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**QUANTUM CONSCIOUSNESS AND THE SEARCH FOR A NEW
PARADIGM: HOW SCIENCE CAN BE SPIRITUAL**

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Abstract

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QUANTUM CONSCIOUSNESS AND THE SEARCH FOR A NEW PARADIGM: HOW SCIENCE CAN BE SPIRITUAL

This dissertation examines how a network of “quantum consciousness” scientists have sought to change the epistemological and ethical boundaries of scientific research in hopes of creating knowledge that can adequately address contemporary problems in both science and society more generally. Quantum consciousness (QC) is defined as both scientific research and spiritual practice that seeks to understand consciousness in light of foundational questions that emerge from quantum physics. QC scientists believe neuroscience alone cannot provide a scientific explanation of consciousness because neuroscience is premised on “materialism” of Newtonian physics. QC scientists draw on the authority of physics to argue the correct scientific account of the mind-matter relationship will have to incorporate quantum physics, understood as the correct theory of matter since the quantum revolution of the 1920’s. Insofar as the physical delimits and shapes the mental, QC makes good on the potential quantum physics holds for redefining what mind is and can be.

By examining the practices and discourses of QC scientists, I demonstrate that conceptual transference between science, philosophy and New Age spirituality is part of the formation of scientific disciplines and the bounds of scientific debate. QC’s

cultural contestations with mainstream science show how the demarcation problem in science becomes intertwined with the mind-matter problem of philosophy. My ethnography follows QC scientists' movements between conferences, research settings, classrooms, and dinner parties to show how technical philosophical disagreements in quantum foundations, such as the measurement problem and the theory of decoherence, are the fulcrum of a cultural, de facto demarcation between QC scientists and mainstream scientists.

Max Weber postulated "disenchantment" as the result of a world rendered knowable in principle, yet the doctrine of intrinsic probability in quantum mechanics denies the possibility of such a world, and thereby troubles the assumption of a necessarily disenchanted science. I show how QC science is motivated by an expectation of a future "spiritual" discovery, called the New Paradigm, that redeems QC's hypothesis that "universal consciousness is the ground of physics." This expectation encourages QC scientists to incorporate and proliferate non-science within science, in ways that make hybrids, rather than clear boundaries. My dissertation shows how QC's expectation of a "New Paradigm" guides what may be called a spiritual revivalism to redefine the secular norms of science.

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Bruce Rosenblum died in 2014. A few weeks before his death, he gave me a book. "I'll want that back someday!" he said. I will do my best, Bruce.

Finally, I thank James Higgins for providing light in the darkest of hours.

Preface

This dissertation is an ethnographic study of some inter-related conceptual problems within science: the problem of induction, the mind-matter problem, and the quantum measurement problem. Each of these problems pertains to insides and outsides of human experience: the boundaries between objectivity and subjectivity, mind and body, and possibility and actuality, to name a few. The study is ethnographic in character because my interest is to investigate how these specific conceptual problems give rise to specific behaviors and discourses among a particular group of scientists, actions and discourses that in turn, take part in shaping the subsequent development of science. My fieldwork was done with *quantum consciousness* (QC) scientists, who believe that consciousness is not primarily a biological function but a quantum physical one. QC scientists see in this belief the implication that consciousness is not limited to humans and other organisms, but is rather a property of the universe itself. QC scientists come to the idea of a “universal consciousness” by way of a certain interpretation of one of the problems mentioned above, the “quantum measurement problem.” The quantum measurement problem concerns why the world of everyday experience does not resemble the world that quantum mechanics seems to describe. Later, we will see how QC scientists give an answer to this problem, in a way that pertains also to the mind-matter problem, by arguing that the boundary between the “quantum” world and the world of experience is mediated by a form of consciousness that is not personal, but rather, universal and perhaps even “physical.”

What makes QC science especially unique, however, is not so much their hypothesis about consciousness, but the expectations they invest in this hypothesis should it gain scientific and socio-political acceptance. QC scientists suppose that were consciousness shown to be a universal and physical phenomenon, there would be a widespread “transformation of consciousness” among scientists, and within “Western” culture in general. Although QC scientists would never say it this way, it is almost as though QC scientists expect that verification of the quantum physical basis of consciousness would produce a direct personal spiritual revelation for every person who comes to know this (as yet unverified) “scientific fact.” Such a revelation is in turn expected to produce the sort of harmonious social conditions that would be necessary to solve major world problems like climate change and economic disparity, and also more personal problems such as depression and social alienation.

My ethnographic work with QC scientists demonstrates how particular lacunae in the logic of scientific thought can become invested with social activities and expectations, that may, at first glance, seem beyond the scope of science. Yet the logic and the forms of sociality that emerge in QC cannot be accounted for without understanding how the problem of induction, the mind matter problem, and the quantum measurement problem are experienced and lived as personal and social problems. These problems have a life that extends beyond the university, intermixing and guiding individuals in their attempts to make sense of their own histories and their own present. For this reason, I introduce and explicate questions relevant to philosophy of science over the course of this dissertation, but not for the purpose of

solving those problems as a philosopher might do. Instead, my purpose is to understand the concrete discursive structures and paradoxes that make meaning of QC scientists' scientific, socio-political, and personal forms of experience. While QC ideas about social and political crisis may be naïve ("spirituality will solve climate change"), understanding how QC scientists come to think and act the way they do requires following some of their more rigorous philosophical work. My research with QC scientists shows that what is productive of QC scientists' "spiritual" expectations and behavior is not simply a discourse or style of thinking. Instead, I found that QC scientists incorporate intractable metaphysical problems into their daily lives such that they became the templates upon which a unique culture emerged and reconfigured the meaning of the tradition of Western science vis-à-vis the modern "West" more generally.

For the purpose of the argument, it is necessary to follow the tendency in philosophy of science to distinguish between metaphysical problems, which are not subject to experiment, and empirical problems, which are. I then demonstrate how QC produces tangible social formations as they reveal in both discourse and practice that the boundary between the metaphysical and the empirical is never final and always indeterminate. This is not to say QC scientists are particularly happy about the role of metaphysics in science today. The metaphysical conundrums at the basis of scientific thought do not sit easily with QC scientists or most scientists in general. While some scientists may deny there is any metaphysics in science, QC scientists have come to recognize that there are indeed metaphysical presuppositions intrinsic to

science. However, QC scientists do consider metaphysical presuppositions to be a threat to science's authority, because they are not empirically grounded. If science must lie on a metaphysical foundation, they say, it should be a metaphysical foundation that can be empirically verified. Surprisingly, QC scientists do not seem to be aware that this goal runs into a logical problem; an empirically verified metaphysics is no longer metaphysics at all, insofar as empiricism is defined as the opposite of metaphysics. Instead, we shall see, QC scientists believe that this paradox can be resolved by the discovery of a universal consciousness whose existence guarantees the veracity and coherence of scientific knowledge as a whole. In a sense, then, QC scientists seek a science that can pick itself up by its own bootstraps. It is the search for this veracity and coherence that my ethnography demonstrates.

As the themes I have introduced above show, concrete philosophical questions emerge when QC scientists attempt to integrate scientific knowledge into their more general lived experience, and in particular the way they register and express their anxieties about personal, social or political crisis. In fact, the very existence of QC depends on the larger history of physics, and particularly the social effects of the quantum revolution, in terms of how scientists imagine what kind of world science in general was revealing. Early examples of something like "quantum consciousness" research are found in the more general and speculative work of some of the founders of quantum mechanics, such as Niels Bohr, Werner Heisenberg, and especially Wolfgang Pauli. Wolfgang Pauli won the Nobel Prize in 1945 for his 1925 discovery of the Pauli exclusion principle, which helps explain atomic structure. He was also a

friend and confidant of psychoanalyst Carl Jung. There is a published collection of letters between Pauli and Jung that gives a view into the method of dream interpretation and imaginative speculation that the two scientists employed. Specifically, Jung and Pauli incorporate and understand metaphysical problems that emerged as a result of Pauli's dreams, which often contained physics symbolism. Even as they sought scientific solutions, they understood their activities together as a "spiritual" struggle to understand how Pauli's unconscious understood quantum mechanical processes in a manner different from the way his consciousness did (Pauli and Jung 2001). Pauli and Jung both had the sense that the unconscious might not be purely psychic, but rather a place where mind "touches matter." From that point of view, the unconscious would not only represent physical process, but also might be directly affected by physical processes. If the unconscious were molded by physics directly, then perhaps unconscious symbolism in dreams could contain direct clues about the nature of the physical.

I first read physicist Pauli's letters to Jung while I was doing ethnographic research. The letters helped me understand the scientists who I was studying in my fieldwork, by showing me what was in common between Pauli and Jung's work compared to that of the scientists I was researching. Pauli, Jung, and the QC scientists who were the subjects of my research all sought to provide a scientific explanation of consciousness using concepts from quantum mechanics. Yet the effort to explain consciousness in relation to quantum mechanics opened into a more foundational problem: the question of the source of authority of empirical knowledge.

While much philosophy inspired by David Hume has pointed to the problem of the non-empirical ground of empiricism (Hume's "problem of induction"¹), I was struck by the fact that Jung, Pauli, and modern quantum consciousness scientists all approached the question of the authoritative ground of science as a "spiritual" problem. The meaning of spirituality in this context implies that coming to realize an empirical understanding of the relationship between mind and matter will have a transformative effect on the person who comes to understand. The "scientific" spirituality of Pauli and also QC scientists entails an effort to transform oneself by transforming how one understands the mind-matter connection as a basis for scientific authority.

Pauli first sought out Jung in his late twenties because he was suffering from depression and alcoholism (Miller 2009: 120). Jung referred Pauli to a young analyst, Erna Rosenbaum, but kept in contact with Pauli. After an initial treatment from Rosenbaum, an informal patient-doctor relationship developed between Pauli and Jung, which developed into friendship (129). As a provider of psychoanalytic guidance, and then over their life-long friendship, Jung taught Pauli to understand spirituality as a faculty constitutive of the psyche. Jung's psychology recognized the necessity of postulating a non-empirical basis of experiential knowledge. He spoke of such a basis in terms of "archetypes" of the unconscious that constitute experience and empirical knowledge and are in this sense not subordinate to empiricism. One could discern the patterning of the archetypes in dreams and neuroses, for example.

¹ See David Hume (1993) *An Enquiry Concerning Human Understanding*. My Chapter 2 contains an in detailed discussion of Hume's problem of induction and how it relates to quantum mechanics.

Pauli's discussion with Jung gave him a new language to speak of himself in ways he was not able to do before, and these new ways of speaking encouraged new forms of familiarity with the self to grow in Pauli's experience. The archetypes of the collective unconscious are primordial to consciousness, Jung said. They appear to the subject as enchanting antinomies, alluring the subject toward self-transformation.² Such antinomies were also found in physicist Niels Bohr's idea of *complementarity*, a concept central to quantum mechanics. Jung suggested to Pauli that for Pauli, antinomies appear from the "outside," as matter and in physics concepts, because Pauli valued physics more than his own psyche and sense of self.

For Jung, spirituality was a name of a phenomenon that was a human universal – the tendency of the psyche to develop, integrate new experience, and heal traumatic psychic wounds. He explained that the need for psychic transformation could be ignored, but not eliminated; spirituality continues to reside in dreams and other expressions of the unconscious.³ Jung worried that scientifically minded folks have an impulsive doubt and even dread toward the metaphysical forms of language that must be cultivated for successful spiritual growth. In "The Psychology of Religion," Jung (1970) presented a case study of Pauli's dreams, recorded while Pauli underwent psychoanalysis, to demonstrate how the scientific mind recognizes the communications from the unconscious only through a negation by intellectual doubt. Indeed, when he first met Jung, Pauli understood his faculty of the imagination as a

² See Carl Jung (1969) "Archetypes and the Collective Unconscious," in *The Collected Works of C.G. Jung*, v. 9. Princeton, NJ: Princeton University Press.

³ See Carl Jung (1970) "The Psychology of Religion," in *The Collected Works of C.G. Jung*, v. 11. Princeton, NJ: Princeton University Press.

domain of illusion and fancy. He distrusted whatever could not be properly subjected to experimental reason. According to Jung, the task of psychoanalysis (and the cure for Pauli) was to restore the imagination of its communicative efficacy within the dynamics of the psyche.

Scientists who believe that only empirical statements have significant meaning can come to see the non-empirical ground of empiricism as a source of anxiety and emptiness. QC scientists of today lament the way many modern scientists believe that science reveals a “cold hard truth” is that we live in a meaningless universe. QC scientists argue this encourages people to believe that recognizing the “true nature of the universe” somehow causes people to feel deeply and existentially alone. Similarly, Jung consistently reminded Pauli that the question of the relationship between mind and matter is not only an intellectual problem, but also a spiritual one. “The union of opposites is not *just an intellectual matter* [...] For only from his wholeness can man create a model of the whole,” Jung tells Pauli in one of his letters to the physicist (Pauli and Jung 2001:99; emphasis original). Jung describes the process of gaining wholeness as the emergence into consciousness of a “third term” (the speculative imagination) that makes new forms of communication between consciousness and the unconscious possible.

As their friendship continued, Pauli came to recognize his search for a “scientific” solution to the mind-matter problem as an expression of his struggle for psychic integration. What long appeared to Pauli as a scientific project finally permuted into a self-recognition of an endeavor to transform the psyche as a whole,

to actualize his relation with himself. Pauli would have to accept that the unconscious basis of his experience could not be fully externalized and made into an object of thought; it would rather remain the background of thought. In other words, Pauli would always have an unconscious, which he could become more aware of, but he could never become fully conscious of it.

Curiously, Pauli developed an ability to see himself in this new way as a result of studying the speculative systems of “amateur” quantum consciousness theorists not unlike the amateurs I met in my own fieldwork. These amateurs were not professional physicists. They had no publications, but were often eager to offer a large mass of unpublished writings, if you would provide your email. They were lone thinkers, captured by their own imagination to solve the deepest mysteries of the universe, and in particular, to understand how consciousness emerges from a meaningless and inert material world. In fact, in my fieldwork I learned that most academic physicists receive emails from such independent researchers who have invented their own “Theory of Everything,” or “Grand Unified Theory.” Such theories usually incorporate consciousness as the essential missing element to physics. The emails can come from the anonymity of cyberspace and from all over the globe. Lacking the expertise of the physicist, amateurs made up (and still make up) speculative systems of the mind-matter relationship that contained empirical errors.

It was the fact that the amateur theories were wrong that led Pauli to seek out their truth and their libidinal source in another place. Pauli used Jung’s analytical methods to find out what the amateurs might be saying about themselves through

physics symbolism. He endeavored to discern in amateur QC efforts the distinct periods of a scientifically minded individual's spiritual movement. In what Carl Jung called "individuation," unconscious materials of the self become conscious, making for a new stability of the psyche. It was easy for Pauli to see how, in the case of amateurs, the unconscious could be symbolized by concepts like "matter" or "atom," whereas the conscious ego could be symbolized by concepts like "psyche" or "consciousness." Then, the amateur's proposed solution to the "psychophysical problem" (how to integrate "mind" and "matter") could be read as a symbolic expression of a unique and personal "individuation" process. By reading this way, the scientific "incorrectness" of the amateur's symbolizations could be rightly disregarded, since what the research effort is "really about" is an individual's individuation process. Slowly, over time and incompletely, Pauli started to read his own efforts at finding a solution to the mind-matter problem in a similar way. While he never gave up his belief in his own superior scientific intellect, Pauli was eventually able to think that his unconscious spoke to his consciousness using physics symbolism. For example, he would dream of a physical process such as a radioactive decay, and then the next day try to understand how the radioactive decay might be a symbol for a feeling Pauli was having at the time about his daily life. In this way, Pauli hoped to learn to hear what his unconscious was saying about him, even as it spoke in physics concepts.

While doing fieldwork, I underwent a transformation that was not completely different from that of Pauli. At first, I listened to the QC scientists who I studied

largely in an empirical register. Yet as I became more comfortable with the empirical material of quantum physics, I started to hear what QC scientists were saying in a new way. One might say I learned how to hear the “spirituality” that inheres in QC thought and conversation. Jung and Pauli will reappear at moments throughout this dissertation as a point of comparison and a conceptual resource for understanding contemporary QC science. Like Jung and Pauli, QC scientists are troubled by the question of the source of authority of scientific knowledge, and they take this to be a problem of spirituality rather than philosophy. Also, QC scientists share with Jung and Pauli a recognition that the “mind-matter problem” of philosophy, which inquires into how to properly account for the distinction between the physical and the psychic, cannot be answered without questioning into the source of authority of scientific knowledge. Hence, discourses on the mind matter problem are at the same time discourses on the authority of science, and disagreements over how mind and matter are related (or not) are simultaneously debates over scientific authority. Recognition of the interconnections between the mind matter problem and the question of authority in science makes possible a kind of spirituality that grows out of scientific thought.

Summary of Chapters

“Chapter 1: Introduction to Quantum Consciousness” provides an overview of quantum consciousness (QC) as both a social formation and a discourse. I describe

some of the major individuals and institutions that make QC possible, and explain the problems that QC scientists try to address. I elaborate on the theme introduced in the preface, demonstrating how QC scientists debate the source of authority of science through a conversation on the relation between mind and matter, or more specifically, mind and quantum physics. I also provide background knowledge that is essential to understanding QC, including some specifics of quantum physics and philosophy of physics.

“Chapter 2: Demarcation: When Physics Encounters Consciousness” explores the problem of demarcation of science from non-science in light of a controversial physics course at UC Santa Cruz. Professor Bruce Rosenblum taught a physics for non-majors course entitled “Quantum Enigma: Physics Encounters Consciousness” for more than fifteen years before several faculty challenged the course content on the grounds that “consciousness” is not a proper topic for a physics course. Underlying the ensuing controversy, questions of how to properly interpret quantum mechanics became entangled with broader questions of philosophy of science and science pedagogy. My ethnography of this unusual physics course demonstrates how technical disagreements between physicists about quantum physics, such as the measurement problem and the theory of decoherence, were productive of political divisions in the physics department on questions of academic freedom and proper pedagogy. This chapter also provides an overview of my initiation into physics culture, and the reader is introduced to a number of concepts from physics and philosophy that become central to understanding the dissertation’s engagement with

theoretical physics.

“Chapter 3: Proliferation: Realism and Counter-Induction in Anticipation of the New Paradigm” draws on science studies, anthropology and political theology to analyze the conditions that make QC’s peculiar mode of scientific practice and discipline formation possible. I begin with an ethnographic analysis of the more conservative approaches to discipline formation I found in mainstream physics, which tended to remain agnostic on metaphysical and speculative problems emerging within their research program by referencing some awaited future experiment, real or imaginary, that would eventually resolve the problem. Then I show how QC scientists’ faithful expectation of an emerging New Paradigm allows them to feel they *already know* the result of a future experiment that will redeem their metaphysical position. QC scientists avoid agnosticism and “make metaphysical judgment *now*.” I argue this politicizes and polarizes QC’s scientific activity in relation to mainstream science. QC’s efforts open up a temporal structure within scientific discourse that resembles certain theological argumentation in its promise of the appearance of a transcendental guarantor at the end of time. QC’s discursive formation motivates “spiritual” action among scientists, which they understand to be for the sake of an expected New Paradigm that will save the planet.

“Chapter 4: Spirituality: Certainty and Doubt in the Quantum Imagination” begins by showing how QC attempts to solve the problem of the ontological relation between mind and matter using concepts from quantum physics. I then show that this scientific-philosophical activity has a “spiritual” consequence, by which I mean that

practitioners report feeling psychologically transformed for the better, and sometimes even spiritually reborn, after working in QC more many years. I argue that QC's spirituality is made effective by authoritative terms derived from science.

Specifically, scientists regard the paradoxes of quantum physics (recall again Schrodinger's Cat) as authoritative and real. Hence, efforts to resolve quantum paradoxes engender psychological transformations insofar as concepts of physics ("matter") delimit the physicists' understanding of self ("mind"). Following this insight, I provide evidence that spiritual self-transformation, experienced by individuals as a change in the whole self, does indeed take place as a result of participating in QC.

"Chapter 5: Conclusion" the implications of the dissertation for understanding scientific knowledge in relation to secularism. Expanding and revising Charles Taylor's (2007) argument that spirituality is central to modern forms of secularism, I argue that modern spirituality is inseparable from a scientific ethos that has two opposed tendencies. On the one hand, it is scientific thought that makes it possible to conceive of a "pure" spirituality as separate from religion. On the other, science always has an ambivalent and skeptical view toward the "spirituality" that it brings into the world. I argue that a proper understanding of spirituality as a "secular" phenomenon must make account for its emergence within concrete scientific concepts, such as those fabricated by QC (or alternately, by mainstream neuroscientists).

Chapter 1: Introduction to Quantum Consciousness

“And even your atom, my dear materialists and physicists — how much error, how much rudimentary psychology still resides in your atom!”

Nietzsche, *Twilight of the Idols*

The Ethnographic Field and Object

Quantum consciousness is a shorthand term for the social milieu that surrounds the controversial scientific hypothesis that consciousness is a quantum physical phenomenon. Quantum consciousness (or QC, my abbreviation) is also a term some may use to describe an expected but not yet realized scientific achievement: a clear and persuasive demonstration of the quantum physical substrate of consciousness. I label these people as *quantum consciousness researchers* working to develop a research program toward that goal. Many QC researchers are scientists who work in the theoretical foundations of quantum mechanics as well as laboratory research to find quantum processes in the brain. Others are amateur scientists or hobbyists, who study and participate in QC research networks without pay. QC research has a significant amount of overlap between professional scientists and amateurs, in part because all practitioners identify with a common self-conception and narrative of the potential for QC to unify science and spirituality. QC became fascinating to me when I began to understand that QC scientists were seeking a form of spirituality, in the sense of a transformation of oneself, from within the concepts of quantum mechanics.

There is a considerable amount of contention in QC, including the name and

classification of this activity. QC may be called quantum consciousness, quantum mind, or more obliquely, “understanding how quantum physics and consciousness are connected.” Some may consider QC a discipline or emerging discipline; others may say it is a movement or a project. In any case, there is widespread agreement that QC will and should become a scientific discipline in the future.

QC scientists expect massive consequences for both science and society as a whole, if and when they are able to demonstrate consciousness is a universal and fundamental physical phenomenon, rather than a product of brains and biology. They note that such a discovery would lead to a spiritual effect because it would change how people understand their relation to the cosmos. Specifically, QC’s scientific discovery would overturn some of the fundamental premises upon which science is based, a set of premises they call the “Newtonian Worldview,” after the deterministic classical physics inspired by Isaac Newton and brought to its pinnacle in the late 19th century, just before the emergence of quantum mechanics. QC’s expectation that it will one day have strong consequences for science and society is derived from QC scientists’ belief that the materialism of the Newtonian Worldview is the bedrock of a hegemonic way of excluding certain forms of thought from science, including spirituality, religion, and metaphysics. If consciousness is fundamental, they reason, the boundaries between science and non-science will have to be renegotiated.

There is no ready-made discourse in the social sciences that can adequately render just what QC scientists are doing. This is in large part due to the way conceptual categories that help us understand human differences tend to render QC’s

scientists' activities somewhat invisible. In fact, QC challenges us to rethink how we understand differences among humans through the lenses of culture, religion, and insanity, for example. An analysis of the contestations between QC scientists and their detractors can show us that what appears as insanity to some, may appear as spirituality or religion to others. QC can be placed in a larger context of academic and popular debate today, as scientists are not the only people in the U.S. and elsewhere rethinking and even agonizing over how to account for and relate to human differences. There is some irony in the fact that, in an age when "culture" is popular currency for explaining and relating to human difference, some anthropologists have turned their attention toward the philosophical concept of "ontology" as another way to register difference (Descola 2013; de Castro 2014; Severi 2014). While anthropologists may argue that a particular group or tribe ascribes to its own ontology, QC scientists self-diagnose themselves in this way, saying to other scientists, "Our ontology is different from yours!"

Yet this is an uncanny kind of difference, since QC thought processes are not so different from those of other scientists. Sometimes those closest to us seem the most alien (Harding 1991; Hess 1993). QC activities appear so familiar, and yet, the results of their activities appear strange, or even wrong, in the eyes of onlookers. Rather than appearing within a frame for anthropologists (and tolerant people of all sorts) to recognize QC as "another culture" with its own distinct way of thinking and doing, QC appears to do what we scholars and researchers all do, but in a way that makes many feel uncomfortable. In result, critics sometimes call QC scientists

“wacko and crazy” to account for their difference. I was not immune from similar criticism in pursuing this anthropological project, as many of my colleagues suggested that this research amounted to advocating pseudoscience. QC scientists prefer to account for their difference from other scientists by their theories of “spirituality,” “ontology,” and also “paradigm” *pace* Thomas Kuhn.

Hence, we must come to understand that QC exists in an imminently polarized field of meaning, such that one must take strides to talk about QC without taking sides. Although QC scientists avow objectivity as much as any scientists, their position and motivations make it easy for them to see the polarizing nature of their activities. QC may be called political in nature, although QC scientists do not often connect their work explicitly to politics in the sense of liberal, conservative, or other political ideologies. They recognize their work as political as a result of the backlash they receive in their effort to find spirituality in science. They report that the backlash from mainstream science seems to be based on “emotional” and “political” grounds, rather than properly scientific ones. Because of this, they have learned to take on and avow the social and political underpinnings of what they call “paradigm shift.” Indeed, many QC scientists read history of science and science studies literature, and while they maintain that scientific objectivity is always possible, they also recognize that paradigms of science do not necessarily become dominant based on pure reason and experimentation alone.

In this sense, QC is self-aware that the effort to find spirituality in science must be a political act, at least insofar as this effort polarizes groups and leads to

taking of sides. QC discourse contributes to its own marginalization by setting itself as an underdog contestant in a battle of “worldviews” against “mainstream science” and the “Newtonian Worldview.” This is in part a reaction to QC scientists’ awareness that outsiders might disparagingly call quantum consciousness a “New Age” science; a point that will recur throughout this dissertation.⁴ QC’s mode of understanding physics, physics history, and the relation between science and society is different in many ways from that of “mainstream science.” Although the line between QC and the mainstream is always partial and renegotiated at every turn, I nevertheless often refer to the “mainstream” in my writing in order to depict the ways QC imagines and constructs its difference from other scientists and scientific communities. At the same time, we shall see that many QC scientists *are* “mainstream scientists” when they are engaging in their daily research, and only become QC scientists when they come together with other QC scientists. QC sets itself against the mainstream by telling an alternate history of science that fits with its opposing scientific and philosophic position. Importantly, QC’s articulation of its divergence from mainstream science is part of how it comes to understand itself as spiritual.

QC scientists expect scientific spirituality is something that must be built for tomorrow through today’s efforts. They matter-of-factly refer to the coming era as the New Paradigm, a time that will come after the discovery of a persuasive

⁴ There is a vast literature on relations between science, modern spiritualism and the “New Age.” Some of the scholars who have influence my thinking on this topic include Hess 1993; Hanegraaff 1997; Albanese 2007; Bender 2010; Kaiser 2011; Modern 2011; Farman 2013; Doostar 2012).

demonstration of the fundamentality of consciousness in the physical universe. The New Paradigm plays a central role in QC thought, but it is an idea surprisingly empty of content until one realizes that the New Paradigm functions as an eschatological plane within QC science.⁵ The New Paradigm is so unthinkable that one can say close to nothing about it and yet so certain that one feels its presence. When pressed, a QC scientist may refer to world peace, or salvation from climate change, or the emergence of new forms of global cooperation between people of different nations and cultures. Yet it seemed to me that QC scientists were not so happy with their answers, almost as if asking questions about the New Paradigm was to be missing the point. Sure, the New Paradigm will bring all these good things, but these things are not it. The imaginable events are mere consequences of something, a “transformation of consciousness,” more sublime and unthinkable.

Mainstream science, QC correctly notices, has no such expectation of a future “shift in consciousness” of scientists or people in general. QC scientists say most scientists have a “Newtonian Worldview”; indeed QC discourse makes the phrases mainstream science and Newtonian Worldview nearly synonymous. This polarization between QC and the mainstream is explained further by QC’s larger narrative of the present state of science as a whole. In QC’s narrative of the present, quantum mechanics has overthrown the classical or “Newtonian” physics developed in the 19th

⁵ While anthropologists have demonstrated that eschatologies and world-endings are often full of knowledge and complex narratives (e.g. Harding 2000; Crapanzano 2004; Pandolfo 2009; Rutherford 2012) it is perhaps fitting that a scientific eschatology should be short on content, since any such content would be considered dubious and subject to empirical criticism. As far as QC scientists are concerned, there really is no point in speculating on what lies on the other end of an apocalyptic or millennial horizon. What QC eschatology does share with its religious counterparts is an immanent political effect, in the sense of persuasive and polarizing narrative force.

century and still taught in high schools today. QC scientists refer to the strange and radical “ontology” of quantum physics, which they think ought to replace Newtonian physics as the exemplar of the scientific worldview. “Quantum mechanics is the new law of the land,” as physicist Stanley Klein puts it. Why have the “ontological effects” of this overthrow not yet rippled through the whole of science? Instead, the Newtonian Worldview persists; people still think atoms are little balls that bounce around, little chunks of matter, though we now know that atoms are nothing like that. QC scientists bemoan public intellectuals like Daniel Dennett and Richard Dawkins who argue that free will is an effective illusion and that science is a necessarily atheistic endeavor. All this, QC scientists say, is challenged by quantum physics, because quantum physics requires reference to an act of observation. Objectivity can no longer be conceived as independent of an act of measuring observation, as was possible in Newtonian physics.⁶ QC scientists hail each other and their audiences to participate together in creating a new worldview based in quantum physics that will replace the old Newtonian Worldview.

QC scientists propose, from many different perspectives and avenues of expertise, that the Newtonian Worldview has persisted to the present because it provides the demarcation between subjectivity and objectivity that is fundamental to

⁶ Any reader knowledgeable about quantum physics will know that this is a contentious statement. It turns on the technical and philosophical questions that make up the field of quantum foundations, whose task is to explain the meaning and implications of quantum physics for ontology, epistemology and cosmology. Although QC is not equivalent to quantum foundations, the “consciousness interpretation” of quantum physics is recognized as a legitimate if somewhat old-fashioned position in the debate on the meaning of quantum physics. For an overview of quantum foundations, see Jammer 1974; Schlosshauer 2011. For an introduction to major issues in quantum foundations using only high school algebra, see Albert 1994.

the authority of scientific knowledge. The source of this demarcation was the classical mechanical experiment, which assigned physical properties to moving points in space-time in a way that had to be modified by quantum mechanics. The emergence of quantum mechanics renders the sort of subject-object demarcation of classical physics untenable.

