivo, p.21

\(^{414}\) This last point, in turn, may help explain why quantum theory is not the dominant metaphysical paradigm in Western
Beyond our subjective experience of time and space, and the words we use to describe them, we cannot know that there is time and space. Mystics are even reported to experience timelessness and spacelessness. Recognizing this paradoxical relation to what we normally accept as reality has left many mystical traditions non-dogmatic, pluralistic, agnostic, nondualistic, non-deterministic, and generally weary about what they can say about reality. And these are exactly the metaphysical bases for the New Physics.

As Bohr said, there is no Quantum World. Instead, what his interpretation of quantum physics implied was “a change in our thought processes,” where an “abundance of concepts and experience” are brought together. Sarfatti has determined that physics is “replacing philosophy as the unifying force between science and art;”415 that it is dissolving classical boundaries. Through this dissolution of boundaries, we are brought from classical physics to relativity to quantum theory; to the union of spacetime; and, beyond spacetime, which is relative and illusive, to the frontier of science which physicists from Bohr to Capra have pointed to: consciousness. As such, the reality we deduce from the New Physics – which is not of God or even Nature, but ourselves – fits perfectly the modern individualist spirituality of the New Age.

Conclusion

Recent changes in scientific theory have been picked up and elaborated in popular culture by the New Age. Bizarre implications have arisen from quantum math: that an electron, for example, is not anywhere until we look. When we look, it decides to be somewhere, and when we stop looking, it's potentially everywhere. To explain this, physicists have had to become philosophers again, often using mystical concepts from ancient, religious sources alongside their mathematical frameworks. Central to this new convergence of science and religion is the realization that in studying reality – whether through meditation or in a laboratory – the participation of consciousness is key. Indeed, some have expressed the belief that they are in fact one and the same – consciousness and matter, energy and thought – and that the only thing separating them is our naïve way of using language.

According to Vanheste, the big question is why New Agers turn to science to support this worldview. His answer is straightforward: certainty.416 Like most of us, New Agers want to know what reality is, and science is a predominant source for answers. In this study, however, we have taken quite the opposite perspective: that of exploring why scientists have turned to the New Age. We have seen how they found that their science did not provide certainty; indeed, that Bohr, Heisenberg, and others accepted the inevitability of uncertainty. And, just like many New Agers, they believed that they shared this same conclusion with the mystical traditions of the East.

The problem, for both physicists and mystics, is that reality transcends what can be said about it. The universe is bigger than any of our models; any word, theory, or label is never going to contain all the information in it that you want. So instead of skepticism, an attitude of agnosticism acknowledges the usefulness of everyone's version or reality. But this is only the surface of the problem: for if, as Einstein has said, "Reality is merely an illusion,” and the outside world isn’t really real, but a myth created by our senses and symbols, then what is real? While there is still much disagreement, many of the physicists studied here had a mystical view of reality. They accepted that reality transcends language; that you can't say much about what it is. So, inspired by different ways of thinking, they

\[415\] Quoted in Schwartz, The Universe, As Seen From North Beach, n.p.
\[416\] Vanheste, p.247
created a new way of using language. The Copenhagen interpretation, Complementarity, Quantum logic; these all allow a broader description of what reality might be.

The New Physics unforgivingly recognizes that words, in the end, are just words; “honorific terms.” Unlike Western religions and classical science, whose words create truth through a faith that what we say is real, really is real, quantum physicists have found they cannot say what it 'is' or 'is not': in other words, they have found that there is no monopoly on truth.

Accepting this limitation, physicists and parallelists turn to relativism. Relativism is said to be truer to what is really real, since what you find out is true relative only to the instrument, language, or mind you use and its location in spacetime. So relativism is in the interest of greater knowledge: science by itself is not enough, nor mysticism, and you have to have a bit of both to know more about reality. As Bohr says, the statements “There is a God” and “There is no God” are equally wise and true.418

Physics, therefore, while still separate from mysticism – remember, even parallels never touch – is connected to it by the physicists themselves. Whether Bohr and Heisenberg would have liked Capra's parallelism, its methods, and its conclusions is uncertain. But the attempt was in line with what they wanted: the “unity of knowledge.” Niels Bohr built an entirely new foundation for Western knowledge on this principle, which he called Complementarity. According to physicist Oskar Klein, Complementarity reflected his own character: Bohr had a “knack for seeing commonalities in apparently different things;” and, like a true genius, he did not shy away from subverting his own beliefs and assumptions.419 This unity and openness of knowledge was enough to create a new truth for the New Age: the reality that we are all, somehow, one.

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417 Gregory, p.184
418 Equally wise and true, then, are the materialist statement “There is a real world” and the solipsist statement “There is no real world.” Ditto on “We are all one consciousness” and “We are all separate,” or the respective belief in unity or duality.
419 Quoted in Honner, p.178
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