QC scientists explain that in Newtonian physics, it is possible to make observations without specifying the basis upon which the observation is made, which means that observation can be experienced as theoretically neutral. Those who have a Newtonian worldview are said to extend this principle to experience more generally: they believe it is possible to have an experience that is unbiased of theoretical or conceptual framing. QC scientists explain that the Newtonian Worldview pairs the possibility of an unbiased and pure experience with a scientific theory of experience wherein consciousness is fully determined by biological processes in the brain. In other words, a theory of epistemology in science is matched with a scientific theory of the conditions of consciousness as scientific object. The two elements operate in dialectical tension and cohesion. This pairing, we will soon learn, gives rise to what is known by scientists and philosophers as the “mind-matter problem” or “mind-body problem.” The mind-matter problem addresses the question of scientific knowledge from both ontological and epistemological directions. On the one hand, it asks how the brain can give rise to consciousness, and on the other, it asks what kind of thing the brain would have to be in order for humans to be certain they are capable of objective scientific knowledge.

Meanwhile, for QC scientists, the overthrow of Newtonian physics means the end of the Newtonian subject of unbiased observation, a supposed to be the condition of empirical knowledge. As a corollary to this view, the end of classical physics also means the subject can no longer be imagined as fully conditioned by neural correlates of consciousness. We now know, QC scientists say, that a new basis of empiricism is needed, and this cannot be possible without a new understanding of the mind-matter connection. A theory of quantum consciousness would provide both a new epistemology for science and a new scientific theory of consciousness.

QC scientists are physicists, neuroscientists, information scientists, philosophers and even a few social scientists that take part in academic discussions on the mind-matter problem as a question of the relationship between quantum physics and consciousness. For physicists, QC is centrally about a sub-discipline of physics called quantum foundations. Compared to QC, the discipline of quantum foundations is “mainstream,” and consciousness usually appears in that field only as an epistemological consideration. This means most quantum foundations theorists leave study of consciousness as a scientific object to the biologists and neuroscientists. They do not consider quantum physics an appropriate avenue to study consciousness as such, even if issues of epistemology enter quantum foundations.⁷

The foundations of quantum mechanics concern the *interpretation* of the quantum mechanical mathematical formalism. A non-technical but very common

⁷ On the other hand, quantum foundations does not garner the same high prestige among physicists as some other fields such as particle physics (which is considered “hard science”) or string theory (which is prestigious because of the high-level math involved). Some physicists will dismiss quantum foundations as “fuzzy stuff.” On the suspicion of physics culture toward quantum foundations, see Keller 1979; Barad 2006; Kumar 2008; Rosenblum and Kuttner 2011)

explanation among physicists for why quantum mechanics requires interpretation is that quantum mechanics is “weird”. Quantum mechanics implies the universe does some very strange things. The popular figure of Schrodinger’s cat, which is in a superposition of living and dead states, is a typical example of this weirdness. I give a first introduction to the interpretive issues of superposition in the next section of this chapter, and then provide a more comprehensive exposition in Chapter 2. Suffice for now to say quantum mechanics is weird and *seems to* imply impossible or absurd things, like cats that are both alive and dead.

Beyond physics, QC is also relevant in the sub-discipline of neuroscience of consciousness. Some neuroscientists think that concepts specific to quantum mechanics might be necessary to explain consciousness. In conversations with physicists, brain scientists borrow both mathematical techniques and philosophical ideas from quantum physics to make possible new interpretations of data, and also new models of the emergence of consciousness in the brain. For example, UC Berkeley neuroscientist Walter Freeman teamed up with theoretical physicist Giuseppe Vitiello of University of Salerno in Italy to use mathematical tools for quantum field theory to model data of brain activity associated with consciousness.⁸ Freeman was a leader in the field of neurodynamics, and sought to model brain activity in terms of brain wave patterns. He found that mathematics from quantum field theory were quite useful in modeling his EEG data, which measured electrical patterns across the entire brain. Yet he informed me in interview he was agnostic

⁸ Freeman died in 2016 at the age of 89.

about the “ontological” implications of that usefulness. As far as he knew, the math could just be a tool, rather than a sign that consciousness necessarily involves quantum processes. Meanwhile, his collaborator Vitiello, and others who followed the Vitiello-Freeman collaboration, understood Freeman’s EEG data as suggesting quantum processes are in fact associated with consciousness. Freeman’s concern was different. He was modeling his data in a manner that would convince other neuroscientists that his holistic and highly specialized mathematical methods were superior for studying consciousness compared to other methods more common in neuroscience, such as the “modular” approach that seeks to attribute specific conscious states to specific locations in the brain.

Examples like the Freeman-Vitiello collaboration show how the academic world of QC is both parallel to and meshed within mainstream academic disciplines like physics and neuroscience. Such relations also extend into the world of publications. It is possible to find queries and hypotheses as to the relationship between quantum physics and consciousness in mainstream layperson’s journals such as *Scientific American*, disciplinary ones like *American Journal of Physics*, and interdisciplinary ones such as *Journal of Consciousness Studies*. There are also journals recognized as “fringe” science such as *Journal of Cosmology* and *Journal of Scientific Exploration* that sometimes contain QC as a theme, and finally a few journals including *Neuroquantology* and *Mind and Matter* revolve centrally around QC issues. Freeman, for example, has published in *Scientific American*, in flagship neuroscience journals, and with Vitiello, in mainstream physics journals as well as

more fringe journals like *Journal of Cosmology* and *Neuroquantology*. The dispersal of QC literature across many kinds of journals gives a clue about the nature of QC itself; it is less a fully fledged and specialized research discipline than a discourse proposing problems and paradoxes that can be extended as a critique of nearly any scientific discipline, and even to the state of science as a whole. As we shall see, QC queries into the ontological and epistemological statuses of consciousness everywhere in modern science.

QC does not yet have the kind of carefully articulated assemblage of technologies and techniques that ethnographers of science have found to be essential in the social production of scientific disciplines (Collins 1985; Knorr-Cetina 1999; Latour 2005). Instead, QC comes into appearance when individual scientists thinking about quantum physics and consciousness leave their own discipline and come together to speak, write, and develop a common narrative and self-understanding about science as a whole. The activities I refer to simply as “quantum consciousness” are largely theoretical, discursive, and speculative in nature. Hence, I did not focus my research on laboratory ethnography, not because it was unavailable, but because ethnographic focus on a specific research program would likely have made the “quantum consciousness” part of the research look secondary to the scientific *discipline* the research takes part in, such as physics or neuroscience. One cannot easily find a laboratory that avows itself as a QC laboratory. Instead, QC becomes real via social networks made largely at conferences, workshops, and home gatherings. These networks crisscross academic disciplines and exceed the

institutional boundaries of the university. Hence, an ethnographic study of a neuroscience lab like that of Walter Freeman, who used mathematics borrowed from quantum field theory, would reveal an interesting case study of intermixtures of objects and ideas between disciplines (Star and Greisemer 1989; Bowker and Star 1999), but it would likely put “quantum consciousness” largely out of view by its technical focus. Freeman’s lab gathers EEG data, for example on rabbits that have learned to perform various tasks, in order to participate in debates in the discipline of neuroscience on the relationship between perception and action. Those elements that QC researchers recognize together as QC are not very visible in that context. However, when Freeman reported how his data is modeled using quantum field theory for the Foundations of Mind (FOM) seminar, the relevance of Freeman’s work to QC became apparent. There, Freeman spoke to physics professors, brain scientists and mystical and spiritual members of the Berkeley city’s community who gathered monthly for FOM. Freeman was a regular attendee of FOM seminars, along with several other well-known names in the Berkeley QC community, including Henry Stapp, Stanley Klein, David Presti, and the seminar organizer, Sean O’Nuallain. Incidentally, the FOM monthly seminar, which took place sporadically from 2014 to 2015, was not exactly UC Berkeley sanctioned. Rather, it took place in UC Berkeley’s Psychology Department building only by virtue of connections made between the seminar organizer and a psychology graduate student who was able to reserve a room.

One of the ways QC scientists develop a common self-understanding is by

attending what I call “hybrid” conferences. Such hybrid conferences bring QC academics into contact with others interested in the QC hypothesis. During my fieldwork I attended conferences with titles such as “Science and Non-Duality”, “Toward a Science of Consciousness”, and “Sages and Scientists.” There, I documented how hybrid conferences triple-function as scientific conference, public education forum, and business conference. Life coaches, therapists, entrepreneurs, and gurus come to these hybrid conferences to learn the QC science they believe pertains to their healing or spiritual practice. Meanwhile, the QC academics are transformed into spiritual celebrities alongside other spiritual leaders and gurus, and share in a common audience. Then, when QC academics finish their activities in self-advertisement, making business connections, promoting their books, or giving spiritual workshops, they steal away to QC research meetings to discuss QC science with other researchers in attendance.

Not everyone in QC is a professor or academic scientist. A group that became more visible to me at hybrid conferences than the universities were the many amateur QC scientists who work on quantum consciousness science, usually without pay, from their homes in their spare time. These “amateurs” are often working or retired professionals, perhaps in engineering or computer technology, who have taken on quantum consciousness theory as a passionate activity of mind (calling it a “hobby” would seem inadequate). As amateurs, they are also fans and followers of the more famous academic QC scientists who give the plenary talks at the hybrid conferences.

Some amateur QC researchers find unique ways to participate in building the

New Paradigm. For example, at the 2013 “Sages and Scientists Conference” in Carlsbad, California, I met meteorologist Elissa Lynn. She was seeking consultation from Chapman University QC physicist Menas Kafatos in regards to her motivation to become “The Climate Therapist.” Lynn worked as the weatherperson for ABC News in Sacramento for 17 years before quitting television and becoming the Director of the Climate Change Program at the Department of Water Resources of the State of California. For Lynn, governing against climate change would require inner spiritual work. She came to this conclusion after experiencing the exasperation of her position as Climate Change Program Director. Exasperated by the ineffectiveness and slow pace of bureaucratic work, Lynn hoped to find more fulfilling ways to fight climate change in her spare time. Her desire to be part of QC was shaped by her ambivalence about her television celebrity, and her desire to put her charismatic abilities to better use. Lynn met with physicist Menas Kafatos to discuss her intention to harness the persuasive power of quantum physics to encourage people to recognize the relationship between mind and matter, and more specifically, attitude and climate change. She hoped her strong television personality could be put to positive ends. A few months later, I received email links to the short videos she had developed starring herself as the Climate Therapist, in which she encouraged listeners to develop their intention to fight a changing climate.

While my dissertation focuses on academic QC scientists, there is considerable social engagement and sharing of ideas between professional and amateur QC researchers. Furthermore, the sense among QC scientists that they are a

collective working against “mainstream science” makes QC science relatively open to divergent and oppositional viewpoints, and tolerant of a somewhat egalitarian sharing of ideas, so long as each divergent viewpoint is espoused as part of the common efforts of QC science. As a matter of terminology, I will refer to academically employed scientists in QC as *QC scientists*, and I will refer to all people who do QC (that is all scientists, fans, followers, amateurs, etc. who try to discover inwardly and outwardly the connection between quantum physics and consciousness) as *QC researchers*. I want to use the more active phrase “researcher” rather than “amateur” or “follower” to emphasize that everyone interested in QC is doing active work, trying to figure out something for themselves, and trying to contribute to the larger project of bringing about the New Paradigm.

Stuart Hameroff is a professor of anesthesiology who works on theories of quantum consciousness with the highly famed mathematical physicist Roger Penrose. Hameroff is one of the most cited QC scientists and the organizer of the “Toward a Science of Consciousness” conference at University of Arizona. When I asked him what he thought of the many amateur theorists who paid their registration fees to put forward their own marginal QC theories, he responded with an open mind, and gestured toward the possibility that maybe one of them (the “little guys,” he called them) would advance the discipline. The common narrative theme of such conferences and similar social events facilitates sharing diverse viewpoints because such sharing is openly espoused as what makes QC more spiritual, and hence ethically preferable, to mainstream science. In the mid-1990’s some of the more

“mainstream” neuroscientists tried to convince Hameroff to make the “Toward a Science of Consciousness Conference “more scientific” (read: fewer hippies, mystics, and weirdos attending). Hameroff refused. The spurned neuroscientists created a rival association called Association for the Scientific Study of Consciousness (ASSC), with its own conference that continues to rival TSC. While many scientists go to both conferences, the modifier *scientific* in the ASSC’s name bears witness to a moment of fissure and debate on what science of consciousness is and should be that remains in place today. QC scientists (amateur and academic alike) are more at home at the TSC conference, because they can share in their understanding that all the activities going on side by side are in fact part of the process of building what is called the New Paradigm.

QC scientists tend to understand the New Paradigm as a project of working toward the development of a future or emerging science that requires scientific, spiritual, and public relations/marketing work. Each of these aspects of building the New Paradigm will be discussed in this dissertation. QC scientists not only perceive themselves as part of a movement to create a new scientific discipline; they also see themselves as forerunners in a global cultural shift taking place currently in world history. The phrase New Paradigm refers sometimes to the expected new scientific discipline, and sometimes to the larger world historical event that the new scientific discipline is hoped to engender. Audiences of QC scientists quickly come to understand scientific verification of the quantum consciousness hypothesis will be the watershed moment for the coming New Paradigm, which means both a new science

and a new historical time. Hence, academic QC scientists with a fan following are able to convert audience members into new fellow QC researchers, and these new “colleagues” later become the little known and never-published amateurs who seek out their better networked and better published peers in hopes of impressing them.

QC’s integration with spiritual cultures like those found at hybrid conferences, and the new and fledgling efforts of amateur QC scientists, are read as signs of a coming world-historical “transformation of consciousness.” QC scientists do experience some evidence for belief, since many do travel internationally, and find conference audiences of at least hundreds for their ideas, from Turkey to South Korea or Italy to India. While my fieldwork was conducted in California and Arizona, and mostly in Berkeley, it was easy for me to trace through interview and online research the global networks of QC scientists and their connections to metaphysical, spiritual and religious groups and businesses all over the world. Participation in these networks, even remotely, did give me a sense that “something important and global is happening here.”

QC scientists diagnose the present as one in which the Newtonian Worldview is no longer considered a legitimate basis for the authority of science, and they see the effects of this legitimation crisis in challenges to science from all directions: by “New Agers,” “postmodernists,” and religious “fundamentalists.” Insofar as quantum physics is the “new law of the land,” these challenges are considered in part (but not fully) justified. This is why quantum consciousness assigns itself the task of saving the authority of science by replacing the Newtonian notion of the unbiased observer

with the development of a “pure awareness” achieved in spiritual practice. Many, but not all QC scientists would say that the spiritual work of QC is to discover pure awareness within oneself, “beyond thoughts or concepts.” They believe this pure awareness, accessible subjectively, can be and should be the ground for the new empiricism of quantum consciousness research. In a dialectical loop, they also believe that QC research just gives objective clarity to the existence and meaning of “pure awareness.” With the Newtonian Worldview in crisis, QC scientists reason that scientists must gain access to a form of consciousness that can be a basis for a new kind of empiricism. Hence, it is necessary to transform the position of subjectivity in science in a way that is not yet fully known. Quantum physics can point the way, however.

Quantum Consciousness and Quantum Interpretation

There is considerable disagreement among physicists about what kind of physical reality quantum mechanics describes. As mentioned earlier, quantum foundations is a sub-discipline within physics that concerns “interpretation of quantum mechanics,” that is, what relationship the quantum physical mathematical formalisms have with physical reality. At the most general level, this brings up the problem of what kind of sign system a quantum physical equation is, as well as what it can mean to talk about "reality.”

The one thing a majority of physicists do agree on is that quantum mechanics rules out the definition of reality that was physically defined by Einstein, Podolsky

and Rosen in 1935, in a paper famously titled “Can Quantum Physical Description of Reality be Complete?” and commonly referred by physicists simply as “EPR.” The EPR definition of reality has some similarity to the common-use and rather ambiguous idea of reality: “there are objects that are really there.” More precisely, quantum mechanics rules out the possibility that physical objects are both local and real. “Local” means objects do not affect one another by what Einstein called “spooky action at a distance.” “Real” means that every physical parameter of an object has a determinate value at all times. It is common physics lore that after the initial few decades of debate on quantum foundations, spearheaded by physics giants including Einstein, Niels Bohr, Werner Heisenberg, Wolfgang Pauli, and Erwin Schrodinger, the concern for the foundational problems of quantum mechanics fizzled out at least until the 1970’s. Interest in foundations reemerged when John Bell developed a theorem (called Bell’s Theorem) that demonstrated that locality or reality do not exist, or both do not exist. Several experiments, including ones developed by physicists John Clauser in California and Alain Aspect in France, apparently verified Bell’s conclusions, giving rise to debate over foundational issues once more.⁹

Einstein's physical definition of "reality" was a way of formalizing the underlying presumptions of classical mechanics. In my fieldwork, I never heard a physicist say there was a need to interpret classical mechanics in the way there may be a need to interpret quantum mechanics. This is because the relationship between

⁹ An overview of the history of these events is detailed in Kumar 2008. David Kaiser (2011) details some of the cultural and spiritual currents of the 1970’s that gave rise to interest in quantum foundations in California, especially at UC Berkeley and Stanford University.

signs and the objects of the signs' referent is assumed to be straightforwardly *constative* in classical mechanics (Austin 1962). The function of language John Austin calls constative, which is the capacity to represent a state of affairs as in the statement "the cat is on the mat," is the function physicists see as the primary and most important language function.¹⁰ Since a classical mechanics expression is sufficiently like "the cat is on the mat," no one has to worry about interpretation of classical physics (unless, perhaps you are a philosopher). Physicists do not see the capacity of symbols to represent *in general* as a problem, or at least, not a physical problem. Many physicists explain the nature of signs in classical mechanics by saying that classical mechanics is just an abstraction and extension of the regular, everyday cognition. It is therefore intuitive; it just "makes sense," and requires no explanation.

Quantum mechanics is not like that, say the physicists. It concerns entities that humans have not had to deal with anytime in human history until the present.

Quantum mechanics equations are understood to concern *intrinsic* probabilities, which means probabilities that are ontological and not due to human ignorance or error. This is why, incidentally, Einstein in his EPR paper claimed quantum physics could not be a complete description of reality. For him, probabilities ought to be an effect of human ignorance; a true physical theory should not contain intrinsic probabilities. Nevertheless, quantum mechanics provides probabilistic solutions as predictions for the outcomes of experiments.

¹⁰ This can be seen in Sharon Traweek's (1988) ethnography of physics, *Beamtimes and Lifetimes*, for example.

In quantum physics, one calculates the *expectation value* of a measurement in a given experimental setup. The expectation value is an average value that one expects to obtain after performing multiple experiments (or, when measuring multiple particles at the same time). Quantum mechanics predicts the results of measurements. If I assign the number “1” for the state "the cat is on the mat" and “0” for “the cat is not on the mat," the expectation value is the average value of zeros and ones that I get after I perform my experiment repeatedly. For example, if I expect to observe the cat to be on the mat half the time, the expectation value is 0.5.

Now let’s switch to the example of an electron and two boxes to understand a little bit about where intrinsic probabilities come from, and why they lead to “weird” results. An electron can be guided into one of two separated boxes as it moves along a given path. If an electron were a ball, we might say the electron is either in the first or second box. Perhaps it is in neither box. It is even conceivable that by some trick of magic, it is in both boxes, although that is difficult to imagine if the boxes are separated. Yet electrons do not behave quite like balls. The electron can be in a kind of state, called a superposition state, such that it would not be physically correct to say that “the electron is in the first box” or that “the electron is in the second box” or that “the electron is in neither box” *or even that* “the electron is in both boxes at once.” Yet these four statements exhaust the set of “constative utterances” one might make about the relationship between the electron and the box. The superposition state, which cannot be described correctly by any of the four “logical” possibilities above, gives rise to the intrinsic probabilities of quantum mechanics. Several

physicists told me that I would not properly understand the concept of superposition and its connection to intrinsic probability until I learned mathematics relevant to describing this concept (Albert 1992 is a good place to start). In other words, they argued that the English language would not properly explain it since: it is primarily a mathematical concept. I learned it, and I think they are right. After I learned the basic mathematics (which took about a year to really understand), my comprehension improved tremendously.

A physics student who tries to learn quantum mechanics, myself included, finds that he or she often "thinks classically" when working out physics problems and has to rectify his or her mistakes by learning to "think quantum." Likewise, my teachers would say, "No, you are thinking about it in the classical way." They labeled some of my usual problem solving intuitions as "classical" or "Newtonian," and encouraged me to try to think about it again. Indeed, the effect of this initiation process sometimes left me feeling like my brain just wasn't "wired" to understand quantum physics. At this juncture, it was common that someone would encourage me by saying that my biology isn't meant to understand quantum mechanics.

Evolutionary stories about brain wiring help physics students cope with the anxiety. A common physics meme is a story about how a caveman didn't need to see the elements of a tiger that are in superposition in order to escape the tiger.

Despite all this, in my fieldwork I often heard physicists describe superposition as a state of being in "two places at once." Some physicists found this kind of language to be more acceptable than others did. For some, it was just

shorthand, and for others it was terribly misleading. For still others, "two places at once" seemed to mean electrons really do go into "two places at once" when they are in superposition. However, as UC Santa Cruz physicist Tom Banks always told me, "You will *never* find an electron in two places at once!"

Tom Banks also once calculated for me the probability that a centimeter cubed block of material would under normal circumstances go into a superposition of states, say for example, on either side of a thin sheet of glass. We need to calculate the probability this event would happen in a given period of time. The probability of this event is so low that it does not matter whether you measure it in the time scale of Planck units (infinitesimal, quantized chunks of time) or units of the age of the universe, you will still get approximately the same probability. It is to be expected, according to Bank's math, that we would have to wait an exponential number of lengths of the age of the universe for such an event to occur.

The spiritual transformation QC scientists seek is a movement from the Newtonian Worldview to the New (quantum) Paradigm. Therefore, understanding the nature of QC spirituality requires comprehension of some of these basic issues of quantum foundations, including concepts like superposition and intrinsic probability. We shall see in Chapter 2 why physicists like Tom Banks feel justified in leaving questions of consciousness to neuroscientists precisely because the philosophical implications of superposition and intrinsic probability do not enter human experience except in the special case of the quantum experiment. On the other hand, QC scientists take issue with the self-concept of "mainstream scientists" (perhaps like

Banks) who understand that their own subjectivity is primarily a consequence of a deterministic brain biology, because such a self-conception is based on Newtonian assumptions. The debate between QC and the mainstream about what kind of scientific theory should ground our understanding of consciousness, an issue that will weigh heavily on our understanding of the nature of science itself, since our understanding of consciousness informs our epistemology.

Furthermore, QC scientists point out that our understanding of consciousness is not simply theorized but also lived; it colors our self-conceptions. As we shall see, especially in Chapters 3 and 4, QC scientists are motivated to do what they do not only because they believe the Newtonian worldview is not adequate, but also because they believe that the Newtonian Worldview is not livable. By eliminating or downplaying the importance of mind in society and nature, the Newtonian worldview gives rise to so many social and psychological woes including climate change, economic disparity, and depression.¹¹ Seeking a “New Paradigm” is a quest to rectify these problems.

¹¹ The narrative of the Newtonian Worldview is flexible and formal enough to encompass different political, secular and religious viewpoints. While most QC scientists are center-liberals to progressives, a sizable minority are conservatives or libertarians. Hence, for example, the “Newtonian Worldview” may as well refer to a liberal nanny-state or “socialism,” with the New Paradigm referring to a coming free-market utopia. It follows that the Newtonian Worldview narrative obscures political (and religious) differences among QC scientists and provides a sense of solidarity against the “mainstream.” There is a tacit agreement among QC scientists not to discuss politics, since politics is “not scientific.” A kind of Marxist analysis might point out that QC is a perfect example of an ideological discourse, insofar as political struggles are displaced into a scientific discursive sphere, in hopes that those struggles might be resolved with the kind of certainty held to be characteristic of science, and especially physics. As with any ideology, the result is that the potential for explicit political struggle and opposition is muted (e.g. Balibar 1995: 43-46). This kind of Marxist analysis often appeared in my mind as I did fieldwork, but it is not ultimately the analytical direction my dissertation takes.

Who Speaks for the Quantum Revolution?

QC scientists understand themselves as continuing what may be called a scientific revolution in their effort to create a New Paradigm. I hinted at, but did not yet fully explain how QC scientists see themselves as the rightful inheritors of the quantum revolution and the “paradigm shift” that took place in Europe in the 1920’s. The leaders of that revolution, including Niels Bohr, Werner Heisenberg, and Wolfgang Pauli, often referred to "the observer" and sometimes "consciousness" in their formulation of the interpretation of quantum physics.¹² Physicists explain “interpretation of quantum mechanics” as involving two inextricable elements: the interpretation of the mathematical formalism of quantum physics, and the interpretation of the experiment as a whole. It therefore becomes difficult to clearly demarcate quantum interpretation from philosophy, and from quantum consciousness. Early quantum luminaries including Niels Bohr, Erwin Schrodinger, Werner Heisenberg, Wolfgang Pauli and Pascal Jordan did not shy away from articulating what they considered the widespread implications of quantum mechanics for philosophy, biology, psychology and linguistics (Holton 2001; Heilbron 2001). Speaking on Niels Bohr, historian Gerald Holton (2001: 271) writes, “Now one must confess that it is on first encounter curious, and at least for a professional physicist perhaps a little shocking, to find that the father of complementarity principle [Bohr], in these passages and others, should frequently have gone so far afield, by the

¹² Of course, much history has been written on the early history of quantum physics interpretations. Some of the works that have informed my analysis include Holton 2001; Heilbron 2001; Cushing 1994; Barad 2006; Miller 2009; Carson 2010; Kumar 2011.

standards of the scientific profession, in illustrating and extending what he took to be the full power of the complementarity point of view.” Bohr’s declarations of the widespread implications of quantum physics are not unlike those of QC scientists, but obviously most scientists do not see Bohr in the same light as QC scientists of today. Yet QC scientists do; for them Bohr and other quantum revolutionaries were luminaries who saw the profound consequences of quantum physics, and it is to the discredit of later physicists to give up on following these consequences to their end. Therefore, from within QC’s way of seeing the world, the seminal quantum physicists are in some sense (if anachronistically) QC scientists, while “mainstream scientists” are not.

In books, during lecture, and in conversation, QC scientists quote the founders’ comments on quantum physics, including Bohr’s famous statement, “Those who are not shocked when they first come across quantum theory cannot possibly have understood it.” The statement is read to portend the exquisitely deep mystery of the mind-matter connection to be solved at some unforeseeable future. We shall see in Chapter 3 this is a future so impossible that it takes on eschatological proportions in the sense that it connects questions of time and the limits of futurity to questions of the nature and rectitude of the soul, or in this case, of “consciousness.” QC scientists weave historical fact with millennial expectations of the coming New Paradigm, as they position themselves as the rightful inheritors of the tradition of the quantum revolution.

The lore QC scientists tell helps explain why quantum consciousness is

something separate from the specialized subfield of quantum foundations, and becomes imbricated in other disciplines and sub-disciplines, especially consciousness studies, philosophy of mind and neuroscience. The “QC-like” aspects of the thought of seminal quantum physicists like Bohr are threaded throughout their considerations of quantum foundations in general. Yet as quantum foundations became its own specialized subfield in the 1970’s and ‘80’s, QC became something different and separate, namely, the distinct effort to elaborate to other disciplines its view on the universal implications of living in a quantum universe. QC refuses to be specialized, and it refuses that the implications of quantum physics remain sequestered to the field of physics. QC is a discourse on why all scientists must accept and begin to elaborate the radical philosophical implications of quantum physics. Hence, QC never becomes its own reproductive discipline, but reproduces itself through relations of concepts and traffic of people between disciplines.

John von Neumann is a major QC hero. He was an eminent mathematician who made major contributions to a variety of fields including physics, mathematics, and computation. His *Mathematical Foundations of Quantum Mechanics* (1932) was the first full mathematical exposition of the quantum theory. In it, von Neumann argues that consciousness (a better translation might be the ego or the “I”) can be recognized as responsible for the collapse of the wave function (von Neumann 1955: 421). In a particular reading of this argument, expounded most famously by physicist Eugene Wigner (1961), consciousness, being non-physical, must cause the transition from superposition of states (which cannot be experienced) to a single state (which is

always the observed result). For von Neumann, the collapse is a real and irreversible transition that is not governed by the dynamical equation of quantum physics. This means that von Neumann's quantum physics affirmed "something else" (a secondary postulate) necessary for the complete exposition of the quantum formalism. There are physicists who continue to follow von Neumann, notably Henry Stapp. A theoretical physicist at Lawrence Berkeley National Laboratory, Stapp is a leader in the QC world. Unlike the majority of QC scientists, Stapp receives regular recognition from other physicists in the reproductive discipline of quantum foundations. Many major publications on quantum foundations give at least brief mention of the "Stapp interpretation." For von Neumann in 1932, and Stapp today, quantum consciousness coalesces with quantum physics interpretation more generally.

QC scientists read the philosophical publications of the founders of quantum mechanics as part of QC history.¹³ Of course, QC scientists rarely say, "Werner Heisenberg is part of QC history." Rather, his name and others read as validation of contemporary QC research and the need to incorporate a theory of consciousness into physical science. A tradition of QC is discursively produced in the continuum between statements and writings of the quantum founders and modern QC scientists. The narration of this tradition often goes along with the sentiment that most contemporary physicists do not bother to think about the philosophical implications of quantum mechanics as the founders did, and therefore miss the revolutionary

¹³ Such books include Niels Bohr's *Atomic Physics and Human Knowledge* (2010), Wolfgang Pauli's *Writings on Physics and Philosophy* (1994), Erwin Schrodinger's *What is Life?* (1992) and Werner Heisenberg's (1999) *Physics and Philosophy*.

importance of quantum physics, not only in the domain of physics, but universally in science and society as a whole.

Implications of Quantum Mechanics

When doing fieldwork with physicists, one must get used to having one's speech corrected. When I first met Stan Klein in his office in the Vision Science Department at University of California Berkeley, he corrected me when I said my research project was about "quantum interpretations." He said it was not, and suggested that I say my project is about "quantum physics *implications*" rather than "quantum physics *interpretations*." This distinction, as I explain below, helped me get into the physics world and learn to eventually be taken seriously by the physicists I intended to work with and study. Klein received his PhD in theoretical physics at Caltech before switching to a career in neuroscience. I sought out Klein because I knew that he had a first-hand experience of the disciplinary worlds of both physics and neuroscience. He is not dismissive of quantum consciousness ideas, but sometimes he states that quantum physics and consciousness have nothing to do with each other.

I started my fieldwork in 2010 by meeting with physicists to learn how to converse with them about quantum physics interpretations. Initially, many of these physicists immediately recognized me as unfit to be initiated into physics. I had not majored in physics and had not taken requisite math such as linear algebra or differential equations as an undergraduate. A few physicists refused to talk to me, but

more often they just frankly expressed their doubts in my ability to study the various interpretations of quantum mechanics and especially the consciousness interpretation. On the other hand, the more I emphasized that I planned to study "weirdoes" and "fringe scientists", the more they saw potential in me as an anthropologist.

Unhappy with my first attempts, I came to Klein to ask for advice on how to better present my project to physicists. He suggested the reason I was getting puzzled looks from physicists was that I was telling them I wanted to study quantum physics "interpretations," but also that I had no training in physics. Quantum physics interpretation is a specialized discipline that requires knowing how to elaborate the mathematical implications of the quantum mechanical formalism and apply it to experimental procedures. In short, quantum physics interpretation requires a mathematical and technical know-how that I did not have (and still do not, for the most part). Hence, when I told physicists I wanted to study quantum physics interpretations, they were puzzled at how I would do this given my lack of expertise. It was as if studying anthropology of quantum interpretations was inseparable from studying quantum interpretation as a physicist.

But Klein surmised that if I told physicists I study quantum physics implications, this would open up a new space for conversation. "Implications" is a word that is not overdetermined with meaning for physicists, and therefore when they heard this word they would not assume they already knew what I meant, and they would want to know more, rather than feel the need to assert their disciplinary authority. I soon learned that Klein is also interested in what he calls quantum physics

implications (he was already something of an expert at what he suggested that I am studying). For him, “implications” concern how quantum physics can provide concepts for thinking about the relationship between science and religion. As I came to know Stan better over a few years, I also learned that the line between “interpretation” and “implication” is not always so stark, even for him. In his talks at conferences, for example, he would often explain that there are 10 or 12 interpretations of quantum mechanics, and then add "and I've got another, which is God.”

In April 2012, Klein and I met in Berkeley after we both attended the “Toward a Science of Consciousness” conference in Tucson, Arizona.

In his usual inquisitive way, Klein said, “So why don’t I interview *you*?”

“Okay, go for it,” I said.

“So you went to the [Towards a Science of Consciousness] Tucson meeting [run by Stuart Hameroff, mentioned above]. So what did you make of [it]? There are more physicists that attend than biologists or psychologists. *Why?*” Klein must know better than me. He received a PhD. in physics at Caltech before moving on to a long career in the study of vision and consciousness.

“Hmm. That’s not the kind of question I was looking to answer. Let me think...” I said.

“Why is there a *culture*?” the professor helped me along. “I thought anthropologists do culture. There is something about the culture of physics that makes people open to things like...”

“To things like this?” I interjected, pointing to the book I brought, which was now lying on the desk. The book was *The God Theory* (2006) by astrophysicist Bernie Haisch, a Stanford Ph.D. and retired research staff at Lockheed Martin.

“Yes, to things like this,” Klein nodded at the book. “Whereas the culture of biology doesn’t much.” *The God Theory* is part of the growing popular science literature on physics and religion. In this book and its sequel, *The Purpose Guided Universe* (2010), Haisch argues that the existence of God can explain certain difficulties within modern theoretical physics. God, Haisch says, is a more parsimonious theory than the multi-verse hypothesized by modern cosmologists like Leonard Susskind (a well known physicist at Stanford).

Stan Klein speaks excitedly of interpretations of quantum physics, as if they could be collected into a bag. That way the interpretations are ready to hand anytime it is necessary to demonstrate the absurdity of the universe. And there is good reason to do so: the debates between science and religion are too polemical, and Klein thinks quantum interpretation can inject a dose of humility. Scientists especially are not humble enough about the limitations of their knowledge, Klein says. Teaching scientists about the interpretation of quantum mechanics is a lesson in humbleness, because there are so many interpretations all of which explain the exact same experimental data. In other words, empiricism cannot give criteria that could decide between the interpretations.

Then Klein began to discuss another book, *The Quantum Enigma: Physics Encounters Consciousness* (2011), by Bruce Rosenblum and Fred Kuttner, both

physicists of the University of California Santa Cruz. Klein and I both knew Rosenblum and Kuttner well. Klein was an old friend, and I had done fieldwork with them (see Chapter 2). “Bruce and Fred have ten interpretations.” Klein tells me. Rosenblum and Kuttner’s *Quantum Enigma* listed these ten interpretations.¹⁴ In detailing the ten interpretations, Rosenblum and Kuttner, like Klein, intended to demonstrate how quantum physics has inspired physicists to come up with wildly divergent viewpoints on the nature of the universe, all of which nevertheless conform to the same very precise empirically validated predictions. Different interpretations emphasize different themes and aspects. The Copenhagen interpretation, for example, emphasizes epistemology and issues of language, including especially what one can and cannot say about a quantum system. The Many Worlds Interpretation emphasizes the unimaginably high number of universes that must exist given a particular way of reading quantum mathematical formalism. Physicist David Bohm’s interpretation seeks to restore determinism and reality to quantum physics, which requires the postulation of a nonlocal but real “implicate order.” And so on.¹⁵ It is not so important here that the reader understands exactly what each of these interpretations might mean, but rather that each interpretation seeks to conform to a

¹⁴ Rosenblum, Bruce, and Fred Kutter (2006, 2nd ed. 2011) *The Quantum Enigma: Physics Encounters Consciousness*, Oxford: Oxford University Press.

¹⁵ A layperson’s introduction to each of these interpretations and more is available in Rosenblum and Kutter’s *The Quantum Enigma* (2nd e.d, 2011: 203-221). Seminal technical papers for the early influential interpretations of quantum physics, including Copenhagen, Many Worlds, and Bohm, are compiled in *Quantum Theory and Measurement* (1983), ed. Wheeler and Zurek. A parade of new interpretations have come into being since Wheeler and Zurek’s book, but as Schlosshauer (2011:ix) states, there has yet to be a new scholarly overview of quantum interpretations for several decades. “A complete, up-to-date account of the field [...] is arguably lacking.” Newer interpretations include Robert Griffith’s (2003) “consistent histories,” Christopher Fuchs’ (2010) “quantum bayesianism” and Carlo Rovelli’s (1996) “relational interpretation.”

different set of concerns and values regarding what a good interpretation of quantum physics might be.

Klein goes on: “I add two or three more. I read a thing about Feynman...” Richard Feynman is Klein’s science hero, and Klein co-authored a paper with Feynman in the 1960’s. Klein was glad to read to a recent article that argued Feynman had his own distinct interpretation of quantum physics.¹⁶ Plus, that would be another interpretation to add to the list. The line between “implications” and “interpretations” gets fuzzy sometimes. Klein listed his “two or three” more interpretations: “[Feynman] might have had a different way to think about the waves and the particles, he actually thought both had reality. I don’t understand. But the other one is consciousness can do the collapse [of the wave function¹⁷], that there could be [...] maybe some type of Hinduism. [...] And the twelfth is God.”

“So what’s the difference between God and consciousness?” I ask.

“Oh, God has got a little bit more savvy,” says Klein with some mischief in his voice, “Consciousness is like a field. I don’t know. Consciousness is kind of vague.”

This doesn't sound much like physics to me, although I did use physics terminology when I asked Klein, “If some of these people are trying to make the claim that there is a universal [God-] consciousness, then the problem comes up, why isn’t God always looking at everything, and collapsing everything all the time? Why

¹⁶ The article was H. Dieter Zeh’s (2011) “Feynman’s Interpretation of Quantum Theory.”

¹⁷ Using the word “collapse,” Klein is referring to the measurement problem, which is a main topic of quantum interpretation. The measurement problem concerns the nature of the transition described by quantum mechanics from amplitudes (which can contain superposition states) to probabilities to an actuality observed. The measurement problem is discussed in detail in Chapter 2.

does the collapse of the wave function take a human to come along and make the observation?”

“That’s what God wanted. That’s how God designed it,” he answers. He is not so much telling me what he thinks as he is explaining the logic of someone else, like an anthropologist might do. “God is busy doing other things...”

“But that doesn’t make any sense!” I protest.

“Whoa! Whoa!” he objects. His eyebrows furrow and he winces. I had crossed a line. Klein explained: “You realize once 1925 arrived, and this is Feynman now, *nothing makes sense!*” He paused, then emphasized. “This is *Feynman* now,” meaning, pay heed young man. I had broken Feynman’s command, heeded by Klein and other physicists too. That’s when I learned the lesson of humility. In *The Character of Physical Law*, Feynman (1965) famously explained quantum mechanics to his lay audience as follows, “I am going to tell you what nature behaves like. If you will simply admit that maybe she does behave like this, you will find her a delightful, entrancing thing. Do not keep saying to yourself, if you can possibly avoid it, ‘But how can it be like that?’ because you will get ‘*down the drain, into a blind alley from which no one has yet escaped.*’ Nobody knows how it [quantum mechanics] can be like that” (1965: 129, my emphasis).

And Klein repeated, channeling his hero, to make sure I was properly struck: “*Nothing makes sense!* Physics, naturalism, no! [...] Classical mechanics, the whole logic of the olden days doesn’t work anymore. None of the ten interpretations [of quantum mechanics] that they [Rosenblum and Kuttner, *The Quantum Enigma*

authors] have in their book make any sense. And now we are getting to the anthropology. Why are physicists tolerant of things not making sense?"

In "Cognitive Repression in Contemporary Physics," Evelyn Fox Keller (1979) argues that the various interpretations of quantum mechanics are each defense mechanisms against the trauma quantum mechanics makes to the physicists' classical (or "Newtonian") worldview.¹⁸ Her psychoanalytic argument suggests that physicists have for the most part failed to articulate the full consequences of quantum physics for how scientists should understand objectivity and epistemology. Perhaps a good definition for the difference between quantum interpretation and quantum implications is that discourses on quantum implications incorporate the problem that many wildly different interpretations of quantum mechanics exist, and tries to account for this divergence of views. Meanwhile, quantum interpretation tries to provide *the* correct interpretation of quantum mechanics, to the exclusion of the others, and as a result remains technical in its discourse. In a similar spirit, Stanley Klein suggests that

¹⁸ Keller (1979: 718) writes, "Today, seventy years after the Newtonian world view received its first jolts, profound confusion remains about the implications of the revolution initiated [...] by quantum mechanics." Although there have been significant developments in the field of quantum foundations, wide divisions persist among physicists on how to interpret quantum physics (for a review cf. Schlosshauer 2011). Keller's argument is not too far off from the kind made by QC scientists, even though QC scientists are likely to take their argument in a different direction from a similar basis. In fact, the game of interpreting quantum physics can be a kind of "Rorschach Test"; Keller, the feminist philosopher, draws feminist implications from quantum physics (see also Barad 2006), while QC scientists draw implications that are congruent with the Western metaphysical and spiritualist traditions (c.f. Hanegraaff 1997; Kaiser 2011). Many other examples abound, including among non-physicists. Implications of quantum physics, explicated by NIH director and geneticist Francis Collins' Evangelical Christian reading in his *The Language of God* (2006), the Dalai Lama's Buddhist reading in *The New Physics and Cosmology: Conversations with the Dalai Lama* (2004, ed. Arthur Zajonc), and philosopher Slavoj Žižek's Hegelian-Lacanian reading in *Less than Nothing* (2012) are a few other example that show how people can see in quantum mechanics as confirming their own complex philosophical worldview. Further, no one is unaware of this problem; the capacity for quantum mechanics to give rise to a proliferation of interpretations, worldviews, and theories, is recognized by everyone involved as part of the challenge of interpreting quantum mechanics.

the various interpretations of quantum mechanics are intended to make quantum physics “make sense,” whereas the “implication” of quantum physics is that “quantum physics doesn’t make any sense,” by which Klein means consensus seems unachievable, hence the various divergent interpretations.

I have provided a number of definitions of QC in this introduction. It is a research program, a spiritual endeavor, in a network of individuals that crisscrosses various institutional boundaries, and a quest for an answer to a specific question (“where does consciousness come from?”). Most broadly, perhaps, we may say QC is an effort to discover the implications of quantum physics. This very open definition would make many very differently situated people, from science historian and feminist philosopher Evelyn Fox Keller to NIH director and Evangelical Christian Francis Collins, all people who engage in quantum consciousness. Although that definition extends far beyond what I have in mind when I refer to QC, and despite the fact that neither Keller nor Collins would self-identify as “quantum consciousness” people, I nevertheless believe there is truth in such a definition. Like Courtney Bender’s (2010) “metaphysical spirituality,” the boundaries of QC are difficult to determine institutionally or ideologically. In the following section, I introduce a limiting case of QC along with theoretical considerations that can help us understand the motivations behind QC research.

Doing the impossible

Let’s recall Feynman’s famous statement quoted above: “I am going to tell

you what nature behaves like. If you will simply admit that maybe she does behave like this, you will find her a delightful, entrancing thing. Do not keep saying to yourself, if you can possibly avoid it, ‘But how can it be like that?’ because you will get ‘down the drain,’ into a blind alley from which no one has yet escaped. Nobody knows how it [quantum mechanics] can be like that” (Feynman 1965: 129).

For better or worse, this dissertation is about QC scientists, who do go straight “down the drain” and into the “blind alley.” Feynman’s quote is a good indication of what opinion many physicists might have of what QC scientists are doing. In contrast, QC scientists experience the trip down the drain leading not to the sewer, but the much more enchanting domain of universal consciousness, much as Alice’s trip down the rabbit hole leads to the mysteries of Wonderland. Mainstream scientists and QC scientists will both recognize QC as a science that deals with *metaphysics*, but the two sides value metaphysics differently. In fact, the contest between QC and the mainstream is in part a question of the meaning and implications of metaphysics, and furthermore, what may be called the metaphysical tradition as it pertains to science. Only if space for metaphysics can be made within science will it be possible to well conceive quantum consciousness, the object of study of my dissertation. Otherwise, QC really does just appear as something gone “down the drain,” as it does to many dissenting physicists. So the task at hand is to understand what kind of metaphysics QC scientists perform, and why they believe it to be valuable.

There is a lot going against us in fleshing out this possibility of articulating just the right meaning of metaphysics in QC’s present time and place. Shapin and

Schaffer (1985), for example, have showed how even for Robert Boyle, metaphysics had taken on a negative meaning in science, referring to whatever is opposed to the empirical demonstrations of the laboratory. In my fieldwork I met no shortage of scientists who understood scientific practice as precisely that which casts out metaphysics. That definition implies that science is the opposite of metaphysics, and it is so pervasive that QC scientists sometimes use the word in that sense just like any other scientist. What exactly, then, is the referent of this kind of metaphysics that must be cast out? Perhaps, for some it is Plato and Aristotle. But just as much or more, when scientists cast out “metaphysics” they cast out a living tradition that has a tenuous and embarrassingly close relationship with present day science. I am not talking about elite philosophy, but something more like the amorphous and popular “the New Age” tradition. Indeed, the popular American conception of “metaphysics,” described for example in Courtney Bender’s (2010) *The New Metaphysicals: Spirituality and the American Religious Imagination*, is clear proof to some scientists that metaphysics is a word whose meaning is not too far from “pseudoscience.” Although the word can have many meanings in the scientists’ lexicon, it cannot, in my experience, denote a higher authority than “physics,” as it implied for Aristotle, for example. This is self-evident for the scientists, even most of those who participate in QC. It is a self-evidence settled by the historical myth of the Scientific Revolution. Yet to understand quantum consciousness, we must recognize the living metaphysical tradition, typified by the pejorative term “New Age,” as an intimate aspect of the scientific tradition that is always cast out at the same time. Metaphysics is a double-

edged sword and a source of ambivalence for QC scientists. On one hand, metaphysics must be cast out of QC science as non-empirical and hence dubious knowledge. At the same time, QC scientists passionately seek out a kind of metaphysics that carries an equal authority to science. For this reason, and with paradoxical results, QC scientists seek out a metaphysics that comes from empirical evidence itself, in other words, a kind of empirical demonstration that is so astonishing, onlookers can then be persuaded to “change worldviews.” Such an effect could only be described as the coalescence of experiment and miracle: an experiment whose results are so impossible that it inspires a conversion in the minds and hearts of others (in this case other scientists).

I begin with an event that is archetypical of what the scientist fears and casts out when she casts out “metaphysics.” Stories like the one I am about to tell are clear evidence to scientists of the danger of “New Age” thought. Even QC scientists would agree this guy went “off the deep end.” Yet, I want to show that this story can be read as an example of QC, in the sense I defined it above. In this story, a twenty-something year old man tries to persuade others by demonstration that something impossible is in fact possible. The source of authority for his act is quantum physics, as he understood it from his readings of metaphysical literature. This example is the “limit” of QC because nearly everyone will have to admit it appears more as madness than spirituality (even if I have not yet fully defined those terms – such a definition will emerge from this story). Yet the young man persists in his belief that the act was inspired by spirituality. I would like to suggest that all QC research, no matter how

expert, has something of this double nature, appearing as madness to outsiders, and spirituality from the inside.

While I was conducting fieldwork in Berkeley, the twenty-something year old man attempted to jump through a glass window in Los Angeles. When I say “through,” I mean he wanted to go through the glass without breaking it. Two friends of mine explained to me that this man had articulated his act in the language of quantum mechanics. Even though I was not there when the man took his jump, I can surmise the many meanings that must have been packed in this word, “through.” At that moment, before the man was about to break the glass, and about to try something impossible, the man must have understood the word "through" as referring to a superposition of states, that property of a physical system described above as unique to quantum mechanics. A superposition of states is, surely, even more unimaginable than jumping through a sheet of glass. Recall from above the difficulties involved in describing using plain English an electron in a superposition state (this problem is described in more detail in Chapter 2). Nevertheless, the young man's avid readings of popular literature about quantum mechanics motivated him to become like an atom, and thereby take on its quantum mechanical powers.

Are we not made of atoms? To be made, to become, to transform into what we already are... It will not surprise the reader that the young man failed at his goal, and was taken to the emergency room. The man was in the hospital for about a year after his jump, and is now paralyzed from the waist down. His morphic impulses persist. He understands himself as a shaman and a shape shifter.

My friends were disturbed that the shaman had attempted his feat, and they were reluctant to give me his contact information. After all, how might the young man react to hearing that an anthropologist wants to interview him about a failed attempt to do something everyone already knows is impossible? Perhaps it would not be incorrect to say that the young shaman identified with an atom, or rather that he thought he could become an atom. We might agree that he is made entirely of atoms, and yet maintain our certainty it is impossible for a man to become an atom.

My friends explained that the young shaman had been inspired by popular American spiritual practices and literature on quantum mechanics and consciousness, a literature that hails its consumers to attend to a hidden reality. Titles like “What the Bleep Do We Know?” (Arntz 2004), and *The Secret* (first a book, then a film, see Byrne 2006 and Heriot 2006) gained widespread popularity in the United States by explaining how consciousness creates reality through quantum physical processes. To be precise, the grammar of this media suggests that reality (read: everyday experience, common sense) is a secondary effect of a more fundamental reality composed of some combination of consciousness and subatomic physical processes. Many books making similar claims about quantum physics and consciousness are often filed in the “Metaphysics” sections of bookstores. Aristotle’s book of the same name, of course, is filed under “Philosophy.”

For many spiritual Americans, “metaphysics” is part of the discourse of the American spirituality industry (Roof 2001; Albanese 2007; Bender 2010). Like 19th-century versions of moralistic and “scientific” spirituality such as the New Thought

Movement, the contemporary metaphysical spirituality depends on concepts from physics. Much of the discourse of American “metaphysics” adds words and phrases from quantum physics to its vocabulary. In particular, “What the Bleep” and “The Secret” are part of a spiritual movement, and aligned spiritual industry, commonly referred to by members of that movement as “The Law of Attraction.” In San Francisco, Berkeley, Los Angeles, Irvine, and Tucson, I met spiritual seekers who believed in, were interested in, or defined their spirituality in relation to the Law of Attraction. The Agape International Spiritual Center, a New Thought-aligned megachurch in Culver City, California, with thousands of members, is a striking example of one of the sources of the Law of Attraction discourse today. This one “simple and fundamental law of the universe” teaches that positive thinking, along with a precisely crafted intention, can “manifest” a practitioner’s desire into a reality. As such, the Law of Attraction is a form of magic with historical roots in the 19th century New Thought movement in the United States: two connected moments in what Albanese (2007) calls “metaphysical religion.”

It is tempting to argue that the young man’s act was motivated by the “pseudoscientific” permutations of quantum spirituality, rather than in quantum physics itself. Is it not possible to say his act, if inspired by anything, was inspired by these misleading and irresponsible accounts of quantum physics? Perhaps. One of my friends suggested that there was an intense and obsessive quality to the young man’s interest in quantum spirituality. If this is so, the young man is not alone; I have met many others who become transfixed by the rules laid down by the universal Law

of Attraction, and similar metaphysical spiritualities. Coming under conviction of the Law of Attraction is not unlike coming under the conviction of an evangelical preacher. *The Secret* (Byrne 2006), which this young man read so avidly, subjects the reader to a totalizing moral economy of action and reaction. It refuses the categorical distinction between metaphor and fact that is necessary to make science-inspired spirituality palatable to the majority of scientists. At the same time, the magic effect that the Law of Attraction exerts on the person who learns it, depends on personal histories as well as what other discourses the law of attraction is read alongside.¹⁹

Although there is some truth in the claim that the shaman's act was motivated by "pseudoscience" rather than real quantum physics, that argument cannot fully

¹⁹ To cite a few examples, one middle-aged woman in Berkeley came to read the law of attraction as an explanation for her chronic autoimmune disease: she came to believe that she brought the disease upon herself by sending negative messages to the universe. She was distrustful of biomedicine, in part due to her readings of alternative medicine literature. Following the Law of Attraction, she sought to solve her problems by "staying positive" and banishing negative thoughts from her mind. On the other hand, a young male undergraduate from UCSC criticized such punitive readings of the Law of Attraction. He drew on the teaching of his Pentecostal uncle to read the Law of Attraction as a set of guidelines for finding the divine inner self.

While many readings of *The Secret* are possible, it would be difficult to disentangle it from a logic of spiritual capitalism wherein financial gain and material well-being distributed according to a cosmic hierarchy. In Byrne's (2006) *The Secret*, mind and matter are sewn into such a tight braid that moral order becomes homogenous with the Laws of Nature. *The Secret* mixes up nature and culture, but it cannot be said to "play" on the ambiguity of between these two domains, because play presumes some ironic distance. Instead, *The Secret* has a unique way of collapsing the ambiguities of language into moral literalism. For example, it explains, "Your thoughts determine your frequency, and your feelings tell you immediately what frequency you are on. When you feel bad, you are on the frequency of drawing more bad things. When you feel good, you are powerfully attracting more good things to you" (43). As a result, followers of *The Secret* can develop a psychic pressure to feel good and repress negative feelings. After all, "It is impossible to feel bad and the same time have good thoughts" (43). The book's indefinite sliding between health (feeling happy, healthy or feeling sad, sick) and morality (being a bad person or a good person) often results in individuals feeling that they are responsible and blameworthy for their own sickness or depression. Many physicists recognize such speech as pseudoscience because it calls to be read according to the norms of reading a factual (scientific) statement. *The Secret* mixes explanatory-causal and poetic-metaphorical registers of speech. Reading with the text, it is as an *explanation* of the "absolute" causal laws between psychology and matter. Reading against it, it is a mockery of science.

account for the problem at hand. The shaman seems to have done something that goes beyond simply having an idea that is incorrect. Although the shaman was clearly “wrong” about his bodily capabilities, it would be equally absurd to think that he could have been stopped in his action if some one were to merely correct his understanding of quantum physics. To imagine trying this is grimly comical: “Now you see, you cannot jump through glass windows, let me teach you the physics so you will be convinced of it...”

I pose this strange fictional response to the shaman to highlight a problem that will course through this dissertation about quantum consciousness. There are two levels at which it is possible for “things to not make sense.” First, there is the empirical level, where it is possible to judge the shaman’s statements and actions according to prior empirical knowledge. Such judgments can determine the correctness of the shaman’s statements, such as whether they are pseudoscientific or scientific, and so on. Categorical judgments like these are made according to criteria recognized as established by empirical knowledge. Yet we hardly need to suppose that empirical knowledge about quantum mechanics is needed to convince most of us that one should not jump through windows. Hence, the shaman’s act is not simply a refusal of empirical knowledge. It cannot be corrected by further empirical explication. The shaman refuses the more amorphous sort of knowledge called “common sense,” and he does so in the name of quantum mechanics.

This is all quite complicated to untangle, because common sense includes not only empirical knowledge about everyday experience, but also expectations about the

meanings of phrases, including the phrase “jump through a glass window.” Common knowledge about the nature of windows should be enough to stop the shaman.

However, the shaman’s act speaks of a stubborn refusal to be governed by the expectations surrounding meaning of a simple sentence, such as “jumping through a glass window.” In fact, for the shaman, quantum mechanics became an interpretative tool that allowed him to doubt the obvious meaning of phrases and conjure new expectations. “Jumping through a glass window” became a new sort of act that pointed toward a domain more fundamental than the common reality that everybody already knows about windows: the “hidden” reality of quantum physics.

With an attention to the level of language that governs the expectation of meanings of even the simplest statements, that quantum “drain” Feynman warned of might begin to unfold into a metaphysics that is adequate to QC. I would like to point out that even Feynman concurs that the drain is in some way a consequence of quantum physics itself, and not extraneous to quantum physics. It results from the simple, innocent question, “How can it be like that?” Going down the drain is to ask, “In what way is this drain a consequence of quantum physics itself and not extraneous?” Things get loopy. Ludwig Wittgenstein (2005), in his terrible worries about certainty and doubt, worried about similar problems. He doubted his hands like the shaman doubted the meaning of a glass window. The philosopher says, “Having two hands is as certain as anything I can produce as evidence for it. That is why I am not in a position to use the actual sight of my hands as the evidence for my two

hands.”²⁰ Such communication constitutes a fact that appears before us, garnering a frame for our interpretative abilities. In contrast, quantum physics seems to challenge our frame of interpretive abilities. There is no challenge to our interpretive ability when we ask whether two comprehensible alternatives are adequate to a situation (“Is it sunny or raining outside?”). For Wittgenstein, the opposite of certainty of this empirical kind is *doubt* (“I’m not sure what the weather is...”) Instructively, and in contrast, Wittgenstein tells us that the opposite of certainty where there are no grounds for doubt is *madness*. Who can admit the quantum shaman is not mad, or as we say today, mentally ill? Yet my anthropological task is to open this madness, and ask how quantum mechanics might become something, for some, that makes possible a doubt that is so general, so universal, that there is no ground for it. It is there that QC cultivates its spirituality. QC scientists seek to transform the self within that universal kind of doubt that has no ground, and at the same time refrain from the attribution of madness or insanity, just as the quantum shaman wanted to do.

The scientist has an ethical obligation to doubt, and to doubt reasonably. Yet recall what happened to Rene Descartes (1906) in the *Six Meditations*, when he set out to doubt on reasonable grounds everything he knew. Very soon in the course of his meditation, he was confronted by an evil demon, and he then saw himself as nothing more than pure thought, with no body, plagued by illusions of fancy. He was confronted by the kind of thought whose modern analogue is the worry, spurred on by

²⁰ *The Wittgenstein Reader*, ed. Sir Anthony Kenny. Hoboken, NJ: Wiley Blackwell. The passage (p. 257) continues: “But it isn't just that I believe in this way that I have two hands, but that every reasonable person does. If someone said he doubted the existence of his hands and kept looking at them from all sides to make sure this wasn't all done by mirrors we would not call this doubting. If someone said to me that he doubted whether he had a body I would take him to be a halfwit.”

a kind of philosophy typical of empiricists, that I am only a “brain in a vat” (Gere 2004) whose experiences are all a sham. The implication of that would be that any sense of an outside world beyond consciousness is merely illusion. Here, confronted by a demon and plagued by doubts that all my experience is a hoax or a sham, is this a reasonable doubt, as Descartes had it, or is it kind of doubt that is insane? Perhaps it is, as Jacques Derrida (1978) suggests in his analysis of Descartes’ doubt, a kind of madness intrinsic to Descartes’ form of reason?

I argue that such anxieties have important effects in science and scientific culture. Certainty and doubt in “reality in general” has implications for how scientists relate to their knowledge, leading at times to anxiety over whether all this effort to produce some meaning out of scientific knowledge is really an impossible endeavor. Maybe all this effort is just so much madness, so much inanity. This is the worry that plagued the scientists I worked with, whether they were “QC” or “mainstream”: the suspicion that the meaning that threads together the whole of scientific knowledge (however it be defined) is ultimately spurious. Not the facts, mind you, but the meanings, the theories, the speculations, that whole web of efforts made to cohere the concrete elements called facts into some larger narrative connecting scientific pursuits to one’s lived experience.

Let us suppose that the ethical obligation to doubt all that is not empirically certain, which is analogous to an obligation to cast out metaphysics, gives rise to two inverse ways of seeing the world. On the one hand, there is a factual world that exists whether or not I exist. On the other hand, I might be a brain in a vat, with no access to

a reality beyond me. QC scientists, like other scientists, feel the obligation to doubt everything not verified by experiment. This, I will argue, leads to a new sort of anxiety and accompanying effort that expresses an impossible desire. This is a desire to demonstrate empirically that metaphysics is real. If one asks a QC scientist why the task of proving metaphysics to be real is so important, one will get a clear answer: the “Newtonian Worldview” has rendered consciousness obsolete, we no longer believe that consciousness is part of reality. Only a new metaphysics can cure us from our worry that our experience is “not real.” Of course, depending on how one defines metaphysics, the trouble with this goal of making a metaphysics that proves experience is “real” is that it is either strictly impossible or else it is indefinable. It is impossible if metaphysics is defined as that which is not empirically certain, and indefinable otherwise, since every critical thinker will be glad to ask you that unbearable question, “What do you mean by ‘real’”? To resolve all this, you might seek out an empirical demonstration that is at the same time a miracle, something like jumping through a glass window without breaking it. That would silence them.

Like the quantum shaman, QC scientists seek to gain access to such an antidote to doubt in the reality of the metaphysical through knowledge of quantum physics. This is why I see a connection between QC scientists and the quantum shaman. Even if the metaphysical should be limited to whatever is opposed to the empirical, metaphysics nevertheless grounds the subject of science and gives access to empirical knowledge. Metaphysics must be made real to save us from that overwhelming doubt that we are only a brain in a vat. QC scientists seek to find an

experiment that would irrefutably demonstrate that there is such a transcendental reality. That is to say, they seek to demonstrate empirically that something exists beyond the empirical.

QC's impossible pursuit of an empirical demonstration of the reality of metaphysics is manifested in the form of a quest for a scientific solution to the mind-matter problem. QC scientists' expect the success of this project to have an effect as astounding as that which the quantum shaman sought in jumping through a sheet of glass. In other words, QC scientists expect that the empirical demonstration of the connection between mind and matter will have the same kind of persuasive force among the community of scientists as the quantum shaman expected among his onlookers, were he to have succeeded. It is plain to see that the quantum shaman's goal to jump through glass without breaking it is both impossible and conceivable. It is precisely because it is conceivable that I can imagine I would undergo a kind of conversion were I to witness his success. The situation of QC science, I will argue, is analogous to the situation of the quantum shaman; their proposal is both impossible and conceivable. Hence, I do not think QC scientists are wrong in their expectation that an empirical solution to the mind body problem would have a persuasive and converting effect, but I do think that what they seek is strictly impossible.²¹ In the following chapters, I will describe and explore this overlapping of conceivability and impossibility as the basis of QC's spirituality.

²¹ I met one QC physicist who stated to me that QC would never find such an experiment. This physicist nevertheless felt that the effort to find such an experiment, and the community building and meaning making that goes along with it, is spiritually healthy. I still wonder how many QC scientists also half-secretly harbor such beliefs.

Chapter 2: Demarcation: When Physics Encounters Consciousness

“People are working very hard to build quantum computers, which will solve problems that ordinary computers can’t. One can imagine a sci-fi future in which this enterprise succeeds, and the quantum computer becomes self-aware, so that we can ask it whether it understands quantum physics intuitively. Its answer may very well be, “yes, but you’re too dumb for me to explain it to you”.

Email to me from physicist Tom Banks

Demarcation and subject constitution

Demarcation is generally understood as the problem of defining a category and distinguishing it from other categories. Scientists, along with philosophers, historians, and ethnographers, have long occupied themselves with the “demarcation problem” in science, which concerns separating science from other forms of knowledge. This chapter addresses the problem of demarcation in science as it emerges in an introductory quantum physics course intended for college students who are non-physics majors. Unlike most "physics for non-majors" courses, this course explicitly addressed consciousness as a relevant topic for quantum physics. Fred Kuttner and Bruce Rosenblum taught “Quantum Enigma: Physics Encounters Consciousness” at University of California Santa Cruz (UCSC) for the last time in Fall 2011. I audited the 2011 course, and conducted interviews with Kuttner, Rosenblum, and other faculty members, on the controversy that had surrounded the course since 2006. The controversy concerned whether or not consciousness was a proper topic to address in a physics course, and whether Rosenblum and Kuttner’s position on quantum physics was within the bounds of acceptable disagreement

among physicists or rather required departmental censure. The problem of translating technical physics concepts to non-experts revealed and put into play a set of issues about demarcation that I argue concern the constitution of the scientific subject.²²

This *constitutive demarcation* concerns a division between science and non-science that is not itself empirically based. In that sense, constitutive demarcation is not about how to classify science and not science; rather it concerns what sort of subjectivity one must attain to understand a given domain of empirical knowledge. We may speak of a *constitutive* demarcation insofar as efforts to separate science from non-science cannot themselves be (fully) grounded in any form of empirical knowledge; instead, constitutive demarcation is a matter of teaching a student to recognize a difference between science and non-science such that this difference appears to be part of the world itself, rather than an arbitrary matter of opinion. This process, I will show, is troubling to scientists because it requires some discussion of philosophy and metaphysics, which is not itself empirical, in order to establish the authority of empirical knowledge over and above non-empirical forms of knowledge. Yet the trouble does not stop there. Quantum mechanics in particular contains some features that offer specific problems as to the meaning and basis of empirical knowledge in physics.

²² My phrasing “constitution of the scientific subject” pertains to the question of what imperatives a subject must introject in order to be recognized by others in a scientific community. Such imperatives are not chosen; rather they appear to a subject. More paradoxically, as I show in this chapter, such imperatives *appear to speak*, hence imply an imbrication perception and language, as when someone says, “What are the facts telling us?” A *discourse* on scientific subject constitution, such as the ones studied in this chapter, attempts to parse out the sources of the imperatives that ground empirical knowledge, a task carried out weaving together concepts such as objective, subjective, physical, mental, biological, social, etc.

While discussions of the relation between quantum physics and consciousness may seem inward and esoteric to outsiders, I argue Bruce Rosenblum and Fred Kuttner's project to deliver a theory of scientific subject constitution, we will see, has a phatic function (Malinowski 1923; Jakobson 1980) – it attempts to establish the certitude of communication in a difficult territory, where quantum physics makes it “impossible to believe” what we are “forced to believe.” As we will see, such efforts are not only reflective, but also formative, of experience. Elaborating a language of constitutive demarcation plays a productive role in maintaining recognition of the self and others as scientific subjects, and hence authorized members of a community of speakers who may debate issues of quantum interpretation. Language about quantum mechanics can animate anxieties about the very possibility of orienting one's experience to the reality articulated by scientific concepts.

The “demarcation problem” is not only a problem for academics. Alongside scholarly work by analytic philosophers, historians and sociologists of science, authors of popular books, magazines, and editorials take their own turn at professing the “proper boundaries” of science. Self-professed “skeptics” find virtue in organizing committees, producing media, and publicly denouncing “pseudoscience” (Hess 1993). The “militant atheism” of personalities such as Richard Dawkins (2006) and Sam Harris (2004) make public spectacle of forceful and hubristic demarcation of science from religion. Meanwhile, many other scientists take a more conciliatory position (four different approaches to demarcation by scientists can be found in Gould 1999; Bala 2006; Collins 2006; Smolin 2006).

This chapter primarily engages with the arguments on demarcation made explicitly or implicitly by my ethnographic participants at UCSC. To begin however, I would like to compare my argument on demarcation with that of Thomas Gieryn (1983; 1999), who was first in explicitly addressing demarcation ethnographically. Gieryn recognizes the shifting boundaries between science and non-science, as well as the role apparently nonscientific actors play in the production of the boundary between science and non-science. He describes demarcation as a boundary-making practice conducted by scientists for the purpose of maintaining their authority, gaining access to resources, pursuing their careers, and maintaining autonomy from outside interference. This thesis has been amply demonstrated, and it will be partly corroborated by my own account. On the other hand, as mentioned above, my study of quantum pedagogy for non-physicists revealed another aspect of demarcation, a more liminal aspect that hit right up against the very possibility of communicating at all, to say nothing of trying to teach non-physicists about what counts as science and what does not.

For this reason, one of the main themes of this chapter is my doubt that demarcation in science can be fully externalized by an ethnographer as an empirical object. Social scientists who find that the empirically based distinctions of science and non-science made by natural scientists do not work cannot solve the problem by replacing a natural science-based distinction with a social science-based one, as Gieryn does for example. Science cannot be demarcated from other forms of knowledge by *any* form of empiricism. The impulse to obviate transcendental

philosophy or metaphysics in the name of empiricism will be thwarted by my ethnographic argument that some part of demarcation always remains transcendental, that is, based in knowledge that cannot be derived from experience²³. This implies also that there is something of demarcation that cannot be communicated reliably. I identify this element as a *mode of appearance*, to denote the way an imperative appears at the level of perception, “to speak,” as it were. As physicist Fred Kuttner put it, “I don't want you to believe something because I say so, but because the evidence says so!” How does evidence speak? Such a question implies a division between “facts” and the subject and suggests that “facts” have a communicative ability. Understanding how facts can speak requires metaphysical considerations that will form a ground to distinguish science from non-science.

The element of demarcation of science from non-science that cannot be empirically externalized gives rise to a *problematization* of scientific subjectivity, since scientists tend to be anxious about non-empirical knowledge, even when such knowledge is used to ground empirical knowledge. Problematization is not a practice, but an expression of a very specific uncertainty that emerges in relation to a practice. In Foucault's (1996: 421) definition, problematization allows a subject to obtain a singular form of freedom from a practice because the meaning of the practice has been rendered uncertain by a concrete historical situation. In our case, the concrete historical situation involved is the discovery of an irreducible uncertainty intrinsic to

²³ Which does not entail, in regard to Kant, that transcendental coordinates are not subject to historical change in expression, as argued by Foucault. Prior to Foucault, Carl Jung (1969) makes this point in *Archetypes and the Collective Unconscious* as well as in his letters to physicist Wolfgang Pauli (ed. Meier 2001). On “transcendental-historical” and “historical ontology” see Foucault's *Archeology of Knowledge* (1989) and “What is Enlightenment?” (2007), respectively.

quantum physical processes – an uncertainty whose actuality is understood to be ontological or real, rather than due to human ignorance or error. This situation gives rise to problematization of scientific subject constitution insofar as the postulate of ontological uncertainty has an important ramifications for any language that would guide experience toward a demarcation of subject from object, epistemology from ontology, and so on, so that one may gain certainty of what sort of thought is scientific thought.

The Quantum Enigma: Physics Encounters Consciousness

The University of California Santa Cruz's faculty Committee on Educational Policy gives guidelines for the "Scientific Inquiry" (SI) General Educational requirement for all UCSC students. According to university rules established by the committee, every student must take a designated SI course. SI courses are designed to familiarize students with the scientific method, defined as "observation, hypothesis, experimentation, and measurement" and to demonstrate the relevance of scientific method to "life outside the classroom." UCSC's SI course guidelines demarcate science by methodological criteria and imply normative implications of these criteria to "life." The general relevance (to "life") of the scientific method implies that demarcation of science is not only about separating domains (of science from religion and so on); rather demarcation more fundamentally concerns the transmission of an interpretive intuition whose *topos* is determined by the example of scientific method. Scientific method does not operate in the SI course as a universally applicable set of

rules even if it postures that way (Feyerabend 1993); rather, it is a paradigm to be followed by example (Kuhn 1962; Agamben 2009). Hence, its “boundary” is indeterminate and its potential applicability is infinite.

Bruce Rosenblum and Fred Kuttner developed Physics 2, “The Quantum Enigma: Physics Encounters Consciousness” as an SI course at UCSC. The course was very popular and received many exuberant course reviews from students over the years. Rosenblum started to teach "Quantum Enigma" in 1988, when the department chair told him it was his turn to teach the physics course for non-majors. Rosenblum developed an SI course that considered scientific method in light of the interpretation of quantum mechanics.²⁴

Rosenblum and Kuttner taught the course without interference until 2006, when they published a book with Oxford University Press based on the course material. *Quantum Enigma: Physics Encounters Consciousness* (2006), sold very well, Rosenblum says, and an updated, second edition was printed in 2011. After the first publication of the book, however, emeritus faculty member Michael Nauenberg read it and then inquired into the course content of Physics 2, "Quantum Enigma." He found the course content, like the book, to be objectionable. In an interview with me, he argued the book contains mistakes in its presentation of physics concepts, and is

²⁴ Rosenblum and Kuttner both described themselves as having an inside-outside relationship to academic physics, and they were both of the opinion that this amphibious status give them the mental freedom necessary to think about consciousness and "quantum mysteries." Rosenblum worked at RCA for nearly 10 years before taking a position as professor at UC Santa Cruz in 1966. He referred to himself as a company man and achieved the position of director of general research at RCA before coming to UCSC. Kuttner received his PhD at UC Santa Cruz, then left in order to obtain a MBA. He worked in business for 10 years before returning as a lecturer at UC Santa Cruz. More recently, he received an MFT and now practices clinical psychology in North Carolina.

deceptive in its discussion of consciousness in relation to physics. Over tea, Nauenberg expressed his exasperation over the whole controversy that then ensued: why hadn't Rosenblum, his long time colleague, or Kuttner, his former student, asked Nauenberg for feedback prior to publication? How had Rosenblum and Kuttner been teaching Physics 2: Quantum Enigma for so long without anyone noticing its controversial central claim that in quantum mechanics, "physics encounters consciousness"? For Nauenberg, this was a cause for alarm. "I had trouble going to sleep," he said, "Usually when I can't sleep about something I get up in the middle of the morning and I go to my computer and I start typing." So he typed up a critique of *Quantum Enigma* (2006) that was published in *Foundations of Physics* (Nauenberg 2007).²⁵ Kuttner supplied a rebuttal in the same journal a few months later (Kuttner 2007). Meanwhile, Nauenberg took the issue to department faculty meetings, and a controversy ensued in the department over whether the course should be continued.

By early 2008, a subcommittee of four faculty members was formed to investigate the appropriateness of the course for the SI requirement and whether it was properly representative of the physics department. In May 2008, the committee, led by faculty member Tom Banks, presented its findings at a department faculty meeting. The committee's recommendation was for the physics department to standardize the Physics 2 curriculum to better reflect the consensus of the department, and further, to begin dispersing responsibility for teaching Physics 2 more evenly

²⁵ Recall from Chapter 1 that there is some overlap between the mainstream discipline of quantum foundations and the spiritual science of quantum consciousness. Nauenberg's criticism of Rosenblum and Kuttner's book, made in a top quantum foundations journal, and Kuttner's reply, manifested some of the boundary work (Gieryn 1983; 1999) between quantum consciousness and quantum foundations.

among the faculty²⁶. Upon hearing this recommendation, Rosenblum took the issue to UCSC's Committee on Academic Freedom. The current Chair of the Physics Department allowed Kuttner to teach the course another quarter while the controversy continued, despite Nauenberg's objections that such action was in violation of the quantum enigma subcommittee's recommendation. The Dean of Natural Sciences ultimately backed Rosenblum and Kuttner's right to teach the course as they saw fit on the grounds of academic freedom. Slow-speed controversy continued within the department. A partial resolution was to have a dissenting faculty member give a Physics 2 lecture each quarter on the interpretation of quantum mechanics. Rosenblum and Kuttner welcomed this, since both were of the opinion that some of the controversy was caused by an alarm at merely hearing the word "consciousness" among some faculty. If more colleagues knew what the pair was actually saying in class and in the book, they reasoned, there would be less apprehension over the course. Rosenblum explained to me that despite his repeated efforts to bring physicists into scholarly conversation on quantum interpretation most abstained. An important exception was Tom Banks, who strongly opposed the course, yet corresponded intermittently with Rosenblum for several years on the issue and gave his view of the correct interpretation of quantum mechanics for Rosenblum and Kuttner's quantum enigma students.

²⁶ A likely contributor to Rosenblum and Kuttner's ability to teach the course the way they wanted for so long without interference was the low desirability and lower prestige in physics culture that goes along with teaching 'physics for poets' courses, as mentioned above. No other faculty or lecturer was anxious to teach it, even after the controversy emerged.

By 2010, another problem was pressing: the University of California budget crisis was forcing the physics department to cut courses. A few faculty members argued to the Chair that department funds should not be directed toward Physics 2 while courses for physics majors were being cut and there was no money to hire new lecturers. According to Rosenblum, the controversy came to a de facto halt when the faculty voted 11 to 4 to allow the course to continue, with the stipulation that department funds would not be allocated to payment of the course instructors (Rosenblum and Kuttner)²⁷. By that time, Kuttner was ready to retire from his position as Lecturer, and Rosenblum (who was already emeritus) decided to quit teaching for health reasons. Hence, everyone agreed that the last course would be taught in 2011, the year I attended. Kuttner was paid to teach the course by funds from the division, with Rosenblum paying out of his own pocket the difference of what would have been supplied by the department.

As I attended the course in 2011, I conducted interviews with both Rosenblum and Kuttner to the point that our meetings became visits between friends. While Kuttner taught most of the 2011 course, Rosenblum was very involved. The course narrative had two main audiences, the physics faculty and the enrolled students. The narrative was a response to both groups and attempted to persuade each group in

²⁷ Rosenblum also taught a seminar at every year for advanced physics majors, which was a more detailed look at quantum interpretation and its relation to consciousness. The faculty did not interfere with Rosenblum's ability to teach that course, and he had already been teaching it for no pay, so the question of funds did not arise. One faculty member I interviewed pointed to this fact as evidence that the controversy was not about Rosenblum's rights to teach his material per se, but it's appropriateness as a general SI course, which, according to this faculty member, ought to represent the general consensus of the department, and not one faculty member's opinions (the omission of Kuttner's relevance in the issue is an example of the hierarchy of the physics department).

relation to the other; hence, the course offered itself as a kind of mischievous but well-intentioned mediator. For example, both Kuttner and Rosenblum made palpable the presence of their disapproving physics colleagues in their lecture hall, saying, "They think we shouldn't be teaching you this stuff!" This gave the students the sense that they were being let in on a secret. In Rosenblum's phrasings, consciousness is "the skeleton in the physicists' closet": "quantum physics encounters consciousness," and "physicists don't want to deal with it!"

At the same time, Rosenblum and Kuttner dedicated themselves to writing and thinking about why this "quantum enigma" was such an embarrassment to physicists. They attempted to persuade physicists, in their department and beyond, to speak with students and the public more frankly and openly about the "quantum enigma." For them, the enigma was real - what needed to be explained was why physicists wouldn't touch it. Rosenblum found sociological and psychological explanations to be convincing: concerns about job security, dislike of "soft sciences," and even a tendency among physicists to avoid talking about emotions, all made Rosenblum's list of factors (he reasoned that both "soft science" and "emotions" have to do with "consciousness"). Rosenblum sought out allies for his explanations of why many physicists were reticent toward the quantum enigma. For example, Rosenblum attended a lecture by UCSC psychologist Eliot Aronson and subsequently invited Aronson to his home to discuss whether the quantum enigma was an example of Aronson's concept of "cognitive dissonance." And yet from the point of view of some of the UCSC faculty, the embarrassment of Rosenblum and Kuttner's quantum

enigma stemmed not from an embarrassing problem in physics, but from the embarrassment that the duo was wrong about quantum physics, and that they were teaching these wrong ideas to students.

Meanwhile, Rosenblum and Kuttner addressed their students as potential sufferers of a debate that had become too polemical, to the point that reasoned argument was difficult. The two instructors felt it was only natural for non-physicists to be interested in quantum physics, because, as they saw it, quantum physics is “weird.” In fact, the one thing the whole UCSC faculty might have agreed on is that students are susceptible to quantum pseudoscience precisely because quantum physics is weird. What was unique to Rosenblum and Kuttner's position was their claim that quantum physics is weird because “quantum physics encounters consciousness.” This reading enabled them to address their students differently from most physicists. Most physicists would provide a corrective to quantum spirituality and pseudoscience by denying any special relationship between quantum physics and the mind, not to mention the mind’s spiritual capacities. However, Rosenblum and Kuttner could address their students as being incorrectly informed about the precise and subtle relationship between quantum physics and consciousness. Pseudoscience was irresponsible and wrong in explaining this connection - but it was there. Hence, in the opinion of Rosenblum and Kuttner, students suffered from a lack of correct direction caused by physicists’ embarrassment at speaking about quantum physics and consciousness. Without any corrective from loud voices in physics, it was not surprising that students would look toward less reputable sources to understand why

quantum physics is so weird.

Given this difficulty, Rosenblum and Kuttner started to pay attention to the tendency of words and concepts that were properties of quantum physics to travel outside their appropriate domain and take on new meanings. They noticed an increase in popular interest in quantum physics, and this increase in interest was a double-edged sword. The publications of *The Tao of Physics* (1975) by Fritjof Capra, and *The Dancing Wu Li Masters* (1979) by Gary Zukav were early signs of an emerging genre of American spirituality that articulated themes of East Asian and Western mysticism, metaphysics, and consciousness transformation from within a language of quantum physics. The role of such literature, and the California science-and-spirituality culture that sustained it, is described in David Kaiser's (2011) *How the Hippies Saved Physics* (which both Rosenblum and Kuttner had read). Both were friends of one of the heroes in Kaiser's book, Nick Herbert, who at the time was living out his later years in the Santa Cruz Mountains, writing poetry about physics and sex, as I was informed. Most physicists, as is clear in the pejorative idiom "physics for poets course," do not hold poetry in particularly high esteem. Rosenblum was no clear exception to this rule.

According to both instructors, spirituality was not always bad, but it could be. In the 2000's, Rosenblum and Kuttner winced as students in their Quantum Enigma course professed their enthusiasm for recent quantum spirituality media, including the 2004 cult-hit film "What the Bleep Do We Know," and *The Secret* (2006), a book-turned-film celebrated on national television by Oprah Winfrey (Gary Zukav also

became a favorite on Oprah's show, see Lofton 2011: 34, 78, 122). And there was more. Rosenblum pointed out to me the many references to "quantum" made in places that such terminology did not seem to belong: in medicine, business, advertisement, and religion. He felt some quantum language was not particularly harmful, so long as the authors made clear that the connections made between spirituality and physics were metaphorical and not literal. For example, he assured me that Capra's physics was mostly right²⁸, even if it made a few risky extrapolations. On the other hand, businesses from financial consulting to alternative medicine used the word "quantum" in a way Rosenblum found misleading, since there was usually no explanation at all of why the word "quantum" was used. More dangerous were media such as *The Secret*, which made a combination of two offenses. First, said Rosenblum, it used language in such a way as to confuse metaphorical and literal modes of speech. Second, the mixing of metaphorical and literal registers misled the public into believing that the contents of *The Secret* bestowed accurate reflection of the opinions of the scientific community. In other words, *The Secret* combined misuse of scientific terminology with a masquerade of legitimate empirical knowledge. In their course, Kuttner and Rosenblum, repeatedly mentioned *The Secret* as a model of what to avoid when discussing quantum physics and its relation to consciousness, metaphysics and spirituality.

²⁸ Interestingly, Capra studied physics at UCSC under Michael Nauenberg, the professor who loudly objected to Rosenblum's course. Nauenberg took some credit for inspiring *Tao*, and he interpreted Capra's motivation for writing *Tao* the way he interpreted Rosenblum's motivation in writing *Quantum Enigma*: a good way to make some extra money (personal communication; see also Kaiser 2011).

Rosenblum and Kuttner's presentation of the quantum enigma was a no-math exposition of quantum physics intended to warn students away from pseudoscience, with *The Secret* as a worst-case example. Yet at the same time, it was also an attempt to persuade physicists that there was a kernel of truth in "quantum pseudoscience": quantum physics does "encounter" consciousness. Rosenblum picked the word "encounter" carefully. "It means to meet unexpectedly," he said. He thought that polarization caused by misappropriation of quantum physics meant that other than "pseudoscientists," only Nobel Laureates and other high-status physicists were willing to mention this encounter (Rosenblum had a long list of such prestigious physicists who had mentioned consciousness in relation to quantum physics, a list he oft-repeated to wary colleagues). Rosenblum and Kutter proposed the way to overcome this disjuncture was to articulate the quantum enigma correctly as a "theory neutral" experiment. Such a presentation, they felt, separates what the experiment "forces us to believe" from our speculations of what the experiment might mean about reality more generally. This conceptual demarcation between facts and speculation was an ethical resolution to the more fundamental problem that quantum physics does not "make sense"; it was the way Rosenblum and Kuttner suggested the students relate to the quantum enigma. Hence, throughout the course, the instructors indexed and distinguished between metaphysical-speculative and factual-scientific registers of speech, and also between the metaphorical and the literal. The litmus test for recognizing pseudoscience was to discern whether the speaker was mixing up fact with speculation, science with metaphysics, or properly separating binary domains.

This was, no doubt, the kind of “boundary-making” practice referred to by Gieryn, as mentioned above. However, at the same time, something subtler is also going on. The articulation of the quantum enigma disrupts the very rules that Rosenblum and Kuttner propose to achieve demarcation, including the possibility of a “theory neutral” account that would separate the facts from speculation or metaphysics. Rosenblum and Kuttner were quite aware that the theory-neutral rendition of an experiment is called into question by the experimental demonstrations of quantum physics. This was of special significance to them. A scientific experiment, and not critiques of science ideology accomplished by ethnographers or philosophers, brings about an enigma for the scientific subject that normally achieves demarcation by separating facts from other forms of knowledge.

Over several lectures, the instructors repeated, “The enigma comes from the experiment, not from the theory.” How can we make sense of this statement, when the “enigma” concerns an impossibility to separate facts of an experiment from its theoretical background? As we shall see, the concepts that make physics intelligible at all give rise to the appearance of binaries such as “fact” vs. “theory” for a scientific subject. The quantum enigma, as told by Rosenblum and Kuttner, is what I refer to as a *necessary appearance* that speaks to a certain kind of subject, namely a subject for whom the classical physics experiment is the paradigm of authority for scientific knowledge. By necessary appearance, I refer to the threading of meaning into perception, so that what appears to the physicist has a necessary meaning that is recognized as prior to interpretation. Such necessary appearances, as I explain above,

orient the perception of the subject in a sign system and hence play a productive role in the reproduction of the social (Zizek 1989; Balibar 1995, see also fn. 3). For the scientists, this translates to “making the facts speak,” and is therefore a phenomenon not reducible to interpretation. In the next section, I show what the facts of quantum physics say about the world, and also, our capacity for knowledge.

The Quantum Enigma, in Two Boxes

Rosenblum and Kuttner emphasize that it is the quantum experiment and not the quantum theory that gives rise to what they call the quantum enigma. Its derivation from experiment is the source of what they consider its special force. Indeed, there are many paradoxes that arise in Newtonian physics: for example, the conflict of the postulate of determinism with our experience of free will. Yet the instructors say these Newtonian paradoxes can be consigned to a merely theoretical domain, leaving the Newtonian worldview intact. In their book, they explain the issue as follows, “[determinism versus free will] is a benign paradox. Though we affect the physical world by our conscious free will, the externally observable effects of free will on the physical world come about indirectly, through muscles that physically move things. Consciousness itself can be seen as confined within the body [...] The determinism/free will paradox could be avoided because it arose only through the deterministic theory, not through any experimental demonstration.” (2011: 32-3). Therefore, whatever the philosophers think up on these issues, “we” (physicists, scientists, citizens) *do not have to believe it*.

On the other hand, Rosenblum and Kuttner tell us that the most basic quantum physics experiment is more absurd than anything an analytic philosopher could dream up. Worse (or better?) *we have to believe it* since it is a mere fact, an observation of something that happens in a very simple experiment. It is “theory neutral.” This puts “us” in quite a bind. Rosenblum often repeated to me and to his class, “we cannot believe it, but we must believe it!” In the next paragraph, I follow Rosenblum in describing a simple quantum physics experiment called the two-slit experiment, which, as Rosenblum quotes the widely admired physicist Richard Feynman, “contains the only mystery.” The quantum enigma effectively destabilizes the constitutive, “psychic-objective” demarcation of the scientific subject by emerging from within scientific method itself. This is not a demarcation of nature from culture or science from religion. Rather, the quantum enigma – a necessary but paradoxical appearance - pushes against the very edges of the imagination within which conceptual binaries of science are formed.

Rosenblum and Kuttner told their “two-box” rendition of the double slit experiment innumerable times, to students, colleagues, friends, and to radio and television interviewers. Imagine a pair of boxes in front of a screen. Both the boxes and the screen have the capacity to register the position of an atom when a slit or hole in one box is opened to find out “which box” the atom is in. The experiment is set up so that an atom may travel through one of two paths (or “boxes”) to hit the back screen. We shoot the atom so that it is equally likely to end up in either box A or box B. At this point, we do not know where the atom is; the atom might be measured to be

in box A and might be measured to be in box B. Physicists refer to this as a superposition of states, in this case, referring to the possibility of the atom's position to be measured in one or the other box.

In what the Rosenblum and Kuttner call the which-box experiment, we open the boxes one at a time. This way the which-box information is recorded.

Unsurprisingly, opening a slit in box A will cause the atom to be emitted onto the screen behind box A, and if not there will be no registered mark; the same is the case with box B. The result of repeating the which-box experiment many times will be a cluster of atoms behind each box, chronicling how many atoms had been in each box.

Now imagine a different experiment called the interference experiment. The difference between this experiment and the last one is that after emitting an atom so that it is equally likely to end up in either of the two boxes, we will open both boxes at the same time. In this case, the atom no longer behaves like a particle, but like a wave. Hence, it will land somewhere on the back screen, but not necessarily directly behind a box. If this experiment is repeated many times in this way, the atoms will form an interference pattern on the screen behind the boxes. To imagine an interference pattern, remember that if you throw two rocks into a pool, the circular waves from each rock will crisscross with the waves of the other rock; this effect is called interference. This happens because wave amplitudes superpose: they can add up or cancel each other out. A similar pattern emerges behind the box pairs. To further explore the wave-like behavior of atoms, we might change the distance between the two boxes. Changing the distance will result in a new interference pattern

proportional to the distance between box pairs. The interference experiment demonstrates that the physical lack of “which-box” information results in atoms displaying wave-like behavior. This is because measurement happens when the atoms hit the screen, not when they are in the boxes. Wave behavior and particle behavior are called complementary because physical situations that make possible precise measurement of wave properties exclude the possibility of measurement of particle properties and vice versa.

Okay, that’s it. Those are the “theory neutral” facts. The presentation is theory neutral if we accept that observations are not already “theoretical” in some sense. Yet observations are not “theoretical” in the sense of interpretation; rather they partake in the more liminal domain of what Freud called perception-consciousness, and what Jung more mystically referred to as the psychic-objective so as to emphasize its imperative force. The result is that Rosenblum and Kuttner’s presentation of the “theory neutral” facts throws into light the “Newtonian” nature of our observations, encouraging all who listen to inquire into what kind of subject *sees* the facts *speak* in this way rather than another. The quantum enigma projects itself into my experience if it is to do what Rosenblum and Kuttner intend for it.

Rosenblum and Kuttner present two experiments that seem to show contradictory things about atoms: that they are particles, and that they are waves. They describe the atoms as seeming to be “in two places at once” in cases where an interference pattern was realized and being “fully in” one of two boxes in cases where two clusters were formed behind each box.

The instructors conjure the problem of subject constitution in science by pointing out that the experimenter could have chosen to do the other experiment. In their account we can use our free will to demonstrate two contradictory facts about a particle in exactly the same state, an apparent paradox. If you have a set of box pairs with an atom whose position is described by a superposition of the two boxes, you can choose to perform the which-box experiment or the interference experiment. Rosenblum explains, “There is no problem with [making a] prediction; the problem comes from the funny feeling that I could have done something other than what I did.” Conscious intervention into the same initial physical situation to be measured can give rise to contradictory physical events.

A key assumption in scientific experimentation is that the results of future experiments can be predicted based on past ones, so long as the experiments use identical initial conditions. However, David Hume demonstrated that this assumption cannot be based in reason. Our past experience could never prove that the same initial conditions would entail the same outcome in the past as in the future. This is because experience is always limited to past and present, and never extends into the future. Mentioning Hume, Rosenblum reminded me *induction* therefore entails a custom or belief that allows us to assume that past cases are representative of future cases.²⁹

²⁹ Induction involves making a logical conclusion about general circumstances based on knowledge of particular cases. A classic example is my “induction” that all crows are black. I have seen many crows, and based on my knowledge that all the crows I have seen are black, I assume that all crows in general are black, including those I have not seen. This is an induction. It is logically possible that there is a pink crow out there somewhere, even if no one has ever seen it! For more on induction, see David Hume’s (1993) *Enquiry Concerning Human Understanding*, especially Chapter 7, “The Idea of Necessary Connection.” Key to Hume’s argument is the temporality involved in induction. Taking our example of crows, “past” and “known” crows are black, “future” and “possible” crows might be pink.

Rosenblum saw free will as crucial to the practice of induction in science. Scientists make an induction every time they make the assumption that the same effects will result from the same experiments. In other words, the ethical demand that scientific experiments should be repeatable is based in an inductive logic. This still holds in quantum mechanics, but with a major caveat. To uphold quantum mechanics' principle of complementarity physicists must deny that there are results to experiments that have not occurred. Rosenblum told me a story of a physicist who yelled at him, "Experiments that have not been conducted have no results!" But Rosenblum could not accept this, "There has to be a fact of the matter for experiments I haven't done," he would tell me, otherwise science is just a chronicle of events that have no relevance to our understanding about reality in general. In other words, Rosenblum believed objectivity entails the ability to imagine the knowledge resulting from experiments holds in cases that have not yet occurred. Closely related to induction, "counter-factual definiteness" gets at the idea that there is a fact of the matter for things that have not happened but could happen based on free choice of the experimenter. For example, I might say that it is a "fact" that in the normal circumstances, if I do not tend to my garden, eventually weeds will begin to take over. I may say this is a kind of fact despite that I never allow this result to take place. In other words, counter-factual definiteness is about the reality of the possible, given a set of initial conditions. If counterfactual definiteness is affirmed, this implies the ability of the imagination to grasp hold of something real beyond immediate

Every time I see a (black) crow, it goes into the former category, always leaving open the logical possibility of a miracle pink crow. See also Deleuze 1991.

perception or memory of a particular experiment, and access a more general reality of possibilities. Exactly what kind of “reality” that might be would be a metaphysical question.

Rosenblum and Kuttner understand the minimal metaphysical aspect of objective knowledge to derive from our free will. They recognize free will as that which demarcates the inside of the experiment from the outside; in other words, free choice demarcates a subjectivity that has access to objectivity. In their account, free choice is constitutive to the experiment because it must be; we must believe in free will because free will, according to our instructors, is the necessary “transcendental” component of empirical objectivity. Rosenblum and Kuttner worried deeply about the paradoxical relationship they saw between the quantum enigma, and induction and free will. Although free will was not itself an empirically demonstrable thing, it seemed to Rosenblum and Kuttner to be a necessary prerequisite to the authority of empirical knowledge. And yet, quantum physics seemed to empirically demonstrate that there was a problem with assuming the free will of the experimenter. In this sense, quantum physics seemed to problematize the very foundations upon which its knowledge was seen as authoritative. The consequence could be vast. "Our laws are based on the concept of free will," Rosenblum would say, and free will is based on counterfactual definiteness, which quantum physics denies. Sitting together in Rosenblum's office, the pair discussed the intricacies of counter-factual definiteness and its constitutive relation to objective knowledge. Could counterfactual definiteness exist at all if it did not exist at the atomic level? To be really real, it could not be an

emergent property of the human-scale or something that exists for “practical purposes.” It was metaphysical matter – it existed or did not. For these reasons, the quantum enigma directed Rosenblum and Kuttner inside themselves; they thought, imagined, and discussed it day after day, and it wasn't just a matter of studying quantum physics and consciousness as scientific objects. It was a question of what boundaries quantum physics made within each of their own psyches, between reality and illusion, experience and materiality, and so on. Each physicist was left with an enigma: he had to believe in the quantum experiment, and yet, the quantum experiment troubled his conviction in those very elements that forced him to believe in experiments as certain knowledge: free will, induction and counter-factual definiteness.

The Craziest of the Universe

Kuttner and Rosenblum (2006) say the pragmatic or un-philosophical attitude toward quantum physics interpretation taken by many physicists is insufficient for combatting pseudoscience. The public is interested in science because they believe, naively or not, that science has something to tell them about reality. Furthermore, the public is able to see that quantum physics implies something enigmatic, even if they are not sure how to understand the enigma adeptly. If responsible physicists insist that quantum mechanics is only a calculation tool, and contains no “meaning” about “reality in general,” the public will look elsewhere for explanations, and become vulnerable to quantum pseudoscience. Hence, pseudoscience is properly fought by

teaching the public, including non-science undergraduates, how to imagine in a manner that recognizes the difference between metaphysics and facts. The instructors were motivated to teach the quantum enigma by the social fact that students want to know about “reality,” not mere laboratory experiments.

Yet, the course did not lead all students to disavow their interest in quantum spirituality, even the kind that Rosenblum and Kuttner considered the worst, such as “What the Bleep” and “The Secret.” How did many students maintain their interests and beliefs in quantum spirituality and sometimes even read “The Quantum Enigma” as evidence of that spirituality, even while Rosenblum and Kuttner explicitly postured themselves against it? Students that considered themselves to be spiritual internalized the authority of the professors’ knowledge about quantum physics into an existing spiritual system, giving rise to a sense of greater self-certainty in the student’s already existing (and developing) spirituality. In this section, I explore how “William” inhabited in his knowledge of quantum physics, as a way of explaining is experience as a whole.

William is the pseudonym of a student in Rosenblum and Kuttner’s class who took an exceptional interest in the course material and was able to perform, seemingly to Rosenblum’s approval, the correct demarcation between scientific and metaphysical registers of speech. Nevertheless, William integrated the quantum enigma into his experience in a unique way that cannot be reduced to the demarcation between domains of knowledge that Rosenblum and Kuttner tried to teach. Instead, William’s engagement with the quantum enigma produced a problematization that

was unique to the way William's imagination integrated scientific concepts and thereby contributed to the structure of his experience, for example, by expressing his feelings of anxiety and doubt in the language of physics.

Quantum physics allowed William to speak of his feelings and ideas in terms of "the way the world is" rather than "the way I am." William reports experiencing *physics* as anxious and doubtful. The facts are saying something to William. William presented his experience of science to me as a comedy of the futility of knowledge, and he quickly imagined me as a fellow traveller in his journey. He described his interest in modern physics as rooted in the joy of learning about "things that happen that shouldn't theoretically happen...like a quantum of energy, what the hell is that?" It was hardly significant to William that there is a physical theory of the quantum of energy, since he knew from Feynman, that "nobody understands quantum mechanics." William explained, "No matter how much you know [quantum physics] it still doesn't make any sense." William took Feynman's quote as a sign of futility in knowledge. Yet however futile knowledge of the universe might be, William's universe was experienced and articulated through scientific concepts.

William used scientific ideas to express his own experience, as well as to check against his experience. He reported that at age 10, he developed a belief in determinism, based partially in his understanding of science, and partially on intuition.

"I did not believe in free will because of determinism, which is basically that if the universe starts with a certain set of initial circumstances then there is this huge causal web where if you were to restart the universe over and over again from the same

circumstances the universe would keep playing in exactly the same way each time down to the last atom. I believed that since I was about 10. It was more of just an image in my head than a well-developed theory in a universe that makes sense.”

For William, a deterministic universe is one that makes sense, a proposition that he gave up around age 16. As he explained, quantum physics helped precipitate a new understanding of a world that does not make sense, a world he describes as “basically magic.”

I didn't see how anything could happen differently [than it does] because I think that if it did occur differently that would imply true randomness and that would imply things happening without a cause which is basically magic, that is my perception of magic, which I did not think existed. And my high school chemistry class we learned this one tentative theory: the Heisenberg uncertainty principle. So if I interpreted correctly, that would mean that true randomness does exist.

This certainty in “randomness” helped William express a total doubt or skepticism of everything, which he then checked against his experience as true (that is, he did recognize in himself an experience of total doubt of “everything”). For William, the Heisenberg uncertainty principle is “tentative” and not extremely well established, because its truth-value is being judged in relation to William's sum of experience, rather than in relation to experiment. His intuition of an association between total doubt and “randomness” led to an association of scientific facts with his experiences of doubt, disorientation and confusion.

Speech like William's is embarrassing to physicists because their expertise provides the physicists with a vantage point from which to sense that William is *projecting*, in the sense of recognizing his own psychological traits in the outside world. The domain “outside experience” is symbolized by “physics” for William, and

that is how he expresses himself as a subject in relation to a world. Yet much like Wolfgang Pauli, who was initially ashamed of the way his own dreams contained incorrect usage of physics terminology (Pauli had high expectations of his unconscious!), most physicists relate to such speech not as a mode of projective expression but as “wrong” or “pseudoscientific.” Yet to figure William as “wrong” does not recognize the expressive and unique element of William’s speech; the element I would argue arises from William’s inspiration to express something transcendental, or beyond the determination of an inside and outside. For example, by naming William’s speech “pseudoscience,” that speech then appears to have come only from an already established, external, and illegitimate source. Such an act flattens William’s engagement with subject constitution into a boundary making demarcation; the potential to respond to William’s speech is thereby lost.

Rosenblum and Kuttner’s course gave William the space to express and explore his own imaginative relation to the cosmos he understood in scientific terms. However, it is not clear that William has developed a conceptual understanding of the difference between classical and quantum mechanics. Some UCSC colleagues might point to William as an example of the danger of posing quantum mechanics merely as an “enigma” without teaching its mathematical justification. The difficulty here is not to identify the difference between science and metaphysics, or science and pseudoscience. William could do that. Instead, I argue that uneasiness with William’s speech derives from the meeting between quantum physics concepts and William’s experience as a whole. William thought he understood quantum physics

concepts but he did not understand these concepts mathematically. Later in this chapter, I will show how Tom Banks argues that without mathematical basis, discussion of quantum mechanics gave only a “poetic impression” that will be fraught with confusion. The debate between Rosenblum, Kuttner, and the rest of the faculty, was not so much over the empirical line between science and other forms of knowledge but rather over what kind of subject could absorb modern physics concepts in a way that physicists found to be responsible or at least palatable. The constitution of such a subject requires participation in a pedagogical tradition (the college physics major) that produces within the imagination a set of connecting principles that gives rise to a mode of experience as a whole. This mode of experience is not reducible to scientific practice, or education, although it arises from it them.

A brief comparison with Rachel will demonstrate. She was pursuing a major in physics, and the shift from metaphysical or speculative discourse on subject constitution to demarcating discourse of science from non-science was already second nature to her. For her, the quantum enigma fit into a conceptual world that was already highly differentiated by physics and other scientific concepts. The internalization of a boundary between philosophy and science made for the opening in the imagination between certain and uncertain knowledge, from which point she was able to imagine a future for herself of increasing scientific certainty. She experienced her personal trajectory as a mirror of the trajectory of science in general; in a world of increasing certainty, her own certainty would increase until she reached the present limits of a specific domain of knowledge. In her experience, speculating

about unknowable things might be fun or fill some emotional needs, but for her there was little sense in “getting stuck” on mysteries and enigmas when there was so much she, as a student, still had to learn from her teachers. For her, metaphysical questions were questions that could not yet be formulated empirically. Until that more certain day, why worry about it?

Interpretation and Measurement

As an ethnographer and as a non-expert in the subject of science, I was open to the persuasion of Rosenblum and Kuttner’s quantum enigma. However, most of Rosenblum and Kuttner’s colleagues were not. Some colleagues were indifferent, others hostile, but few if any spent enough time with the two physicists to try to hear the quantum enigma from within Rosenblum and Kuttner’s worlds. No doubt, it took a lot of time, and professors are busy people. Yet I want to explore another reason the transmission of the quantum enigma among Rosenblum and Kuttner and their colleagues was so contentious: it has to do with the way physicists interpret each other’s speech. Rosenblum often quoted Sharon Traweek’s (1988: 162) claim the typical physicist “longs passionately for a world without loose ends.” Rosenblum was aware that physicists tend to think and communicate in terms of right and wrong. This manner of communication is adequate for teaching physics students to perform calculations. One calculates correctly or incorrectly. Physicists inhabit a world of computational abilities that far exceed my own, and a student has to go very far before coming to issues that cannot be designated “correct” or “incorrect” by one’s

superiors. If a physicist disagrees with a colleague, the act of ceding there is room for a “reasonable difference of opinion” between self and that colleague is a sign of respect toward the colleague. Otherwise, the colleague will be blown off as “wrong.” Wolfgang Pauli even immortalized the phrase “not even wrong,” which denotes an even lower level of respect, insofar as someone who is “not even wrong” is considered to be incapable of formulating statements that can be judged right or wrong. We may easily deduce from this situation that an ability to formulate statements that others in the physics community can arbitrate as right or wrong is a minimal requirement for entrance into that community. Outside of that capacity lays the domain of “poetry,” or worse, “the New Age.”

This style of language ideology had effects in the quantum enigma controversy. UCSC physicists who argued quantum mechanics always ought to be taught within its mathematical foundations interpreted the quantum enigma course as if it were a mathematically based course, and from these premises came to the conclusion that the quantum enigma course was “wrong.” My own ability to become conversant in the debate required me to get a handle on the stakes of mathematical exposition in the discourse of quantum interpretation. I had to learn enough mathematics to begin to see what happened in the moment of translating the exposition of mathematical formalisms into speech, and back again. Mathematical exposition is a code that must be translated into further code by speech if the meaning of the mathematical code is not already known. Roman Jakobson (1980) referred to the function of coding as “metalanguage.” I learned by participation in physics

education that confusion and disagreement is liable to arise any place where the metalanguage of mathematics cannot remain implicit to the act of calculation, and must be brought out in speech. At this point, there is a minimal extension of meaning beyond the internal consistency of the formalism. In consequence, the first seed of the duel between physics and metaphysics is planted. This is an effect of the fact that, although computation can be judged right or wrong, it is more difficult to say whether the metalanguage that explains the computation is right or wrong. In so far as the metalanguage takes up something of the computation, it seems a right/wrong judgment on the metalanguage may be possible. On the other hand, is also at this place of translation that apparently “metaphysical” questions begin to emerge, in order to determine for example, the referent of formalism (for example, some students may ask with exasperation, “but what *is* an electron?”)³⁰ Some of these metaphysical questions are no doubt the result of being a novice; I know this because the whole thing seemed riper with “metaphysics” to me when I started quantum mechanics then it does now several years later. I assure you that I met many physicists who do not have such metaphysical problems as I have about physics equations, and they would rightfully say I have these problems because my math skills are undeveloped. But is

³⁰ Jakobson (1980: 90) treats such metaphysical questions as follows: “Statements of existence or nonexistence to such fictional entities [as unicorns] give rise to lengthy philosophical controversies, but from a linguistic point of view the verb of existence remains elliptic as far as it is not accompanied by a locative modifier: ‘unicorns do not exist in the fauna of the globe’; ‘unicorns exist in Greco-Roman and Chinese mythology’” and so on. Is the same true for physical entities? These considerations bring us back to the problem of induction and the question of the generalizability of scientific statements considered throughout the dissertation. I think Rosenblum for one wanted to be able to say “electrons exist” without any locative modifier and at the same time without the statement being considered elliptical.

the appearance of metaphysics fully attributable to the students in incomplete understanding?

Let me explain briefly. One day, walking with Fred Kuttner back to our cars after the day's lecture, I expressed confusion about how physics students ever learn anything. Kuttner rejoined that I seemed to be doing as well as anyone else at my level, and that I just had to learn to be a good problem solver. "To be a good physicist, you have to know how to problem solve, and that is mostly done on your own. People are willing to answer any question you bring them without judgment, but they also don't want to hold your hand". There is a belief among physicists that intelligence is an innate entity that resides in the psyche, and different people have different amounts of it (see also Traweek 1988: 79). I doubt Kuttner fully believes this himself, but there is a "physicist part" of him, as he puts it, that leans that way sometimes. For Kuttner, becoming a good problem-solver is learned in many hours of problem solving. Yet Kuttner and others still gave me the sense that I was to be judged by how well my mind resembled a computer, that is, how well I could compute. I started to judge myself that way too.

One day I wrote in my notebook "After you get some idea of what the math symbols mean, you feel encouraged and want to keep going. It feels good to solve problems, after being in anthropology or social theory where you can never solve any problems. Physics is hard and makes your brain tired. You have to have a multiple hours block [of time] and enough energy to concentrate. You also have to have the will to do it, you have to be able to conjure up that will, beyond the amount of will

that it takes to read a book [casually]. You have to engage in active reading and problem solving.” Even in my own language, learning physics entailed a demand to have a certain psychological quality: problem-solving ability and smartness that could in some way be recognized when physics problems were successfully solved. I imagined an invisible "X" in my brain that may or may not be there, and it would be the deciding factor of whether or not I would succeed.

But computers can do the "X". “It's just a calculation,” Fred reminded me a few days later. Plus, students learn some of the physics before they know how to do the calculations. For example, students are given solutions to the Schrödinger equation without knowing how to do math necessary to calculate solutions themselves. They are supposed to bracket that. I constantly objected to the bracketing, I wanted to know every little bit because I could not tell what was relevant. "But a computer could do this", Fred would say, “And it usually does.”

Experiences like these helped me understand the exasperation that emerged between Rosenblum, Kuttner, and their peers, over the quantum enigma. Is there or is there not something to understand about quantum physics other than computational skill? I came to realize that physicists tend to think about interpretation as if it were a calculation, as if, for example, an interpretation would be ultimately reducible to a computation performed by neurons in the brain. Or, as is the wager of quantum consciousness (not discussed in this chapter), perhaps the brain is a quantum computer...

Physicists often think they immediately know the “right” meaning of a

sentence. Several times, I watched a physicist read half a sentence, and declare that sentence wrong, before bothering to see whether there was any qualifier or modification at the end of the sentence. This was not just a quickness to judge. Rather, I think it is an interpretive style that emerges as a result of expertise (years of practice) in mathematical science. Is the computation right or is it wrong?

Projection and Objectivity

As discussed above, Carl Jung and Wolfgang Pauli's letters suggest an answer that raises new questions: facts speak via *projection* of a psychic element into an object such that it appears as coming from the object. Jung had suggested that Pauli's dreams about physics were examples of projected psychic contents into "physics symbolism." But Pauli was no fool, so he invented an excellent counter-argument: Jung's determination that the contents that spoke to Pauli were *psychic* was unfounded. Since such contents were transcendental (beyond empirical determination), Pauli stated such contents could as well be called *physical*. And if they were physical, then they were indeed objective and not "mere" projection. We see here Pauli's implicit valuation of the "physical" over the "psychic," a valuation Rosenblum argued is shared amongst most physicists. Pauli and Jung then embarked on a project to develop a language adequate to Pauli's inclinations that could speak of the transcendental level wherein demarcation between mind and matter could not be determined empirically. As described in Chapter 1, both individuals regarded the development of such a language as an issue of spiritual healing, based on the

hypothesis that the devaluation of the psychic aspects of life leads to repression of certain mental phenomena and therefore psychopathology, as in Pauli's severe depression and drinking. Together, Jung and Pauli started speaking of a "psychic-objective" domain, and this way of talking preserved both Pauli's sense that facts can speak as well as Jung's sense that facts speak by virtue of projection. I submit that the development of a discourse that is adequate to the question of the transcendental constitution of empirical knowledge is central to the project of quantum consciousness, and partially explains, following Pauli, why QC discourse is connected with spirituality and healing.

My engagement with the quantum enigma, and its subject constituting demarcation of subject from object, leads me to argue that objectivity is not adequately explained by reference to scientific practice. An ethnographic account of objectivity must also describe objectivity's persuasive mode of appearance, which is not reducible to a practice but is rather its condition of possibility. What makes physics so persuasive, and so hard, Fred Kuttner told me, is the actualization of coalescence between physical experimentation and mathematical computation. Such coalescence has a temporality of postponement that Kuttner characterized in his discussion of the Galilean origins of the scientific method: questions that are not subject to experimental determination are forestalled to the future, when and if such measurement can be made. Until then, talk is speculation. This point is developed in full in the following chapter.

Kuttner's colleague, Michael Nauenberg, named this coalescence *real* when

he said, "What is real is what can be measured." High valuation of experimental measurement can mean refusal of talk about what cannot be measured, which includes, to be sure, the constitution of the scientific subject capable of measurement. Furthermore, measurement becomes the archetype of judgment in general, as when a colleague is judged (or "measured"?) to be wrong. As Jung pointed out, the scientific mind treats transcendental speech with suspicion, as fantasy, and as a result, the ego devalues the very imagination it is constituted within. The wave function used to calculate the results of quantum physics experiments, Nauenberg said, "is not a real thing. The wave function is ...essentially our knowledge of the physics. [...] It is not something that you can touch or feel or see or measure." And he warned, "The idea that the wave function is a real object is the source of innumerable amounts of nonsense."

Physicists spend a lot of time making computations such that much of their subjectivity is composed by the flow of mathematical discourse. I almost want to say that physicists fantasize that the mind is a computer, except that this would miss the point that much of what physicists do with their imaginations is compute. The imagination computes; the imagination imagines that it is a computer. It follows from this that physicists will explain the failure of persuasion on some failure of computation. I sometimes got the sense that "You read that wrong!" meant something very like, "You calculated that wrong!" or even "Your brain went defective!" Indeed, sometimes physicists reacted to each other with offense, as if a claim that someone misinterpreted someone else's statement was a sign of an insufficiency; guilty for

being a bad computer. Furthermore, who was better at doing calculations was often a determining factor for deciding who had a better understanding of the interpretation of quantum mechanics.

Maybe so, and yet all this requires that every sentence about physics has one correct meaning. Physicists do not just aspire to a world without loose ends; they also posit a world without loose ends: a computational world. Pauli, the Nobel Laureate, was able to convince Jung that his dreams reflect something real about physics, namely, a transcendental “psychic-objective” domain that makes objective knowledge possible. Pauli made sure he knew what his dreams meant before Jung could get there. Rosenblum and Kuttner also reserve the right to express thoughts that are therefore not “merely” projections (in contrast to William’s ideas, for example). Like Pauli, they judge themselves so able based on the self-certainty that their metaphysical thoughts extend from a “correct” knowledge adequate to a measurable physical reality. Inversely, if a physicist is anxious or embarrassed by Pauli’s, Rosenblum’s, or Kuttner’s speech, there is an impulse to find a sentence that is “wrong,” which is possible only when sentences have only one correct meaning.

The trouble is, it is possible to talk about transcendental things without saying anything wrong, and yet, the uneasy feeling can emerge nevertheless. In fact, Rosenblum reported his embarrassment about the way quantum spirituality guru and media mogul Deepak Chopra³¹ discusses quantum mechanics: “There is nothing I can

³¹ Catherine Albanese (1992) discusses Chopra’s early endeavors in quantum healing. Chopra’s understanding of quantum physics has evolved significantly since that time, see my discussion in Chapter 3.

point at in what he says and say ‘that is absolutely wrong’,” but Chopra made Rosenblum feel uneasy anyway. Anthony Aguirre, who participated in the 2008 committee that produced a recommendation to the faculty on what action to take in relation to the course controversy, gave a similar explanation for his colleagues’ unease with Rosenblum and Kuttner:

“They have written this book about the strange things in quantum mechanics [...] And they inhabit this very tricky zone. *It is hard to point to a particular sentence or paragraph in the book* and say ‘This is a very terrible thing that you have said that talks about quantum mechanics in an irresponsible way.’ At the same time, *the sum total of the book* gives - suggests without coming out and saying it a particular philosophical viewpoint that I think that a lot of people are troubled by. I am not; not necessarily me, but a lot of people are troubled by it.”

As Aguirre notices, Rosenblum and Kuttner frustrated their colleagues’ desire to locate a general feeling of unease in one or two “wrong” sentences, just as Chopra frustrated Rosenblum’s desire to do the same. The physicists’ interpretive style, which demanded that sentences have a correct meaning, led some physicists to claim that they knew better than an opponent the correct meaning of the opponent’s statement. One colleague, for example, exclaimed to Rosenblum, “I think you are misrepresenting your own position,” a peculiar but not impossible claim that implies this faculty member saw something in Rosenblum’s position that Rosenblum could not see for himself. A different colleague explained it to me this way, “Bruce [Rosenblum] and Fred [Kuttner], I think, are genuinely baffled by why people are so upset by [the book and course] because *it is not even clear that they themselves believe this overall feeling that is coming across in their book*” (my emphasis). Were

Rosenblum and Kuttner unaware of their own position?

Anthony Aguirre referred to a “sum total” that defies demarcation. Recall that I felt I understood subject constitution in the quantum enigma when I was able to “not understand” the way Rosenblum and Kuttner “did not understand.” This happened when I was able to inhabit Rosenblum and Kuttner’s whole imaginative process with some success: I too saw the “sum total.” If the quantum enigma was not transmissible between Rosenblum, Kuttner, and colleagues, it is in part because some physicists found such discussion to be a waste of time. But it was also because their colleagues approached Rosenblum and Kuttner as if what they were saying could be adequately accounted for as either “right” or “wrong,” or a matter of personal opinion, and therefore of little interest. In each case, there was no capacity or no desire to engage mimetically in Rosenblum and Kuttner’s world or learn the meanings of their terms by imaginatively inhabiting their conceptual landscape.

Rosenblum and Kuttner proposed the quantum enigma in a discursive field that requires experimental measurement and mathematical demonstration as conditions of persuasion and yet they explicitly stated the quantum enigma requires no math to comprehend. In this sense, they not only put into question an established way of interpreting the foundations of quantum mechanics, they also put into question the structure of “consciousness” that understands experimental knowledge as authoritative. The quantum enigma compels from a different place: an experimental fact appears to put into doubt the relationship established in the “Newtonian” imagination among mathematics, observation, and measurement. From one direction,

there is no problem: the measurement is precise. Yet from the other direction, an enigma is revealed in the translation from measurement to experience as a whole.

Rosenblum and Kuttner experienced their peers as persuaded by particular interpretations that were actually only one interpretation among others. Both physicists were particularly suspicious of what they considered the pragmatic and “for all practical purposes” interpretation, which understands the quantum wave function as only a tool for making predictions. Such an interpretation, to their mind, thoroughly bifurcates the imaginative link between physics and experience as a whole such that physics cannot situate the subject in a scientific worldview. This “threat” to the scientific worldview is amplified in the discourse of QC scientists, as I show in Chapter 3 and 4. Meanwhile, maintaining and “working through” the imaginative coordinates established by the presentation of quantum physics to the scientific subject reveals, to me at least, the constitution of the subject as a whole. In simpler terms, the personal aspects of comprehending quantum physics come forth and are made explicit, though not systematically. And if we listen to that “sum total,” perhaps we can surmise that in Rosenblum’s protestations against physicists’ embarrassment of his ideas there is an unconscious knowledge that every individual must comprehend quantum physics within a unique, personal imagination.

“Pictures in Your Head”

Tom Banks and Bruce Rosenblum’s debate over the “quantum enigma” and the foundations of quantum mechanics extended beyond the question of faculty or

administrative action on the quantum enigma courses. To justify his opposition to contents of the quantum enigma course, Banks tried to persuade Rosenblum to accept what he understood as the correct interpretation of quantum mechanics. Likewise, Rosenblum attempted to persuade Banks that there really was an enigma beyond what Rosenblum considered Banks' pragmatic "for all practical purposes" interpretation. I contacted Tom Banks to understand his position on the quantum enigma course. Banks responded that to understand the "essence of quantum mechanics," I would need to learn some math: probability theory, and linear algebra, and about the origin of very large numbers in physics.

Thus far in this chapter, I have not yet provided a fully elaborated opposing view to that of Rosenblum and Kutter. In this section, I describe what learning the "essential mathematics" from Tom Banks taught me about quantum mechanics. Banks provided me five weekly lessons in the linear algebra for the most basic possible quantum mechanical system, as well as a lesson in decoherence theory. Meanwhile, I also studied Stanford professor Leonard Susskind's quantum mechanics lectures for Stanford's "Continuing Education" program, available on YouTube, and David Albert's (1994) *Quantum Mechanics and Experience*. All of these lessons were on the topic of "spin," a physical parameter discussed below.

A different perspective on the "meaning" of quantum mechanics did not come to me immediately. I struggled with it into the middle of 2012, and then I stopped my studying to concentrate on my fieldwork. About one year later, in 2013, I returned to Bank's lessons. I was astonished to realized I was able to understand at that later time

what Banks had told me a year ago far better than I did when I first encountered it, despite that I had not undergone any practice in the interim. I had not been practicing quantum mechanics, but I had been thinking about it unconsciously. The coordinates of my imagination had been shifting; I understood new principles. Something new appeared to me: I was a little bit more a subject of physics. It was in this sense that the meaning of quantum mechanics changed for me; not, mind you, my opinion of it, but rather, what it said to me. The facts spoke to me differently. And then I understood what had frustrated Banks so much about Rosenblum's course.

It is at this point in the present text that I come right to the limits of ethnographic method, that is, right to the limits of any empirical expression of demarcation in science. I have told my reader that you will have to learn some mathematics to understand what I will say next, and I believe that is true. This is because something shifted in my own psyche, and I cannot convey that shift to you. I will, nonetheless, try to give a hint of it.

The first step to understanding the essence of quantum mechanics, in Banks view, is to understand that quantum mechanics is an intrinsically probabilistic theory. "Any attempts to understand the quantum wave function as anything besides a recipe for computing probabilities is doomed to confusion because it's wrong," said Banks. It is wrong, Banks says, to infer from the double slit or "two box" experiment described above, that any particle was ever in "two places at once." Banks put it this way, "the claims that the quantum theory predicts that things are in two places at once, because the wave function has support in two places at once is as wrong as the

claim that the theory of weather predicts that the storms are in two places at once because the probability distribution has peaks into different places.” In Banks’s “counter lecture” to Rosenblum and Kuttner’s courses, Banks emphasized that there is no mystery involved in a probabilistic theory predicting two or more possible results. The difference between classical probability theory, as in weather predictions, and quantum probability theory, is that the terms for the possible outcomes interfere. This necessitates that probability in quantum mechanics be intrinsic, which means inherent to the system and not a result of a defect or lack of precision in measurement. Banks taught me linear algebra to demonstrate how intrinsic probabilities are a necessary result of the mathematics that gives correct predictions of a simple quantum mechanical system.

Banks also taught me the quantum mechanics of a parameter called “spin” of an ammonia molecule. The question we wanted to answer was, “what is the probability that the spin of molecule points up along a given axis?” The mathematics for this question contains within it the algebra to calculate the probability that the molecule points up or down in any direction in three-dimensional space. By learning the mathematics, I came to the limit of my own imagination; this limit appeared to me as something intrinsic, something that would not go away by learning more. If an ammonia molecule is in a state such that there is a 100% chance that the spin will be measured to be “up” when measured along the Y-axis, then there is a 50% chance that the spin will be measured to be “up” when measured along the X-axis. Notice that an arrow pointing “up” along an X-axis cannot be realized if the same arrow is pointed

“up” along the Y-axis. Just like registration of wave properties excludes registration of particle properties in the two-slit experiment, registration of the spin direction along one axis excludes the registration of spin direction along a different axis. This means that the molecule is in a superposition of states with regard to its spin. The “crazy” inference to make regarding spin, using Rosenblum and Kuttner’s mode of interpretation of quantum physics, would be that the molecule’s spin is pointed in more than one direction at once, which is logically impossible.

Yet Tom Banks example of spin allows for a different reading, although it took time to dawn on me. What took me so long to understand is that I cannot correctly make a picture in my head of the ammonia molecule as “up” along the Y axis, because imagining that requires imagining the ammonium molecule as having a definite position along the X- and Z- axes as well. But a definite position along the X- and Z- axis at the time of definite position along the Y- axis is not what quantum mechanics predicts. Therefore, the word “up” in quantum mechanics does not correspond in any way to the picture I have in my head of something pointed up. Any picture I can have in my head of spin is “wrong.” By analogy, Banks wanted me to understand that this is also true for all other physical parameters measured in quantum mechanics. When Banks says quantum mechanics is strictly a tool for making predictions he is asserting his awareness and even awe in regard to this situation.

Intrinsic probability, Banks explained, can be unsettling, because it implies an objective limit to knowledge. This is a lesson in humbleness. Banks explained, “since we learned to talk and think, we’ve been incredibly arrogant, assuming that the world

had to conform to the rules we made up in our heads.” Quantum physics compels Banks to accept and experience human knowledge as limited in relation to the world. In his mind, it is therefore wrong to interpret quantum physics equations as anything but tools to make predictions. He called the hope derived from classical physics of “being able to predict everything if only you knew initial conditions” a “fantasy”, now overturned by quantum physics. The “quantum enigma,” Banks insisted, derived only from Rosenblum and Kuttner’s insistence that the world conform to their expectations.

When I gave Rosenblum an early draft of this chapter, he responded that he was concerned that I had been persuaded by Banks, and that I was not taking a neutral viewpoint. When I gave the same draft to Kuttner, he more casually remarked, “Yup, Bruce [Rosenblum] is an experimentalist and Tom [Banks] is a theorist.” Did I adopt the viewpoint of Rosenblum and Kuttner, or that of Banks? In response to this question, I emphasize that a unique mode of appearance crystallized for me under the direction of Rosenblum and Kuttner, and then in another unique mode crystallized, in a different way, under the direction of Banks. In either case, the mode of appearance, or “what the facts say,” was not reducible to any learning practice. This became especially clear after my work with Tom Banks produced a difference of modes of appearance in my imagination from the one I had grasped from Rosenblum and Kuttner. Yet another difference emerged when I learned that it was possible to do the quantum mechanics in the same way but develop new understandings of it, even without additional learning practice. My ability to follow the steps that Tom Banks

modeled for me did not change so much as a new image emerged in my mind, after a year, from which I derived a principle that had always been there, and yet has now become part of me in a new way.

I do not think that this means I understand quantum interpretation in the way Banks understands it, or in the way Rosenblum or Kuttner understand it, although, as I mentioned above, I did spend considerably more time with Rosenblum and Kuttner than with Banks. For that reason, I was able to see what Anthony Aguirre had called the “sum total” of Rosenblum and Kuttner’s position, so that in that case, I felt more able to see traces of a subject constituted in the whole of what the two physicists were able to say about the quantum enigma. And yet, there are things that all three physicists (Rosenblum, Kuttner, and Banks) say that still makes no sense to me. Nowadays, I no longer believe that this is only because I am a non-expert, although there is a surely a lot of that too. But the other part is, I am developing my own unique understanding of quantum mechanics, an understanding that is inseparable from my psyche as a whole. Hence, I cannot externalize it or communicate it fully. It is esoteric in that sense. I know that my psyche shifts in relationship to my practicing physics problems because new things appear to me. The facts speak differently, and they compel me differently. It’s not my choice to see it that way, and yet, like Jung and Pauli, I think that it is the unconscious that is revealing the facts in new ways to me. Because otherwise I would have to think that facts can speak, and that would be real superstition, wouldn’t it?

Computation and Spirituality

I started in this chapter with an excerpt of an email to me from Tom Banks, in which he imagined that a quantum computer tells us that we are too dumb to understand quantum mechanics intuitively. Bank's "sci-fi future" suggests an absolute incommensurability of scales; this quantum computer, who has gained consciousness, is able to determine *for us* that we cannot understand the gap between itself and us. And what guarantees that there is no such incommensurability between two humans?

It is significant that Banks' "quantum computer" *speaks* and says quantum physics implies an alterity beyond human comprehension. Rosenblum and Kuttner tried to articulate that alterity in the "quantum enigma," but colleagues rejected the duo's articulation. One reason for this is that Rosenblum and Kuttner's version brought the alterity of the quantum enigma into the human world, which, as the two themselves noted, caused problems for the theory of authoritative empirical knowledge. Keeping the enigma out of relevance to human experience is one way to avoid the paradoxes described by Rosenblum and Kuttner, and there are good theoretical reasons for doing so. In fact, in the past several decades physicists have developed decoherence theory to explain the transition from a quantum to an apparently classical world we live in.

In short, decoherence theory demonstrates that the interaction of a microscopic particle with its environment "decoheres" the interference terms that give rise to quantum-type behaviors. As a result, when a macroscopic (human scale)

measurement is made of a quantum system, the result is a quantum probability distribution that is empirically indistinguishable from a classical probability distribution. The interference terms become so small that they are impossible to measure in principle³². UCSC physicists including Tom Banks, Michael Nauenberg, and Michael Dine all assured me that the theory of decoherence adequately explained the appearance of a classical world from the quantum one. Banks and Nauenberg both emphasized that it is “unscientific” to talk about quantum interference in everyday life because such interference effects cannot be measured.

Decoherence, like Rosenbloum and Kuttner’s meditations on free will and induction, is a theory that grounds the authority of empirical knowledge about quantum physics, but in a way that is stabilizing for quantum physics, rather than troubling. In this conclusion to Chapter 2, I want to point to the transcendental gesture that the theory of decoherence enables: it, too, is a piece of scientific discourse on subject constitution, and it too plays a role in the transcendental authorization of scientific knowledge in a manner than is expressed with concepts internal to science. I argue the theory of decoherence is important to physicists because it assures that the kind of incommensurability suffered by the future scientist at the hands of his quantum computer is not suffered between actual scientists of today. In this vein, I will briefly show that decoherence theory extends beyond its empirical foundations and forms part of the metalinguistic discourse of physics that explains the very possibility of empiricism.

³² In principle here means, to measure them would take time-scales of exponentially greater magnitude than the age of the universe.

I have argued that physicists' differences in interpreting quantum mechanics are not reducible to a difference of knowledge, opinion, or viewpoint. There is a constitutive disjuncture between the scientific subject and its practice that opens onto a mode of appearance that compels the subject to suture the disjuncture between the two. This may result in an effort to think "quantum" rather than classically, to rectify apparent logical contradictions, or as we see in the next chapters, the effort may even go so far as identification with the atomic world (to obtain "quantum consciousness" within oneself). In any case, these efforts are not reducible to practice alone. Rosenblem and Kuttner's course suggested at least a possibility of quantum spirituality because it rendered plausible a real transformation of the psyche that occurs as a result of working through quantum physics. Not only my opinions and knowledge change, but what the facts say to me also changes, in a way that shifts my experience of inside and outside, psyche and physics.

So what keeps spirituality at bay? How is the "esoteric," constitutive and not fully communicable dimension of knowing quantum mechanics denied, veiled, or repressed? What keeps physicists safe from the devastating incommensurability delivered by Bank's imaginary quantum computer? The answer is implicit in the chapter as a whole, but now can be stated clearly. To avoid postulating a constitutive demarcation within the subject that would reveal an esoteric dimension to speech, a determinate translation of meaning has to be posited between two interpreters who have different understandings, such that, at least in principle, the meaning of any sentence can be known for certain, so that this meaning is known to be shared in

common (this is roughly Wolfgang Pauli's definition of objectivity, for example). As I have shown, imagining computation as the paradigm for thought is also to imagine thought as determinate translation: physicists compute, physicists imagine thought as computation, thought is computation. If brains work like computers, they compute, and therefore in principle we could understand how anyone thinks. The becoming-conscious of the computer is the limiting point of the disjuncture between a computational model of consciousness and consciousness itself. If only the computations of consciousness could coalesce with our consciousness of computation, then we would finally know what each other means for certain. Many physicists imagine that the neuroscientists might solve that problem for them eventually.

When Tom Banks asked Wojciech Zurek, a leader in the field of decoherence, to comment on Rosenblum and Kuttner's book, Zurek did not simply state his position of how decoherence adequately addresses the measurement problem and the apparent quantum-to-classical transition. I argue that would have been enough to answer the question. But Zurek went further: he stated that the brain decoheres and that consciousness will therefore most likely be explained classically by neuroscience. Why would he say that?³³ To imagine consciousness as classical computation is to order the total of knowledge such that there is no intrinsic or inherent disjuncture in human consciousness: what we do not know of consciousness now can be known in the future. The *objective* limit to knowledge given by quantum

physics is thereby contained in the sub-atomic world and does not seep into the human world. If we do not understand each other now, we may in the future. To say that consciousness is not quantum is also to say that the intrinsic uncertainty of the quantum theory does not affect the condition of possibility of human knowledge as such since consciousness is classical.

Although Tom Banks imagines, playfully, a conscious quantum computer infinitely beyond us, Roger Penrose and Stuart Hameroff hypothesize, literally, that the human brain is a quantum computer. In the next chapter on quantum consciousness the imaginative travels of QC physicists attempt to catch traces of a consciousness in that place beyond the objective limit of knowledge provided by the uncertainty principle.

Chapter 3: Proliferation: Counter-induction and Realism in

Anticipation of the New Paradigm

“I think if we ever reach the point where we think we thoroughly understand who we are and where we came from, we will have failed.”

Carl Sagan, *The Varieties of Scientific Experience*

Spiritual Politics for a New Paradigm

I met Monica Cotto, a post-doctoral student at UC Berkeley, when Professor Wolfgang Baer invited Cotto and me to Monterey Naval Postgraduate School (NPS). Baer, a soon-to-be emeritus professor, wanted input from Cotto on the mathematical aspects of his theory of the physics of consciousness, and I was invited as anthropologist-participant. Cotto helped Baer with the mathematics, directed him toward some key sources, and then took the opportunity to attempt convince Baer his work would benefit from better social networking. Baer should meet high impact quantum consciousness scientists, Cotto insisted, and they would show him how to seek out the sources of funding and media dissemination that would make Baer’s ideas more widely known. Yet Baer worried that a more public stature was not quite what he sought, and he wondered what strings would be attached to fraternizing with people like Deepak Chopra, a major media mogul who has played a central role in quantum consciousness networking. Would increased popularity force Baer to compromise his message? Cotto insisted it would not, and a few years later Baer was up on stage with Deepak Chopra, 12 other scientists, and actor Jim Carrey at

Chopra's Sages and Scientists Conference in Carlsbad California. Baer was able to stick to his message after all, though he did wonder sometimes to what extent he was truly being heard.

I soon learned that Monica Cotto played an important role in QC research because of her avid networking efforts. She was not only trying to increase her own connections, but also use her many connections to help other QC scientists meet one another. As Cotto knew, many QC scientists are isolated individuals, working on unique quantum consciousness projects alone or with only one or two others. Cotto sought out isolated individuals who gave talks at conferences or made publications in quantum consciousness journals and helped them become part of the QC community; she encouraged them to mingle with those who sociologist Harry Collins (1981) would call the "core set" members of QC. In an interview with me, Cotto explained her motivation in bringing individuals together was to "build the new paradigm" more than to advance her own personal career.

This claim was not likely inspired by mere modesty. In fact, as Cotto saw it, her efforts in QC might be putting her budding physics career in danger. Cotto's name is a pseudonym. She prefers anonymity because she separates her "mainstream physics" life from her life in the marginalized discipline of quantum consciousness. She is concerned that her quantum consciousness studies could have negative effects on her job prospects. I have agreed not to discuss her "mainstream" work to prevent the possibility of revealing her identity, but I do it with regret, since she incorporates that work with her QC research in instructive ways. Her internal intellectual life was

not so split as her social life.

Not unlike other QC scientists, Cotto's endeavors were guided by the temporality opened up by a mutual understanding that QC scientists are together engaged in making a "paradigm shift" toward what QC scientists commonly refer to as the New Paradigm. In this vein, Cotto made strong statements among her QC colleagues, and roused them to understand that paradigm shift requires a finely tuned combination of empirical research, political struggle, intellectual effort, and spiritual engagement. Cotto understood everything (or most everything) she did as part of this effort. Sometimes she would disappear for a few hours or even days without notice (if it seemed at times notice should have been given), returning to explain she was doing yoga, swimming, or at a meditation retreat. In contrast to her mainstream physics life, QC was a world in which Cotto did not feel the demand to separate science from spirituality, but where instead she could talk openly about her spiritual developments in a language spoken in the terms of modern physics as much as Eastern and Western spiritual traditions, which she sometimes called the "wisdom traditions."

Cotto's contributions to QC email lists and message boards were usually scientific criticism, but once in a while she would send a poem or quote, for example, this poem by Rumi, which would break the flow of the text of email arguments much as it breaks the flow of my own ethnographic analysis:

An intellectual is all the time showing off. (Am I, the anthropologist, not an intellectual? And you too, dear reader?)

Lovers dissolve and become bewildered. (Then keep reading...)

*Intellectuals try not to drown,
while the whole purpose of love is drowning.*

Intellectuals invent ways to rest, and then lie down in those beds.

Lovers feel ashamed of comforting ideas.

You've seen a glob of oil on water? That's how a lover sits with intellectuals, there, but alone in a circle of himself.

Some intellectual tries to give sound advice to a lover. All he hears back is, I love you. I love you.

Love is musk. Don't deny it when you smell the scent!

Love is a tree.

Lovers, the shade of the long branches.

To the intellectual mind, a child must learn to grow up and be adult.

In the station of love, you see old men getting younger and younger.

Shams chose to live low in the roots for you.

So now, he soars in the air as your sublimely articulating love!

~ 'Like This', Rumi.

In the lines of her email following this poem, Cotto suggested that her colleagues in QC might remember the truth of love that inheres in knowledge. She also reminded them that science is not a great grid of interconnected facts with only a few, or very many, holes left to fill. Rather, events occur everywhere and always that have no scientific explanation. For Rumi, the mystery of the One is in everything created. What then, does it mean for something to be understood? Is scientific knowledge a network of true statements with small lacunae to be filled in here and there? Or is it more a game of sleep, to hide us from our longing for union with the beloved? Cotto was not atypical among QC scientists in holding these questions close to her as she performed her research. Like many QC scientists, Cotto added “spirituality” to the list of prerequisites in her otherwise more or less Kuhnian account of how to make a “paradigm shift.”

QC scientists do not think spirituality is part of every paradigm shift. It is rather what would make the paradigm shift to be brought on by quantum consciousness a unique event of potentially world historical significance. Cotto admonished her colleagues to remember how long it took for the Newtonian worldview to become established in the West after Newton's discoveries: "at least a few centuries." Cotto's implication was that present day scientists should recognize that their own worldview is similarly behind the times. Political work would have to be done to make institutional and intellectual space for quantum consciousness to even begin to be able to ask the right questions. A proper research program, Cotto admitted, was far in the future. At the same time, Cotto insisted that "mainstream" scientists who simply dismissed QC were badly shortsighted. Current quantum consciousness science admittedly stands in a marginal state today, but Cotto was motivated by a future history, which she and other QC scientists called the New Paradigm, that would eventually redeem QC's hypothesis that consciousness is fundamental to all physical processes.

Cotto surmised that the reason QC is not yet universally accepted science is not because QC is wrong, but rather because Newtonian consciousness inevitably makes progress in the right direction appear absurd to contemporary scientists. Indeed, many scientists and scientifically minded people still think quantum physics itself is absurd or "weird": "we" find it difficult to integrate our knowledge of quantum mechanics with the whole of our knowledge and expectations (I made this point myself in Chapter 2.) For Cotto, this situation further demonstrates our

ignorance of what is to come. Her imaginative horizon (Crapanzano 2004) of scientific history foresees a future for humanity that is both certain and unforeseeably different from the present: certain because quantum physics has revealed that the future “New Paradigm” will eventually reconcile science and spirituality, and unforeseeable because the scientific and social consequences of this effect cannot be known before hand.

This chapter describes the elements that hold quantum consciousness together as a marginal and “radical” science that neither disappears nor becomes “normal science” in the Kuhnian sense (Kuhn 1962). Quantum consciousness does not easily fit into the Kuhnian designations of either “revolutionary” or “normal” science, or into what Harry Collins (1985) calls an “extraordinary” science. Many in QC are hesitant to call QC a science at all; instead they refer to an “emerging science,” to designate a science yet to come.

As a social formation, QC relies upon hybridizing and networking (Latour 1993; 2005) between disjointed communities and institutions that would otherwise remain separate in their processes of self-reproduction. At a given time, a group of QC scientists may find funding offered from an obscure and secretive philanthropic group located in Denmark, arrange for an experimental set up at the Institute of Noetic Sciences in Petaluma, and publish the results in a low-impact journal. At the end of it, it may be that fellow QC scientists cannot agree upon what the results mean. And the next time around, a new “assemblage” (Marcus and Saka 2006) must be created almost from scratch. The problem faced by QC is not only a lack of access to

resources, but perhaps even more so a problem of lack of stability across time in piecing together those resources. It is as if there is an array of potential elements (individuals, theoretical questions, experimental methods, funding sources, dissemination sources, etc.) that has to be “got going” again for each new project. For most QC scientists, nothing is already going for you before you get started.

QC’s quest for a New Paradigm is a unique example of the role of induction as a governing principle of sociality in science. Induction is constitutive of scientific practice, but not reducible to it, because induction cannot itself be reduced to an empirical object of any scientific knowledge. Just as Durkheim’s (2008) “collective effervescence” introduces a proper name for the substance of the ritual constitution of the social, so Hume (1993) recognized in the social custom of induction an organic compulsion to repeat. This question of substance, and its uptake into the social, is also a concern to QC scientists, who attempt to think the organic with quantum mechanics. Cotto, for one, attempts to transform the social efficacy of scientific knowledge in revealing the social substance (here called “love”) inherent to induction. In speaking of substance I intend to conjure problems of metaphysics, since it is the intention of QC discourse to bring its listener to the problem of induction in general or “as such”, a discussion that inevitably leads toward what QC scientists call the “mind-matter problem” (see also Chapter 2). Never far from the QC scientist’s mind are problems like the one David Hume (1993) showed us: induction is the basis of empirical knowledge, but is not itself empirically demonstrable.

Empirical knowledge contains both inter-subjective and denotative elements

comprising measurement, and a temporality of expectation known as prediction. Given all this, any empirical proof of induction's validity presumes what it sets out to prove. It is well known Hume concluded that induction rested its authority on belief enacted in social action or "custom." Perhaps less attention is paid to Hume's introduction of a metaphysical substance, a tendency to repetition in the mind, to resolve the paradox. This substance is not only cognized in thought, but also in feeling. It is felt to be real; one feels it *must* be real. For QC scientists, "universal consciousness" (rather than Hume's cognitive tendency) fulfills the need for a transcendental guarantor of inductive knowledge. Here we have returned to Cotto's reminder of the element of love and faith that inheres within knowledge. Induction cannot be justified by empirical argument, although it stands as empiricism's basis of authority. In this way, induction is the "metaphysics" that gives metaphysics its modern meaning; metaphysics is no longer the science of Being qua Being as in Aristotle's *Metaphysics*, but becomes defined against empiricism as "non-verifiable knowledge" (Shapin and Schaffer 1985). Induction is the non-verifiable knowledge that grounds verifiable knowledge.

From one direction, this problem is a source of paradox amplified by QC scientists and minimized in the practice of disciplinary science. Yet another reading is possible, if we recognize that in QC discourse "consciousness" is something social and compassionate, so that to find consciousness at the foundation of science is to find community, love, and faith as a hidden desire beneath even the most doubting ethos of empiricism. This the inner-personal struggle that many QC scientists engage

within: they too feel the power of empirical doubt, and as much as any other scientist they cannot stand to hear too much about faith or belief. As much as for any other (atheist, “mainstream”) scientist, QC scientists worry that angels of faith are liable to turn into dragons of dogma. Seeking out a New Paradigm is intended to resolve this dilemma found at the foundation of scientific thought in the problem of induction, and its corollaries: the mind-matter problem and the quantum measurement problem. The New Paradigm is the infinitely distant yet immanent point in the future when universal consciousness appears through an empirical frame, finally giving guarantee to the veracity of induction. In this sense, the temporality of awaiting the New Paradigm mimics certain religious eschatologies by positing a transcendental guarantor that appears at the “end of history,” (Stewart and Harding 1999; Harding 2000; Rutherford 2012) but this time to revive the authority of science in the face of economic collapse, apocalyptic bad weather, and nuclear annihilation.

In this chapter we will see how the thought and sociality of quantum consciousness can be described in the way it organizes around the problem of induction. As I my discussion below will demonstrate, induction includes its opposite, *counter-induction*, and can therefore make disorder out of order. In the case of QC, the problem of induction makes rhizomatic connections between the mind-body problem and the quantum measurement problem, and shows up in every scientific discipline. It is made to appear standing as the metaphysical foundation of every empirical enterprise. In this way, QC radicalizes the equivocality of induction and sets it to work against the “mainstream.” This is not done in the name of some ulterior

“spiritual” motive, as some critics of QC have charged (Koch 2012; Tegmark 2014), it is done in the name of a radical empiricism that insists on empirical criticism of all “metaphysics,” including that metaphysics which sustains science: the metaphysics of induction. In other words, while scientists who work within the paradigm of a “normal science” may place doubt in *this* or *that* induction, QC doubts induction *in general*. This is a radicalized empiricism, which ends up turning itself inside out. In that case, it becomes attuned to the quality of social bonds, and then takes up various forms of social commentary, science advocacy, and spiritual revival. I will show that the result of this totalized “empirical doubt in the basis of empiricism” turns induction into counter-induction, where counter-induction can be defined as the form of induction that takes into account the possibility of its own negation. All this is done in the name of averting the planetary catastrophes articulated by scientific discourses of climate change, rising income inequality, and nuclear disaster.

Insofar as QC refuses to settle itself into any “normal” (*pace* Kuhn) scientific discipline, it does so because there is no empirical solution for two dilemmas that it conjures at the source of mainstream scientific subjectivity: the mind-matter problem or the quantum measurement problem. The mind-matter problem and quantum measurement problem can both be universalized so as to reveal the necessary “metaphysical” (i.e. inductive) commitments of all scientific disciplines. In a gesture of radical empiricism, QC refuses commitment to *all* metaphysics, including induction insofar as it remains metaphysical. It therefore seeks an empirically verifiable inductive practice, which for Hume would be impossible, but which for QC

is motivation for what I will call proliferation in science. As we shall see, proliferation in QC takes on millennial proportions: the fulfillment of the impossible in the form of an empirical solution to the problem of induction redeems all other metaphysical toils in science and at the same time provides a cure for the social substance of science in general, giving rise to the New Paradigm.

In describing the ways of quantum consciousness, I have borrowed terms from Paul Feyerabend's philosophy. Feyerabend (1981) identifies "proliferation" in science by two connected rules: counter-induction and realism. The rule of *counter-induction* states that science sometimes makes new discoveries when new theories are invented that fit the same data as the old theory. The practice of making up new theories, or multiple theories, that fit the same "old" facts would be disallowed by Karl Popper's (1959) philosophy of science based on his criterion of falsification.³⁴ Nevertheless, Feyerabend (1975, 1981) considered it a historical fact that scientists engaged in counter-induction to advance science, whether or not philosophers of science consider this practice to be permissible.

The second rule of proliferation is *realism*. Realism implies the belief that the imagination can grasp unknown realities, and participate in them substantially, as it were. Realism is always preferable to pragmatism, as Feyerabend would say, because realism engages the imagination to create new counter-inductive theories. Since more

³⁴ For Popper (who was Feyerabend's teacher), a new theory is only needed when a set of "new" facts begins to destabilize the reputability an old theory. See Popper (1959) *The Logic of Scientific Discovery*. However, Feyerabend (1975, 1981) provided several historical examples in which the invention of a new theory prior to the emergence of new facts advanced science. A new theory made it possible to conceive of new experiments that consequently produced the new facts that could disprove the old theory. Had the new theory never been invented, the new experiment could not have been conceived.

than one counter-inductive theory can exist simultaneously, Feyerabend's ideal scientist holds multiple contradictory theories to be true at once, and acts on belief in all of them. As Feyerabend pointed out, scientists necessarily hold multiple theories to be true at once without ever fully commensurating them. Counter-induction, then, requires a realistic yet anarchic imagination, as opposed to the pragmatic attitude that can only retain the old theory until disconfirming facts arise. A healthy science exists in an "anarchic" state of pluralistic realisms.

Proliferation and Ethnography of Science

Feyerabend's concept of proliferation appropriately characterizes QC because the proliferation concept is indebted to Niels Bohr, the seminal quantum physicist, and Feyerabend's philosophy of science takes inspiration from the concepts and problems of modern physics.³⁵ Feyerabend's endorsement of proliferation allows for the kind of ethnographic participation necessary to do justice to QC's project, which is no doubt an impossible one. Seeking an empirical solution to the problem of induction opens up a temporality for a permanent state of proliferation. The structure of proliferation can be articulated as a double-layering of certainty and uncertainty: proliferation derives from a situation wherein scientists are uncertain about whether or not they are certain about the meaning of their statements. In other words, like any

³⁵ cf. Feyerabend (1981). Feyerabend also had an interest in mysticism and Neo-Platonism, and one can readily find continuities between his doctrine of proliferation and his more mystical persuasions. cf. Kidd 2010. It is also important to note that Feyerabend's concept of proliferation extends beyond the problem of more than one theory corresponding to the same set of facts, into the theory-laden basis of facts. It is the instability of the limit between facts and their theoretical interpretation that renders proliferation necessary and unavoidable to some degree. This complication is addressed later in the chapter.

scientist, QC scientists are at times certain of the inductive logic they put forward, and at other times they are not so certain. What distinguishes QC from disciplinary science is the way the temporality of the “New Paradigm” mediates this contradiction by positing a total doubt in *induction in general* and then organizes a sociality around that total doubt, rather than repressing it so as to carry on with the “normal science” of this or that paradigm.

For this reason, QC poses challenges for method in ethnography of science. In this section, I briefly consider these challenges so as to put better focus on proliferation as it occurs in QC. Harry Collins’ (1985) *Changing Order* is a comparison of how knowledge is made in three scientific disciplines. Collins book is instructive here because it explicitly provides a “sociological” solution to the problem of induction. Collins, the sociologist as observer, claims to have empirical access to practices of induction in any given science, and makes sociological comparisons on that basis. What does the sociologist supposedly see when he witnesses induction as an ordering principle for science? He sees that induction is judged to be correct or incorrect in relation to “social convention.” Such conventions or norms may vary across disciplines, but must maintain coherence within disciplines for knowledge production to happen.

This is not a true solution to the problem of induction, but a “pragmatic” solution, and we shall see, it is inadvertently conservative much in the way Karl Popper’s philosophy of falsification and refutation is conservative in contrast to

Feyerabend's.³⁶ Moreover, Collin's solution is spurious because social convention is no more observable than induction. In imagining that he can *see* social conventions, Collins makes a mistake that QC scientists would not make: he claims to solve the problem of induction by locating its authority in the "social," and claiming to have empirically verified it.³⁷ Note that David Hume (1993), in his *Enquiry Concerning Human Understanding*, also makes the first move, but refrains from the second. QC also articulates a response to the problem of induction, yet it is a spiritual response involving both consciousness and physics, carried out in the practice of its impossible quest and oriented toward future fulfillment, as we soon shall see.

Claiming to "see" induction in the "social," or even in a hybrid of "nature-culture" (*pace* Latour 2005, for example), is to be even more conservative than "mainstream science," insofar as mainstream science cannot do with the total exclusion of proliferation from scientific thought, because the total exclusion of proliferation from science amounts to the claim that the time of writing (if not the time of ethnographic fieldwork) is always a time when scientific revolution is over. The hostility I encountered among some scientists toward science ethnographers can be explained by their concern that I thought I would be able to see something they

³⁶ Popper's famous description of science as a process of hypothetical conjecture and experimental confirmation or refutation can be found in his *The Logic of Scientific Discovery* (1959). Feyerabend's criticisms of Popper's philosophy can be found in Chapter 6 of *Farewell to Reason* (1987), pp. 162-191.

³⁷ While many science studies scholars, in following the "ontological turn," have given a strong critique of SSK's move of limiting realism, these scholars share with Collins the practice of banishing counter-induction, since claiming to have empirically discerned the source of an induction coincides with the exclusion of counter-inductive reasoning. No appeal to "co-emergence," "hybrids" or "nature-cultures" (Haraway 2008; Latour 2005) can exempt us from this difficulty, since these appeals still collapse the transcendental into the empirical, if perversely so. The fact that many STS scholars take a perverse stance consciously and affirmatively does not change its inability to account for proliferation in QC and science more generally.

could not see; that I would claim to have revealed the source of the mystery of induction, and in the wrong place: in “the social” rather than in “nature.” To make such a claim would be doubly incorrect. First, for the scientist, the correct name of the source of induction is “nature”. Second, the imaginative temporality of science requires that judgment on all metaphysical questions be forestalled to a future time, when they can be decided empirically. In contrast, both sociologists of science and “ontological turn” scholars (e.g. Mol 2002; Law 2012; de Castro 2014) oppose this temporality of science in practice when they reduce “ontology” to something that can be discovered by ethnographic research and thereby make *metaphysical judgment now*, in the name of empiricism. This has the effect of closing the transcendental gap opened by the problem of induction, as well as its historical-transcendental corollary found in the progressive imaginative horizon of empirical research. In “mainstream” scientific temporality, it is *not yet time* for such metaphysical judgment, except only provisionally when necessary³⁸. Such a position maintains the problem of induction whose function is the opening of discursive space for further *empirical* research by forestalling all *metaphysical* determination to the future.

When Collins defends his theory of how “facts” become “entrenched” in a “reality” mutually created by scientists, he does not take seriously that scientists often claim they “do not know what reality is.” An attitude of “unmasking” science’s underlying “metaphysics” forecloses the possibility of discerning the social effects

³⁸ My analysis of the temporality of metaphysical judgment in science is indebted to Robert Meister’s (2010) argument in his book *After Evil* concerning what he calls the “Theology of Human Rights,” which he traces from its Christian origins. My “Theology of Metaphysical Judgment in Science” undoubtedly has related origins, but I will have to explore them in a later connection.

that the denial of “metaphysics” has within science. Latour’s (1999; 2004) “constructive” attitude of showing how such “factishes” are made is no better, because it too ignores or at least downplays the potential for total doubt in science: the claim I often heard from physicists “I do not know what ‘reality’ is” is both an affirmation of total doubt and a denial of metaphysical talk. It matters that scientists deny metaphysical talk because this denial opens up the metaphysical-temporal horizon (“now is not yet time for metaphysical judgment”) that is the condition of the continuity of the scientific tradition, and subject constitution within that tradition. QC is a challenge to this way of speaking and therefore an internal opposition to how the scientific tradition is delimited.

An ethnography of science that comes to terms with proliferation must be able to theorize total doubt in science, because the difference between QC and the “mainstream” is not a positive or categorical difference. It is a difference in the way each social group organizes around and constructs the meaning of what it does not know in relation to what are understood as ontological constraints or absences, as in the problem of induction. This means that I will not claim to have observed “induction.” Instead, I must walk a difficult boundary, working more as a participant than an observer, learning how to organize my own thoughts around a doubt in induction-in-general in a way that resonates with QC. We shall see how the difference between QC and the mainstream is a difference in ways of organizing around and relating toward what QC scientist Sperry Andrews calls the Void. The QC method of reading quantum mechanics leads to a proliferation of this “void,” from this induction

to that one, until the point when induction itself is thrown into doubt. If one is fortunate, one may find universal consciousness within the void. What many QC scientists are looking for there is called community, love, or consciousness. It is from this vantage point that one becomes able to see the Newtonian Worldview of mainstream science, toiling in its unconscious and inconsistent commitments to *these* inductions but not *those* ones, and engaging in wordplay, asserting that some metaphysics is not really metaphysics but “pragmatic assumptions,” whilst other assumptions *really are* metaphysics. It is from this vantage point that the stage is set for proliferation.

Proliferation within the Newtonian Worldview

In the late 2000's, the Graham Fleming Lab at UC Berkeley experimentally demonstrated electronic coherence in the energy transfer process of photosynthesis, a quantum phenomenon not reducible to classical approximation. Very quickly, discussion of the “role” of quantum mechanics in photosynthesis became a topic of interest for popular science magazines, science blogs, “New Age” mystics, as well as QC scientists. Significantly, commentators not directly involved in the study, or in the discipline of quantum chemistry more generally, tended to see the Fleming Lab's discovery as having profound metaphysical, even “paradigm-shifting” implications. The Fleming Lab fought against such readings. Nevertheless, in this section I intend to show how such a “metaphysical” reading, which coincides with what I have called proliferation, is at least already implicit to the logic of scientific inquiry of the

Fleming group. In other words, such a reading must be “stopped short,” so that it is not amplified beyond what are considered reasonable proportions. As I have argued, such a stopping short entails a particular ethical orientation toward metaphysical (defined as non-empirical) judgment: the time for such judgments has not yet come, because we cannot yet decipher their meaning. These are the negative determinations that bring into relief a way of fulfilling the obligation to empirical knowledge in science, as we shall see in the following case.

My argument revolves around how different individuals represented the motivations and meanings of the Fleming lab’s results, and not around the lab practices themselves, which I did not study or witness. I sought out several interviews with several graduate students and one post-doc (Fleming refused an interview) because of the role the lab’s results had in QC discourse. QC’s talk about the Fleming lab was one example of how QC assembles its permanent revolution by “proliferating” on the significance of scientific results like those found by Fleming. In this section, I explore how an account of quantum photosynthesis by a post-doctoral student in the Fleming laboratory tended to forestall or demur on aspects of proliferation that were nonetheless admittedly intrinsic to the professed motivation for studying quantum photosynthesis. In the following sections, I show how a leader in QC amplifies proliferation for the sake of converting “materialists” to “change worldviews” and seek out “the New Paradigm.” Meanwhile, it is essential to understand that both individuals make a balancing act of skepticism and proliferation, which amounts to saying that every induction is a potential counter-induction, and

this ambiguity defines struggles over the continuities and discontinuities of the scientific tradition.

I contacted the Fleming Lab in 2012 to discuss quantum photosynthesis. Graham Fleming directed me to a postdoctoral student named Jahan Dawlaty, who would be willing to see me because he had interest in translating science to the public. Both Fleming and Dawlaty recognized me as someone in need of instruction. Dawlaty was keenly aware of the “questionable” things that were being said about his lab’s results – “New Agey,” “spiritual,” and “pseudoscientific” things that were misleading the public. He also criticized the popular science media for exaggerating the significance of the results. He had a vague sense of quantum consciousness, but he had little conception that QC composed an organized social network of scientists. For him, QC was “promoted” by loner fringe scientists who misunderstood the correct meaning of what the Fleming lab had discovered. Dawlaty believed that QC scientists were wrong about what the facts were, and he spoke of them as though they were Pied Pipers leading the public astray. Hence, he intended to teach me the science, that is, to instruct me on the proper demarcation between fact and interpretation.

As a rebuttal to his idea of what QC scientists were saying about his lab’s work, Dawlaty assured me that “this has nothing to do with consciousness.” He added, “The truth is we don’t know whether electronic phase coherence plays any necessary role in the function of the plant.” In other words, quantum coherence had been confirmed as happening in photosynthesis, but there was no way to say whether

quantum processes are necessary to photosynthesis. Dawlaty showed me how it was possible to measure energy transfer from sunlight into plant cells, and explained how it was possible to distinguish between classical and quantum-type energy transfer.

But then, upon a moment of reflection wherein I remained silent, he became concerned that his wording could mislead me into believing quantum mechanics was a special-case theory and not a universal one, so he added, “nobody doubts that quantum physics plays a role in life, because the way molecules exist is a quantum process. At one level, the way the world exists is a quantum process, for example, the Pauli exclusion principle [discovered by Wolfgang Pauli in 1925] makes the periodic table possible.” In this way, in addressing me, Dawlaty came upon the problem of demarcating facts from their interpretation. We have seen that in discussing quantum mechanics, such a demarcation is a feat that requires rigorous conceptual equipment. On the one hand, to speak of a “role” of quantum mechanics in life processes seems to imply a bifurcation of the world into quantum and classical domains. The passion to interpret scientific theories realistically leads Dawlaty to an affirmation of a merely pragmatic status of such a bifurcation between quantum and classical worlds, as is seen in the metaphysical assertion that, “the way the world exists is a quantum process,” a statement which engages the realist imagination, and therefore, as we shall see, flirts with potentials of proliferation.

In coming upon this problem, Dawlaty quickly “stopped short” and directed my attention elsewhere. Though such metaphysical statements could be made, it was *not yet* time to discern their meaning. Rather than discuss philosophy, he proceeded to

fill in and replace the word “exists” with a long discussion of the mechanisms of quantum photosynthesis. Dawlaty revealed to me that what he *did* already know was matter of empirical demonstration. He could show, for example, how measurements of energy transfer demonstrated that quantum phase coherence was maintained in a way that made the transfer more efficient, and he explained why those results invalidated older models of photosynthesis that presumed energy transfer occurred in a “classical” way, not a quantum one. Soon, my exposure to the quantity and complexity of his knowledge of the science of chlorophyll made me feel like my “philosophical” questions were a bit naïve. It became clear to me that quantum coherence in photosynthesis was one piece of the larger practical structure of the laboratory; it did not have the same “paradigm-shifting” ramifications here as it would for quantum consciousness.

Still, Dawlaty’s articulation of the Fleming Lab’s mode of inquiry contains, at least potentially, the seeds of conceptual dilemmas that expand into quantum consciousness-type proliferation should it be permitted. To understand why, we must analyze the implications of Dawlaty’s claim that the discovery of quantum processes in chlorophyll did not mean that those processes are *necessary* for photosynthesis. Necessity is a transcendental judgment that cannot be determined empirically. Nevertheless, it was just this possibility of necessity that inspired Dawlaty’s interest in quantum photosynthesis. In this regard, he suggested some criteria for determining necessity, and each of these criteria were concerned with the possibility that a particular mechanism of photosynthesis would evolve by natural selection. For

example, Dawlaty supposed that greater efficiency in photosynthesis implied a possible evolutionary advantage. As he put it, “If you show that it helps just a little bit, that is enough in the biological world to say yes that gives an evolutionary advantage.” A moment’s reflection shows how Dawlaty is engaging in a kind of thought that requires realistic participation in scientific knowledge of the kind that gives rise to proliferation of counter-inductions. This is because the evolutionary advantage explored here is an advantage not based in a concrete ecosystem; it is rather an advantage among possible worlds. Evolution’s ability to select one type of physical mechanism over another implies a *telos* or selection of best possible worlds for the plant *as both a physical object and an organism* and not selection of organisms in a concretely defined ecosystem. Normally, evolution is understood to operate on biological traits. To say the least, Dawlaty’s speculation brings up metaphysical questions as to just how natural selection might operate to select “quantum” versus “classical” physical mechanisms as if the distinction between quantum and classical were equivalent to distinctions between biological traits. Yet, before I could make such a comment, Dawlaty’s proliferative train of thought was immediately qualified, since he immediately added, “But there is no consensus as to how much advantage it gives you compared to [a different widely accepted model of photosynthesis].” This is an example of the kind of self-limiting ethics Dawlaty demonstrated to limit his metaphysical speculation before it got going. No determination on the necessity of a quantum pathway in photosynthesis could be made since there is no consensus of what would constitute an evolutionary advantage

of one type of pathway in comparison to another. I would submit that such a consensus would require consensus on a metaphysical question, namely the transition between the inorganic and the organic. Such a metaphysical consensus is precisely what QC builds in relation to research like Fleming's on quantum photosynthesis, and that is why Dawlaty saw QC claims are irresponsible. At the heart of the question of quantum photosynthesis is the gap between the kinds of knowledge constituted by various experimental research programs including quantum mechanics, organic chemistry, and evolutionary theory (cf. Galison and Stump 1996; Knorr Cetina 1999). To enter too far into an interdisciplinary debate on quantum photosynthesis risks the kind of speculative proliferation quantum consciousness produces. Meanwhile, Dawlaty left the question aside for future determination.

The discovery of electronic coherence in photosynthesis did not lead Dawlaty to induce the necessity of quantum processes for photosynthesis. Dawlaty had named efficiency as a criterion for making such an induction, but deemphasized the metaphysical difficulties that arise from asserting that natural selection can operate on inorganically defined processes as those in physics. Still, if I am correct, it was this very possibility of establishing a "metaphysical" connection between organic and inorganic processes that animated Dawlaty's desire for quantum photosynthesis, a desire he dutifully held in abeyance until a future time when such a connection could be rendered empirically verifiable and therefore meaningful to his scientific community. After all, what could it mean that evolution would "select" a quantum mechanism for photosynthesis rather than a classical one? For Dawlaty, it is not yet

time to answer such a question, because we cannot yet know what the question means, or if it means anything at all.

Totalizing Science: Consciousness, Doubt, and Quantum Measurement

QC is not a simple reassertion of philosophical speculation into science; instead, QC's speculation is put to the service of rooting out metaphysics everywhere and subjecting it to criticism (this process should not be confused with abolishing metaphysics). Questions like the ones brought up by the Fleming Lab's quantum photosynthesis contain heterogeneous strata of scientific knowledge. QC scientists recognize a need to call into question the meaning of statements that result from research like the Fleming Lab's, in this case concerning the relationship between life, physics, and evolution. QC's adherence to proliferation is inspired by the sense that in the present historical conditions – the era of quantum mechanics - postponing metaphysical judgment does not further science but instead renders incoherent the meaning of statements that combine the scientific knowledge of more than one discipline or field. In other words, it becomes difficult to speak of a “scientific worldview,” and instead two worldviews come into relief: those who are of the “Newtonian Worldview,” and those who recognize that the Newtonian Worldview's game is up and are seeking a “New Paradigm.” From this view, a coherent and unified “scientific worldview” will only be restored by the development of new conceptual determinations that are as yet unknown. Hence, for QC, now is a time for proliferation of general level, transcendental concepts that mediate between domains

of scientific knowledge. It is not time to defer metaphysical judgment but proliferate metaphysical judgment. On the other hand, what is deferred to the future in QC research is making a decision about which of the many possible counter-inductions QC produces are to be designated as having a certain and established meaning. QC scientists seek the kinds of induction that will establish (good, true, adequate) connections between consciousness and physics – a kind of magic that would transform social bonds via the power of physical bonds.

In “The Science of the Concrete,” Claude Levi-Strauss³⁹ explains that science cannot answer the question of how to order concrete facts into an emerging structure as magic and myth does, since its method moves in the opposite direction, building facts out of already existing structures (i.e. research programs). For this reason, it is conceivable that competing scientific worldviews may emerge, and this is precisely the situation QC makes and then self-consciously stages to account for itself and its present. “Crisis” or paradigm shift is here not something recognized or responded to as happening only within a single scientific discipline; QC scientists see and react to a chiasm within science as a whole. As a result, they experience an opening up of a time wherein the meaning of scientific statements is not so clear, and thereby develop a sense that any experiment may become relevant to the development of the New Paradigm. It was not uncommon for me to meet QC scientists like retired theoretical physicist Richard Sears, who was familiar with some anthropological literature, and who articulated science as a unique form of magic. For Sears, the search for the

³⁹ See Claude Levi-Strauss (1966) *The Savage Mind*. “Chapter One: The Science of the Concrete.” Chicago: University of Chicago Press.

“New Paradigm” included coming to consciousness of the magical aspects of science (where “magic” was defined in a general anthropological sense of an efficacy between words and things). As a member of the Friends of Carl Jung Society of Monterey, California, Sears knew that magic entails a way of responding to or working with risk, indeterminacy and uncertainty (c.f. Malinowski 1925; Evans-Pritchard 1976; Levi-Strauss 1963).

For QC scientists, the two most significant points of amplification of indeterminacy of meaning is found in scientific knowledge of consciousness on the one hand, and the quantum measurement problem on the other. When QC scientists affirm that “consciousness” conjoins with “wave function collapse,” I argue they are also implicitly affirming that scientists do not yet know the full meaning of their statements on these questions, and such judgment has *not yet* come, and even cannot come, prior to an unforeseen scientific discovery that determines the meaning of wave function collapse. This is because while much can be said philosophically about both the mind matter problem and the quantum measurement problem, scientists take for granted that the meaning of such talk cannot be known for certain until an experiment renders the meaning of such statements clear.

To elucidate these themes, I will explore how Dr. Stuart Hameroff took up the results of quantum photosynthesis into his work on quantum consciousness. Stuart Hameroff is a leader in QC, and a friend and colleague of many other high-profile QC researchers. He first gained his notoriety in science for his collaboration with Sir Roger Penrose, a high-profile and illustrious physicist, on the QC theory of

orchestrated reduction in microtubules. The popularity of the Penrose-Hameroff theory helped launch the first “Toward a Science of Consciousness Conference,” an interdisciplinary conference still held bi-annually in Tucson Arizona. Roger Penrose, Hameroff’s co-author, makes strongly metaphysical arguments that receive attention from other well-known scientists in physics and neuroscience, due to Penrose’s high status. Penrose argues that quantum mechanics’ theory of “wave function collapse,” the point of transition or “cut” between description by quantum superposition (which is never observed) and description of an observed (“classical”) experimental result, may require reference to Platonic values that condition the measurability of the observable world. Penrose hypothesizes non-computable Platonic values condition the collapse of the wave function and therefore contribute to the structure of the boundary between “classical” and “quantum” worlds. This characteristic of non-computability, Penrose says, is shared by consciousness. With reference to Plato and consciousness’ access to a higher realm, Penrose’s ideas resonate well with the metaphysical or New Age tradition, yet Penrose’s prize-winning achievements in both physics and mathematics, and ability to dissociate himself just enough from Stuart Hameroff’s more “New Agey” ideas, make Penrose immune from too much derision by colleagues in science. I never met Penrose in my own fieldwork, and everyone I talked to spoke of Penrose as a figure of the highest reverence, even if some physicists thought Penrose’s ideas on consciousness were a bit “wacko.”

Meanwhile, Hameroff has gained popular celebrity among spirituality consumers and seekers on the science and spirituality lecture/conference circuit, and

he has appeared on television and was featured in the cult-hit documentary “What the Bleep do We Know.” (Rosenblum and Kuttner referred to this film as a primary example of quantum pseudoscience, see Chapter 2). In part a result of his association with Penrose, Hameroff’s popular celebrity among American metaphysicals draws many to the TSC conference, and is part of what makes TSC a “hybrid” conference of scientists, mystics, doctors, philosophers, and gurus. Meanwhile, Hameroff has maintained his day job as an anesthesiologist; it is notable that even such a successful figure in QC such as Hameroff does not work in QC research full time, but has another, more “mainstream” life and profession that sustains him. Hameroff is professor emeritus at University of Arizona Department of Anesthesiology, and is well known in the quantum consciousness world as Director of the Center for Consciousness Studies, also at the University of Arizona. The center hosts the above-mentioned biannual Toward a Science of Consciousness Conference. The name of the conference, as Hameroff emphasizes, is meant to suggest that a developed science of consciousness is not here yet, but in the making. As it turns out, the name of the conference in 2016 was changed for the first time to the “Science of Consciousness Conference.”

Hameroff spends a great deal of time on the road promoting the orchestrated reduction theory of QC, both by attending hybrid “science and spirituality” conferences like the Science and Non-Duality Conference (Hameroff knows the organizers and helped get this conference start up and gain popularity in the later 2000’s), and by giving lectures to university departments, and for other venues such

as TEDtalks and Google Tech Talks. Even at Hameroff's academic seminars, there is a sense of hybridization of science and spirituality, which contributes to the sense that a "New Paradigm" is emerging. For example, Hameroff visited the Redwood Center for Theoretical Neuroscience at the University of California, Berkeley in January 2013 to present a talk on "Quantum Cognition and Brain Microtubules." About one hundred people of all ages, mostly men, attended the talk. Before the talk, a recent Vision Science Ph.D. sitting next to me opined that the age of atheism was over and people like Hameroff would bring metaphysics back into science. Beyond being a vision scientist, this man was a young entrepreneur and seeker of new, "consciousness-shifting" experiences, some of which he hoped to turn into marketable commodities. He anticipated that if Hameroff were correct, a new synthesis would be possible between science and spirituality. Quantum consciousness science would therefore replace dominant sciences that lack what he called a "spiritual ontology."

This commentary at a seminar at the Redwood Center Vision Science is possible by virtue of this vision scientist's knowledge of an array of media dissemination that extends beyond the university proper, but also maintains its viable presence within the university. His ability to interpret the multiple levels of meaning in Hameroff's speech shows us that QC has an audience among scientists that reads various genres of popular and academic dissemination as in dialogue with one another, and as composing an emerging "quantum worldview," which is simultaneously recognized in contradistinction to the mainstream scientific

worldview, here registered as “atheism,” and often registered as “Newtonian.”⁴⁰

Hameroff views recent reports of quantum processes in biology such as quantum photosynthesis in the scientific literature as vindication for the Penrose-Hameroff “orchestrated objective reduction” theory of consciousness (known as Orch-OR for short). The Orch-OR theory combines knowledge from various branches of science, including neuroscience, physics, and anesthesiology. Penrose’s “objective reduction” interpretation of quantum mechanics, which makes reference to Platonic values, plays an important role in Orch-OR. In physics, “objective reduction” implies that the collapse of the wave function would be a real physical event, such that there is a real transition from a “quantum” world to a “classical” one. In contrast, as we have seen, most physicists understand wave function collapse only as a consequence of calculating probabilities for experimental outcomes. Recall for example Michael Nauenberg’s statement that “the wave function is ...*essentially our knowledge* of the physics. [...] It is not something that you can touch or feel or see or measure [...] the idea that the wave function is a real object is the source of innumerable amounts of nonsense.” Against Nauenberg, *objective* reduction means that the wave function and its collapse are indeed real physical events. Another key idea in Orch-OR is the hypothesis that “objective reduction” (already a contentious idea) takes place in cell structures called microtubules in the brain. Microtubules are traditionally understood

⁴⁰ Bruce Rosenblum’s quip that quantum mechanics does not say anything about God, but does disprove the classical-mechanical universe in which atheism makes most sense comes to mind as the kind of remark a QC scientist may use to explain why he or she uses terms like “Newtonian,” “materialist,” and “atheist” almost interchangeably.

by biologists to be involved in facilitating movement within cells, but Hameroff has proposed that these structures are complex and active enough to carry out another function: facilitating an “orchestrated” objective reduction. The “orchestration,” which Hameroff relates metaphorically to music, of objective reduction events is postulated to give rise to consciousness.

We are beginning to have a sense of the mass of “ifs” that must be compiled together to make sense of the Penrose-Hameroff Orch-OR theory. Tracing the lines of proliferation can be disorienting, which is why I think most scientists prefer to simply reject such compilations of speculative thought. As I persevered in my attempts, however, I started to see that a theory like Orch-OR becomes sensible when one is able to imagine one’s own consciousness as part of the world described by Penrose-Hameroff. This is why Orch-OR resonates in the world of QC; it calls for a conversion to a new way of relating a multitude of different facts and ideas together in a new way.

We have reviewed the basics of Penrose’s interpretation of quantum mechanics and are one more step toward understanding how quantum photosynthesis is read as a sign of quantum consciousness in the world of Stuart Hameroff. Orch-OR requires a realist imagination and a willingness to participate in counter-induction to develop an ability to hear what it means for facts like quantum photosynthesis to become a sign of consciousness. For Hameroff, the discovery of quantum photosynthesis was a boon following years of criticism of his theory from neuroscientists and physicists who claimed quantum processes cannot be relevant to

biological systems because decoherence processes would prevent it. Physicist Max Tegmark and neuroscientist Christoph Koch (who appears in Chapter 4) spearheaded some of these criticisms when they were both working at California Institute of Technology. Scientists challenged not only the veracity but also the scientificity of the Penrose-Hameroff theory by challenging the theory's falsifiability (following Karl Popper's falsification criterion for good science) and even by comparing the theory to religious belief (see e.g. Grush and Churchland 1995; Penrose 1997; Tegmark 2000; Koch 2012). Hameroff's Toward a Science of Consciousness conference, (TSC) which started its annual run in 1994, became an effective platform for such arguments over the scientificity of the Orch-OR theory. Such accusations seemed corroborated by the worries of some scientists that the centrality of Orch-OR theory at TSC was attracting too many mystics and weirdoes to the conference.

As a result, Christof Koch and other like-minded scientists started The Association for the Scientific Study of Consciousness (ASSC) in 1997; many of the high profile members of the TSC conference became Board Members of ASSC; Hameroff was not invited, and expressed to me that he felt spurned. For him, this was an act of insurrection and betrayal. So when Hameroff was making his academic rounds in 2012-2014, he pointed to new evidence in quantum biology as enough to rebuff his rebufferers, including Tegmark and Koch, perhaps not only for their views on science, but also their narrow-mindedness about what science ought to be.

Stuart Hameroff and his fellow QC scientists regarded quantum photosynthesis as a *sign* of quantum consciousness. Recall C.S. Peirce's formulation

that one attribute of a sign is that it addresses somebody (Peirce 1998: 228). Quantum photosynthesis, as a sign of QC, addressed those involved in quantum consciousness science, and we shall see how at a more technical level, it was a question of an address made by universal consciousness – that pure awareness that human consciousness can strive for and which QC scientists understand as the basis of quantum physical reality. Hameroff transforms the discovery of the Fleming lab into an event for a concrete consciousness, both human and cosmological. For QC scientists like Hameroff, the Fleming Lab’s discovery reveals and amplifies a trace of the passage from psyche to physics from within life, and it therefore became a sign that the quantum consciousness hypothesis would be eventually be redeemed. Following on the coat-tails of the large amount of press the Fleming lab was receiving at the time, Hameroff and his colleagues constantly pointed to the discovery of quantum coherence in photosynthesis at conferences, in journal articles, and in informal conversation, as evidence of their eventual success.

The direction of Hameroff’s enterprise is to bring consciousness into science not only as an object, but also as subject. In practice, this means bringing into focus the effects of scientific knowledge on the scientific subject. To persuade “mainstream” scientists of the legitimacy of QC entails bringing consciousness as subject, and not only as object of knowledge, into the account of the scientifically described world. The result, I will show, is an amplification of proliferation. As I mentioned earlier, QC does not invent its moments of proliferation from thin air. Rather, it retrieves them ready made from already existing research programs.

Proliferation is intrinsic to scientific inquiry, insofar as scientific statements obtain meaning by the ordering of transcendental concepts both within and between disciplines. QC “roots out” metaphysics in science and amplifies its passion to obtain from science universal and transcendental knowledge about what is real. At the same time, QC admits that no metaphysics is certain before such statements can be empirically verified. The result is an amplification of proliferation in hopes of converting others to join its search for the New Paradigm, wherein the possibility of such verification is revealed.

Hameroff and his colleagues recently published a paper entitled “Feasibility of Coherent Energy Transfer in Microtubules” (Craddock et. al., 2014). The paper compares quantum propagation of energy between chromophores in light harvesting to the possibility of quantum propagation of energy between chromophores in microtubules, and concludes that the coherent energy transfer is *biologically feasible* in microtubules. The authors stated that at the main purpose of the paper is to stimulate experimental research on this possibility. Yet it is central to recognize that the discovery of coherent energy transfer in the microtubules cannot alone be evidence for Penrose and Hameroff’s Orch-OR theory because the Orch-OR theory is composed of elements that span across the scientific disciplines. Furthermore, these elements are not “merely” facts; what are pieced together are not only facts but facts attached to metaphysical gaps within scientific knowledge, revealing sites where the meaning of certain statements cannot be decided. No different from Dawlaty’s restrained desire to know if quantum photosynthesis is necessary to plants as a matter

of natural selection, such transcendental problematizations come into being as a result of attempting to fit the facts from different disciplines together in a second-order structure or “worldview.” Therefore, to understand the relevance of the Fleming Lab’s find of quantum photosynthesis for Hameroff’s Orch-OR theory, we must investigate how these various lacunae emerge within scientific disciplines and are then pieced together in Hameroff’s process of proliferation.

What is that stake when QC brings facts like quantum photosynthesis into its domain is an elucidation from within the facts of a set of concepts that are not themselves testable, but which condition the meaning of empirical statements and therefore also the condition of possibility that a given statement be recognized as testable or not. For example, consider Penrose’s claim consciousness has access to the universe’s “fundamental space-time geometry” at scales beneath the Planck scale. Such an access is not remarkable if considered an issue of mere representation and epistemology (humans have access to representing anything they like). What is remarkable is Penrose’s corresponding assertion of an ontological touch between consciousness and fundamental physics. Echoing a desire to resolve the antimony of subjective and object registers of description, Penrose’s theory implies consciousness mediates between the Platonic and the “material” world we experience. Penrose does not wait to make metaphysical judgment, but rather makes it now (what Feyerabend calls “realism”) and proliferates on its consequences for general concepts such as “matter,” “mind,” and “Idea,” all of which become reconfigured in the counter-induction made possible by Penrose’s interpretation of quantum mechanics. In short,

the realist element of proliferation can transform a trivial sentence about mathematics and consciousness into a “profound” metaphysical one. In the first case, consciousness is obviously involved in doing mathematics. In the second case, “consciousness-doing-mathematics” becomes a clue to understanding a hidden fundamental reality.

Next, we will see that Hameroff’s collaboration with Penrose enables further counter-inductions on theoretical questions in anesthesiology, made with two more of Hameroff’s close colleagues and Orch-OR aficionados, Travis Craddock and Jack Tuszyński. Of particular concern to Hameroff, a practicing anesthesiologist, is that the mechanism that anesthesia uses to inhibit consciousness and memory in the brain is unknown. Hameroff and his colleagues reason that knowledge of this mechanism could help solve the mind-matter problem. Yet in his writing as in his speech, the apparently empirical question of the mechanism that inhibits consciousness soon gives rise to the problem of identifying consciousness as an object of research, then spirals into metaphysical questions concerning the nature of consciousness and its relation to matter.

When consciousness is not operationalized as a research object, “consciousness” always means more than what can be said about it, since it designates a whole of which speaking can only be a part. Hameroff’s way of approaching this difficulty from within allegiance to empiricism is typical of QC scientists’ practice of proliferation. His article on anesthesiology makes connection between theoretical questions on the mechanism of anesthesiology and the article

discussed above on the feasibility of electronic coherence in microtubules. Hameroff amplifies the mind matter problem within the technical questions of anesthesiology just as he amplifies the quantum measurement problem within the question of biological feasibility of quantum processes in microtubules, usually with a gesture toward Penrose. The method here is one of reading empirical statements in light of these antinomies such that the facts take on a perspective; they suddenly appear to be addressed to someone insofar as they take on a relation to a given antinomy. Let's explore this in more detail.

The authors point out that it has long been known that a major characteristic of an anesthetic substance is hydrophobia. They cite research that shows that anesthetics have been shown to operate on microtubules, and combine this knowledge with their own assessment of the feasibility of quantum coherence in microtubules (the other article mentioned above). Hydrophobia is a characteristic that promotes quantum coherence in photosynthesis, and is also a characteristic found in microtubule channels. Together, these elements are summed together (we may say "counter-induced") to suggest the plausibility of the hypothesis that anesthesia operates on microtubules to prevent consciousness by disabling the ability of the brain to maintain quantum coherence. This sets the foundation for the further counter-induction that the origin of consciousness is found in quantum coherence. Meanwhile, this last counter-induction is made possible by the work done by Roger Penrose on collapse of the wave function by fundamental space-time geometry, or gravity, which as we saw entailed metaphysical commitment *now* to a tri-world composed of

Platonic, material, and mental realms. Something of the subjective side of consciousness, via Penrose's creative access to the Platonic realm of mathematics, enters into Hameroff's article published in the medical journal *Current Topics in Medicinal Chemistry*.⁴¹ Without Penrose's metaphysical commitment in the present, such a counter-induction could not be made, despite that "objective reduction" remains almost totally in the background of the paper on anesthesiology currently under discussion. Where it does appear, it does so in a list that reminds of Levi-Strauss' (1966: 17) bricolage, insofar as it does not contain consistent categorization typical of conceptual thought but instead conveys signs. The authors explain:

“Several possible modes of quantum processes, including quantum dipole coupling, resonance energy transfer, electron mobility and superposition, and ‘orchestrated objective reduction’, are included in [the theory present in this paper].”⁴²

The most important sign here is the last one, “orchestrated objective reduction,” or Orch-OR, which stands like a Trojan horse in an article that for the most part reads as though it were concerned with very narrow questions on the chemical mechanisms of anesthesiology, signing toward other concrete elements: the quantum measurement problem as expressed by the metaphysics of Roger Penrose.

The (not yet realized) experimental confirmation of biologically significant quantum processes occurring in microtubules does not necessarily lead to the conclusion that such processes give rise to consciousness. But rather than insisting on

⁴¹ See Craddock, et. al., (2015) “Anesthetics Act in Quantum Channels in Brain Microtubules to Prevent Consciousness.” *Current Topics in Medicinal Chemistry*, v. 15, pp. 523-533.

⁴² *ibid.* p. 531

determining the correct meaning of statements at every given moment, proliferation allows for the meaning of scientific statements to become destabilized and take on the multiple meanings. At the same time, allegiance to the need for eventual empirical confirmation of their statements gives room for multiple, not always compatible metaphysical judgments to co-exist within and between individuals. This coincidence of counter-induction and realism gives rise to a bricolage or “piecing together” of various scientific ideas, each of which comes to reveal its concreteness as a result of exiting its native conceptual network.

This is not a simple attempt to solve one mystery with another mystery, as some critics of quantum consciousness have charged (e.g. Koch 2012: 104-105). Instead, building a theory of quantum consciousness requires lifting concepts from their native context in laboratory practice and combining these concepts with other concepts from other contexts. Such attempts, which I have called “realist” following Paul Feyerabend, make the metaphysical disjunctions of the facts come into appearance, at which point the metaphysical foundation of each fact becomes a problem inherent to building a structure that might fit the facts together. Proliferation is taking place; metaphysical judgments about both the mind matter problem and the quantum measurement problem, neither of which can be decided empirically in the present, are combined into a pieced-together structure called orchestrated objective reduction theory, a theory of quantum consciousness. Hameroff and Penrose’s Orch-OR theory is formed something like an octopus, with each of its tentacles firmly situated in a distinct discipline (anesthesiology, quantum biology, quantum

foundations, neuroscience, computer science), and with a head that connects and transcends all of them.

Writing the Quantum Soul

Due to the social and textual conditions in which it is produced, no one can doubt Orch-OR has been more constructed than discovered. This seems to be regarded as a positive by fellow QC researchers who affirm building is as important in science as discovering. At this point, we may take a step back and ask what justifies compiling a complicated amalgamation of facts, conjectures, even blendings and blurrings, into a quantum consciousness theory like Penrose and Hameroff's Orchestrated Objective Reduction. An answer is to be found in QC's articulated goal: to reconnect, fix, suture what QC scientists experience as a crisis of scientific subjectivity. To be sure, this goal is predicated on a diagnosis that is confirmed both with respect to oneself and with respect to others and the world, as a judgment on what our present is, specifically in regard to the history of science.

Since the crisis is diagnosed both internally and externally we may not be surprised to find QC's method of seeking out a cure is pursued both from the inside and the outside, that is to say, as an individual spiritual practice, and as a kind of spiritual revival in science, which takes the form of amplifying tendencies toward proliferation already present in normal or mainstream science. The subject of Chapter 4 will be to focus on the specificities of QC as a spiritual practice operating at the intra-psychic level. Here then, let us begin to understand QC's spiritual revival, as a

social action that seeks to diagnose and resolve a crisis, both through persuasion and through theoretical research. At the discursive level, we have seen that the crisis pertains to an uncertainty of reconciling the effects of the quantum revolution of 1900-1927 with the rest of scientific knowledge. The meaning of transcendental synthetic statements about science “in general” becomes particularly uncertain when such statements combine language about quantum mechanics with language about biology or psychology. To listen to QC researchers debate each other is to witness the uncertainty about the meaning of such synthesizing statements proliferate into a generalized doubt about the state of the scientific worldview, which comes to be called “The Newtonian Worldview.” The compositional integrity of a scientific subject is experienced as bifurcated by two modes of description: “quantum” and “classical.” The constitution of the scientific subject, to whom “the facts can speak” (see Chapter 2), is dismembered and recomposed within a process of doubting the veracity of *this* or *that* particular induction, one after the next, until all induction – induction as such - comes into doubt. QC researchers may describe this state of generalized doubt as a simultaneous recognition and overcoming of the Newtonian Worldview: a point when the subject recognizes its Newtonian persuasion has always been unhinged from the world, in a general state of doubt toward all things within consciousness, and ultimately toward consciousness itself.

It was April 2012 in Tucson, Arizona when Dr. Deepak Chopra addressed a larger audience who shared these concerns and anxieties. Chopra was giving the keynote speech on the opening night of the Toward a Science of Consciousness

conference. The next day, Chopra would debate Leonid Mlodinow, on the stage in front of the conference audience, at an event called “War of Worldviews.” It was, among other things, a plug and free advertisement for Chopra and Mlodinow’s co-authored book by the same title (see *War of Worldviews*, published in 2011).

Chopra’s central role in *Toward a Science of Consciousness (TSC) 2012* was organized with the help of Stuart Hameroff, the TSC conference organizer and a friend and colleague of Chopra.

On the opening night, I have just arrived in Tucson after a seven-hour drive from Los Angeles. Chopra was talking to a large lecture hall of mostly white people, mostly over 50 years old. When I entered the room, Chopra was turning his audience attention to the question of who or what is the subject of thought. He said, “Many people, when they start meditating, say they have too many thoughts. What is it that is having the thoughts?” The audience laughed. Chopra clicked through slides projected onto on large screen behind him; he showed pictures, cartoons, graphic designs, and spoke of the Vedanta tradition, and of Rumi and Jesus. He explained that there is a truth beyond religion, which is nevertheless given by each of the multiple religions. Alongside his various religious references, stitched and braided in his speech were mentions of famous pop-psychologists and words adopted from the technical language of quantum mechanics: non-locality, entanglement. “There is no mechanistic explanation for the many processes [of the body]” he said, “all your body processes are cosmic rhythms. Consciousness is self-regulating, it has feedback loops, it is nonlocal, it does not exist in space-time.”

Chopra reminded his audience that the superiority of science for finding truth is a metaphysical assumption. It is an assumption made by a transcendental consciousness oriented within space and time, toward the objects of its perception. “Matter is a metaphysical assumption,” he said. “We do not experience matter, we experience sensations, and we call this the physical world.” Chopra continued to explain to his mostly agreeable audience that the quest to explain consciousness with recourse to neuroscience is based on wrong metaphysical assumptions. The brain does not cause consciousness. Those who believe it does have mixed up transcendental and empirical levels, he said. “And how can you prove this?” Chopra asks. “You can prove it in the laboratory of consciousness!”

With this, Chopra’s lecture moved into a conversation of the advantages of daily meditative practice, and the necessity of proving to oneself, in the laboratory of consciousness, that consciousness is not caused by the brain. This idea that mind comes out of the brain, Chopra says, is the product of the Newtonian worldview. Over the course of the next few days, I heard conference-goers affirm themes similar to those Chopra had mentioned, in particular themes about the detrimental effects of the Newtonian worldview, and its power to dislodge people from the ability to recognize the reality of their own (transcendental) consciousness. They also emphasized importance of spirituality as a mechanism for escape from the Newtonian Worldview. For some, the spiritual change came from a particularly revelatory moment, for others, during a meditation retreat, and for still others, it was a slow and steady process. Some conference goers explained that the Newtonian worldview was

responsible for the recent financial collapse, for climate change, and for individual mental health problems, among others things. A few mentioned nuclear weapons, terrorism or war.

At TSC, I was able to clearly see how quantum consciousness was not only a research program. It was an integral and indispensable part of a spiritual revival and metaphysical movement, whose central aim was to find contact with Universal Consciousness. This was clear enough on opening night, just from the way to Chopra's language was filled with scientific terms, but even more so because most of the people there were scientists, doctors, psychologists, philosophers, and engineers. So, while it was easy for me to understand why a "mainstream" scientist like Christof Koch might have come to feel like "weirdoes" had overrun TSC, these weirdoes were nevertheless weirdoes with scientific credentials. As far as I could tell, these people were all scientifically minded, with similar backgrounds, personalities and concerns as any other scientist.

Meanwhile, it was also clear to me that many of the people there, perhaps a majority, believed that quantum consciousness scientists were the proper leaders for directing opinion about what a science of consciousness should mean. The reason, again, was explained by Chopra and repeated by many others. Quantum consciousness, and quantum mechanics more generally, was seen to contain a special persuasive power upon scientifically minded people that various religions and spiritualities did not have. It was quantum consciousness, and not religion or spirituality, that was the special key to escape from the Newtonian Worldview. At

this conference, and ones like it, there was a general consensus that encouraging individuals with a Newtonian worldview to think hard about quantum mechanics was the best method for helping them break free from the “materialism” that imagines consciousness as a product of the brain. Quantum physics, spoken in the language of QC, could ignite spirituality.

In this view then, the Newtonian worldview is an obstacle to spirituality, and QC is the cure. Spirituality comes in many shapes and forms. As Chopra had explained, spirituality is a truth common to all religions. Yet the person with a Newtonian worldview is blind to this common truth due to the prejudices of her materialism. The best chance for removing this blindness is quantum physics, which directly confronts the “Newtonian” assumptions of the materialist. Many conference goers agreed that quantum physics held a special persuasive power for dislodging “materialists” from their Newtonian Worldview. Some had undergone a self-transformation away from materialism toward seeking a “New Paradigm” themselves, while others had seen it occur in friends or colleagues. Quantum mechanics helped them catch a glimpse of universal consciousness, via QC’s unique way of reframing the mind-matter problem as a conduit of spirituality. They explained to me in interviews that they had been atheists, or that they had a Newtonian worldview, until they learned about quantum mechanics. Some of them were physicists, and a great many more were scientists of other fields. Some were already working on quantum consciousness projects, with colleagues or on their own.

There was another demographic of conference goers who had not undergone

any self-transformation, but came to TSC just for fun, “for the excitement of it.” For these individuals, who stayed away from all things “New Age” in their daily lives, coming to TSC was a small taste of a forbidden fruit: to engage in metaphysical speculation without the caution usually required by their colleagues in “mainstream science.” TSC felt to me at times as much a vacation destination as an academic conference, with colleagues going off to tan by the pool or discuss their scientific ideas or spiritual practices on private walks in the desert. This second demographic was not very easy to separate from the first, since an individual’s mere presence was almost enough to render a conference goer a part of the larger project of working toward the New Paradigm. If someone called a fellow conference goer a materialist, someone else would point out that the boundaries are not so certain, and that “everyone has a place here.” (What rendered someone an outsider was excessive “religious belief,” a phrase that was synonymous with a refusal to be persuaded by scientific evidence. Needless to say, no one who could fit that category had attended the conference).

There was another way that quantum consciousness held a special authority at TSC. Many conference goers expected that QC was the emerging science within which truly decisive future experiments would eventually emerge. As mentioned earlier in this chapter, the fulcrum of QC’s current social organization is its expected future success in bringing about the New Paradigm by developing empirical evidence that irrefutably demonstrates the primacy of consciousness to physics. So, while in the present, QC takes a central role in its power to persuade materialists toward

spirituality, this persuasion is as yet not as effective as it could become. This is because nearly everyone recognized that the transformation of consciousness brought about by the historical development of the quantum revolution in physics, and then the development of quantum consciousness, was only a partial transformation. The spiritual moment of the present possessed only subjective certainty, and required the development of a fully-fledged empirical research program in QC that would transform this subjective spiritual certainty into an objective spiritual certainty: a scientific spirituality. This was the meaning of “building a New Paradigm.”

This explains why Deepak Chopra works closely with the quantum consciousness community, providing its researchers with the funding and institutional infrastructure and networks of dissemination that QC scientist might otherwise lack. Chopra’s efforts and support are a strong example of how QC scientists are able to thread their science between the two worlds: academia and the spirituality industry. An example of this is found in analyzing one last article written by Stuart Hameroff, this time with Chopra as his co-author (see Hameroff and Chopra 2012). In some ways, we have come far from Hameroff’s alignment with the illustrious physicist Roger Penrose that helped bring about his notoriety⁴³, yet understanding QC in its concrete actuality requires an ability to read each element of Penrose-Hameroff’s Orch-OR theory as part of one large bricolage, built with the aim of treating the

⁴³ This point is verified by the next to final sentence of the abstract of Hameroff and Chopra’s (2012: 79) “Quantum Soul” article, which reads: “Sir Roger Penrose does not necessarily endorse such proposals which relate to his ideas in physics.”

present crisis and breakdown of the Newtonian worldview, and replacing it with the building blocks that will eventually become the New Paradigm.

In “The Quantum Soul: A Scientific Hypothesis,” Hameroff and Chopra (2012) explain the urgency in bringing science to recognize the inner laboratory of consciousness. Their task combines consideration for the troubled conditions for individual mental health provided by a hegemonic knowledge form (“Newtonian” science) that is incapable of providing an effective discourse on consciousness, and is therefore also lacking ground for its own knowledge. The incapacity of modern science to produce an effective discourse on consciousness is understood as an explanation for the modern experience of alienation. What is at stake in Hameroff and Chopra’s article is an attempt to produce an adequate theory of scientific subject constitution, one that would authenticate the veracity of scientific statements in general, and make it possible again to have a coherent scientific worldview after quantum mechanics, this time based in the transcendental syntheses of quantum consciousness.

QC’s formulation of the conditions that would release the modern person from her condition of alienation is, as I have argued, a strictly impossible one: what is desired here is an empirical demonstration of why induction is legitimate. In other words, the impossible demand is for an empirical demonstration of the validity of transcendental statements, the very statements that condition the possibility of truth in empirical knowledge. In the last section of this chapter, I will show how the structural impossibility of the demand opens up the millennial temporality of the New

Paradigm, wherein resolution to the impasse is realized in an asymptotically distant future. Before we get there however, let us investigate how the quest for an adequate and therefore impossible theory of scientific subject constitution plays out in Hameroff and Chopra's "The Quantum Soul."

On its surface, "The Quantum Soul" is a text on a certain form of experience regarded by mainstream science as illusory: near death experience (NDE) and out of body experience (OBE). Some of the reported characteristics of such experiences are a sense of tranquility, love, the perception of a light or a tunnel, and "having one's life flash before one's eyes." In reading Hameroff and Chopra's text, it is clear what "illusory" means in regard to NDE and OBE; it means that individuals who undergo such experiences have experienced something that is "not real." People who describe their near-death and out of body experiences draw from this experience conclusions that are subject to doubt by scientifically minded skeptics, and so such skeptics seek out alternative explanations for these experiences, for example by pointing to biochemical and neurological markers that correlate to such experiences. Two related problems immediately surface: there is no reason to suppose that the possibility of biological or neurological explanation of experience renders the experience itself to be "not real." The second problem, which follows from the first, is that it is not so easy to explain what one means in designating one experience as real and another experience as an illusion.

Underlying Hameroff and Chopra's text is a grappling with the problem that the categories that condition experience, such as "real" and "illusory," cannot

themselves be subjected to empirical research, but nevertheless determine the contours of empirical inquiry. One maybe tempted to resolve the problem by simply doing away with such transcendental categories, if it were not the case that such categories form the coordinates that constitute scientific subjectivity itself. Hence, when the authors claim that current science lacks the ability to judge the reality of alternate states of consciousness, precisely because current science “cannot even explain normal consciousness,” (Hameroff and Chopra 2012: 80) something unique is going on. The authors pose the problematic in two parts. First, we are led to recognize that science does not have the ability to determine or judge the categories by which it assigns reality to this or that experience. This could be passed off as a merely philosophical problem if it were not for the next step, which completes the problematic. The second step is the recognition that the scientific ethics demands that the authority of knowledge be based on observation and measurement. From here, we may deduce that mainstream science is obligated in its practice to admit that some forms of consciousness are authoritative: those forms that constitute a measuring observation. To repeat Chopra and Hameroff’s argument in another way: 1) science cannot explain *any* form of consciousness, which means science cannot finally account for its decision that certain aspects of consciousness are real and others are illusory, and yet 2) in practice, science must not only decide but also recognize certain aspects of consciousness as authoritative and “real.” The unity of the two elements of the argument does not entail that a particular science cannot determine whether a particular observation is real or illusory (in fact, this question of how

scientists determine whether particular observations are real or illusory is the object of study of many ethnographies of science). Rather, what occurs here is that a specific empirical set (in this case NBE and OBE) gives rise to a doubt in the categories that frame the meaning of empirical observation *in general*, in this case, “real” and “illusory.” Raising the categories that condition scientific observation to a state of generalized doubt amplifies the stakes of disagreement between parties on the value of evidence. For mainstream scientists, the personal accounts of individuals who have had near death or out of body experiences simply do not count as evidence. However, the problematic posed by Hameroff and Chopra points out that some experiences, specifically those connected with what is considered scientific observation, do necessarily count as evidence. The question is then raised of why some observations are recognized as scientific, and others are not. While philosophers and scientists have written many an apologia on this very topic, Hameroff and Chopra seek to resolve it in a different way, that is, through a proliferation of what counts as scientific observation. Specifically, NDE and OBE are included within the realm of real experience, enabling the possibility of “scientific observation” of such experiences.

This is why the article’s authors emphasize that the entire data set of near death and out of body experience is disqualified by mainstream science *not* on grounds that this or that particular induction was faulty, or this or that particular experiment was poorly performed. Rather, Hameroff and Chopra claim that the data is excluded as such, and it is excluded as such because it does not fit within the

Newtonian worldview. It can only become recognized by the mainstream as data if and when a “paradigm shift” occurs that would render it recognizable as workable empirical evidence. We may now come to understand why the “quantum soul” is not simply a scientific hypothesis, as the title claims. It is more than that. It is a text that implores its readers to “change worldviews.” Readers are invited to question themselves about what is real in experience, and to admit to themselves the intractability and inescapability of the problem as it pertains to scientific knowledge. If the subject of science may be brought to see that he or she cannot account for the question of what is real within experience, then Hameroff and Chopra may have succeeded in planting the seed of paradigm shift toward spirituality within the individual’s mind.

In “The Quantum Soul,” the Penrose-Hameroff theory becomes the suggested route toward a resolution to the problem of scientific subject constitution, namely that science cannot account for its own transcendental coordinates that render observation veritable. The centrality of the problematic of subject constitution in science found in this article, relative to the other Hameroff papers I have reviewed in this chapter, makes possible stronger destabilizations of meaning within scientific discourse. These destabilizations of meaning correspond to a metaphysical judgment that has been made *now*, in the present, and that inversely, such metaphysical judgment is made possible insofar as its meaning is *not yet* determined by empirical verification. It is worth noting that my analysis here, which allows for QC to make metaphysical judgment now and defer determination of its meaning to the future, is an inversion of

another possible assessment of QC discourse: that Hameroff and Chopra are simply using scientific language in an irresponsible manner.

Consider first the following example from the text. The authors explain, “Atoms and subatomic particles can exist in two or more states or places simultaneously” (Hameroff and Chopra 2012: 82). As we learned in Chapter 2, physicists practice a kind of hermeneutics that would render such a statement straightforwardly *wrong*, because the statement equates a physical state, which is mathematically specified, with a “place,” which is a colloquial non-technical word, and furthermore, because the statement describes a superposition as two “states” whereas in fact superposition is correctly described as a single state (a superposition state). More criticisms of the statement could be put forward, and they would have the effect of a correction, rendering Hameroff and Chopra as incorrect in their language usage. A few sentences later, the authors go on to explain that, “A humpback whale leaps out of the sea whole, despite the fact that the atoms and subatomic particles comprising the whale may occupy uncertain or even multiple positions in the invisible realm of possibilities” (82). This statement is equally subject to criticism as the last (super position already implies uncertainty/indeterminacy, so there is no sense in saying “uncertain or even multiple,” and so on...). However, something else now comes into play that is not reducible to the critical lens. Here, Hameroff and Chopra are providing a realistic interpretation of quantum mechanics in so far as their speech invites the imagination to pass between the macro-world (“humpback whale”) to the micro-world (“invisible realm of possibilities”). The incommensurability between

different kinds of statements (statements about atoms, statements about whales) is commensurated by an active, realistic imagination that assumes its own authority in accessing the pass between the atomic- and whale- scales. This is the key to making metaphysical judgment now and forestalling determination of its meaning, which also implies warding off the critical physicists whose corrective hermeneutic is intended to splice up the imagination, to stop it short, to direct it to follow the proper channels already laid down by the division of labor among the scientific disciplines. For example, the critical physicist may emphasize that the “invisible realm of possibilities” is not something the imagination can access; it is a “realm” only in so far as a mathematical phase space such as a Hilbert space can be called a “realm.”

Let me be clear that my argument is not meant to suggest Hameroff and Chopra need not or should not speak correctly about physics. Quantum consciousness physicists themselves do not shy from correcting Hameroff or Chopra’s language about physics, sometimes in a seminar room, in print, or on stage in front of an audience. What concerns me here is the ethical relation QC physicists take toward statements like the ones considered above, which at the same time concern all QC scientists as a community forging an ethical relation to the common future horizon of the New Paradigm. We have seen how physicists who are critical of QC demand that all statements about physics have a clear meaning now, in such a way that stops short metaphysical speculation by separating and organizing statements according to their discipline of origin, and by denying meaning to statements that are too general or too synthesizing. What is forestalled beyond the horizon of the future for the non-

revolutionary, normal scientist is metaphysical judgment itself. In this view, metaphysical “assumptions” accrue as a mere byproduct in the wake of empirical and theoretical inquiry, and therefore they can be treated pragmatically. Yet we have also seen that scientists, whether they are recognized as mainstream or of the New Paradigm, necessarily shore up authority of science via the composition a scientific worldview that necessarily contains transcendental, synthetic statements.

Therefore, the contrast between QC and mainstream is not simply that mainstream scientist demand greater precision in scientific discourse, although in some cases this is part of it. QC scientists do expect their colleagues to make technical errors when speaking about matters outside their discipline of expertise. What assures affinity among QC scientists is not mutual recognition of mastery of the same or closely related fields of knowledge as it may be for scientists working within a single discipline. Rather, the affinity cohering networks of QC scientists is a mutual recognition that metaphysical judgment on the primacy of consciousness has been made in the present, and that its empirical justification will result from working together toward a future New Paradigm.

Hence, in QC science, a colleague’s misuse of language may not give rise to the kind of censure that can occur within other research programs. Instead, misuse of language is interpreted in the context of proliferation (counter-induction plus realistic imagination), a method of interpretation that tends to give rise to two parallel types of responses from QC colleagues. First, colleagues respond to technical misuse of language with proposals to standardize language and terminology. It is not

uncommon to find QC scientists working together to standardize their various disciplinary jargons; they sometimes go so far as to attempt to propose algorithms that could synthesize different disciplines' terminologies into a single standard terminology. However, I have yet to see any widespread agreement on terminology; such agreement rarely extends beyond two or three close collaborators. Any time a large group of QC scientist attempted to standardize language usage, the process of rendering metaphysical statements into empirical ones made those statements lose their numinous ability to commensurate discursive boundaries via realistic imagination. Once "corrected," the effectiveness of imagination to pass across domains and synthesize a counter-induced worldview was disabled. This did not lead QC scientists to give up however. On the contrary, it strengthened their resolve against the perniciousness of the Newtonian worldview, which they never failed to blame as the cause of the mischief, and this further reassured them that building the New Paradigm would require the coming of a metaphysics that could transmit its force into the empirical domain without losing its numinous force of imaginative synthesizing power. This would occur only when the consciousness became able to affirm itself of its own reality, even as consciousness was always displaced by its own demand for empirical demonstration of itself, which alienated it.

Therefore, alongside the corrective and standardizing method of interpretation that QC scientists share with all scientists, the imaginative and counter-inductive mode of interpretation is sustained by a desire for synthesis of all science into a new worldview or "Paradigm." Faith in proliferation redeems the technical errors and

silliness of Chopra and Hameroff by providing the imagination with the capacity to ground this subject of science in metaphysical certainty. And if such certainty is not fully present, it is because its meaning is not yet verified with certainty. Such certainty is known (or hoped) to be coming in future.

It is in this vein we must interpret statements from Hameroff and Chopra like this one: “Consciousness is a process on the edge between quantum and classical worlds, the process consisting of discrete, quantized ripples in the fine scale structure of the universe, transitions between subject and object.” Against the grain, the sentence can mean something very trivial: that consciousness can have knowledge of different sorts, pertaining to different phenomena including those described in classical and quantum terms. Yet Hameroff and Chopra are obviously working against such a trivial understanding; rather, the authors invite the imagination to realize itself in a metaphysical language authorized by, but not reducible to, the language of the scientific disciplines. Perhaps, for a fleeting moment, the scientist gains access to reality not by representation, but by the imagination’s propensity to touch the physical cosmos. Such a thing would only be possible, of course, if consciousness *really is* “a process on the edge between quantum and classical worlds, the process consisting of discrete, quantized ripples in the fine scale structure of the universe, transitions between subject and object.” Spinning out dilemmas, amplifying the process of proliferation, and counterbalancing the corrective and technical propensities within scientific meta-language, QC scientist work at the point where the real is delimited within the experience of a subject of science. When they attempt to

answer the question empirically, they fail to answer the question. And when they give a non-empirical answer, their answer is ineffective because it is not empirical. In the next chapter, this dilemma sets into motion a dialectic that I refer to as a kind of scientific spirituality.

Chapter 4: Spirituality: Certainty and Doubt in the Quantum

Imagination

"The blood in my veins is beating so hard that it will burst them. I feel like flying, swimming, yelping, bellowing, howling. I'd like to have wings, a carapace, a rind, to breathe out smoke, with my trunk, twist my body, divide myself up, to be inside everything, to drift away with odors, develop as plants do, flow like water, vibrate like sound, gleam like light, to curl myself up into every shape, to penetrate each atom, to get down to the depth of matter – to be matter!"

Gustave Flaubert, *The Temptation of St. Anthony*

(cited in Taussig 1992)

Spirituality, Science, and the New Age

“Spirituality” is as contentious a word for scholars of religion as it is for scientists. Individuals from both groups are apt to display a certain embarrassment upon hearing a friend, family member, or colleague express his or her interest in “spiritual” things. With this in mind, I was surprised to read Charles Taylor in *A Secular Age* (2007) characterize Western “religion today” as emblemized by a “spirituality” of self-expression and autonomy in religious seeking. What is this “spirituality,” which is the object of intellectual embarrassment and yet central enough to “the secular age” for Taylor to give it a clear focus, if not his ringing approval? To begin, this spirituality is defined against institutional “religions.” Practitioners of such spirituality tend to think religion is too stifling for “authentic” and “free” spiritual searching (see e.g. Roof 2001; Bender 2010; Lofton 2011). “Spirituality” distills “religion” of its baggage and redeems its inner value. While

some scholars describe spirituality as an American, or more generally Western, human activity, others emphasize its global connectivity and syncretic potency to include most anything (Rothstein 2001; Zhan 2009; Doostar 2012; Sutcliffe and Gilhus 2014). As if to defy theoretical assessment, it is almost as if it were better to characterize the “spirituality” in question by a list rather than a definition: spirituality is astral planes, chakras, meditation, parapsychology, yoga, Reiki, ritualized psychedelic drug use as a form of therapy, workshops with Native American shamans; the list goes on.

Courtney Bender (2010) argues that this amorphousness, which makes studying spirituality appear “akin to shoveling fog,” is the result of studying spirituality in too individualistic of terms, and refusing to see underlying institutional and discursive threads. Detractors of “individualistic” accounts of spirituality insist on its Protestant origins, pointing to the long history of Protestant desires to revive what they perceive as Christianity’s spiritual core (Fessenden 2006; Keane 2007; Lardas Modern 2011). In this vein, John Lardas Modern worries accounts like Taylor’s “essentialize” spirituality, because Taylor claims that something extra-historical and universal emerges uniquely within the history of the West. In this chapter, I take a different track from those who seek to undermine universals with historical or cultural analysis. Rather than insisting that nothing escape history, I suggest an exploration of the mode of appearance of universality within a concrete history, using the example of quantum consciousness. As I demonstrated in previous chapters, the phrase “mode of appearance” concerns the way an appearance becomes

characterized by the form of necessity; it may be understood as that which must be true such that a particular relation between knowledge and a social order be reproduced. Moreover, the mode of appearance concerns the threading of the signifier into the domain of the image, such that general concepts, like the concept of scientific fact, appear to a subject as part of the world. As Fred Kuttner put it, “I don't want you to believe something because I say so, but because the evidence says so!” (see Chapter 2). In this chapter, we will see that scientific spirituality depends on how the evidence takes on the ability to “speak for itself,” as it were.

The unusual challenge of articulating scientific spirituality resides in understanding how scientific facts (not this or that fact, but facts in general) become numinous and compelling for a subject who might, as a result, go through a kind of conversion, or as QC scientists put it, undergo a transformation of consciousness. If my reader can accept this point, he or she may be persuaded that at least some of the tendency to debate whether modern spirituality is more “individual” or “socially and historically constituted” derives from a scholarly refusal of the possibility that scientific facts can become *enchanted* in Max Weber's sense: facts, like gods, can speak. Neither the individual-based or social-based accounts tend to recognize the importance of the propensity for facts to appear as a source of enchantment for a subject.

Why is it not considered remarkable that facts can say things to people? Instead, the mode of appearance that makes facts speak is generally assumed, following Weber, to be a vector of *disenchantment*. For Weber (1946:155),

disenchantment is not a result of the world rendered already *known* by science. Rather, disenchantment entails a subject for whom the world appears already *knowable*, in principle.⁴⁴ The facts speak, nonetheless, and so disenchantment is the name of a unique form of enchantment, a unique mode of appearance to a subject, the one we call “modern” (cf. Taussig 1993; Latour 1993; Lardas Modern 2011).

Yet it is exactly this so-called “modern” idea, that the world is fully *knowable in principle*, that quantum mechanics denies. The conceptual archive provided by quantum mechanics thus makes possible a transformation of the mode of appearance of scientific facts to a subject away from “disenchantment” in Weber’s sense. Physicist Niels Bohr coined the term “complementarity” to refer to the fact that the physical situation that make possible one kind of measurement, such as position, excludes the possibility of another kind of measurement, such as momentum. Complementarity requires physicists to regard quantum probability as *intrinsic* to the physical system, which means that quantum probabilities do not result from human error or ignorance. *It appears* to quantum consciousness scientists that one of the consequences of intrinsic probability is that the theory of quantum mechanics does not provide a definitive cut between the subjective and objective realms in the way classical mechanics does. I say, “it appears” because I want to emphasize that the facts speak in a mode of appearance: QC scientists don’t see this issue as a matter of interpretation, but as a matter of what the facts say. Here we are confronting the

⁴⁴ See “Science as a Vocation” (1946) in *From Max Weber: Essays in Sociology*, ed. H. H. Gerth and C. Wright Mills, Oxford: Oxford University Press. The exact point on Weber and “knowable in principle” is taken from Jean Pierre Dupuy (2013) *The Mark of the Sacred*. Stanford: Stanford University Press. pp. 55-56.

realm physicist Wolfgang Pauli, in his letters with Carl Jung, (Pauli and Jung 2001) called “psychic-objective.” For Pauli and Jung, the psychic objective is the name of what must necessarily appear to consciousness as the condition of stabilizing a psychic boundary between a (scientific) self and its outside. And yet, at the same time, the mode of appearance that comes with quantum physics can seem to deconstruct itself from the inside, proliferating paradoxes. In Weber’s sense, quantum facts can harbor enchantment; or in Jung’s language, they can acquire a numinous aura with a unique quality that can only be understood from within quantum mechanical concepts (Jung 1970; Jung and Pauli 2001).

Meanwhile, the language available to scholars of spirituality hides such a possibility from sight. In this chapter, I have not dared name quantum consciousness’ spirituality as “New Age” (as sociologist Wouter Hanegraaff [1998] does, for example) for fear of further contributing to this blindness. Indeed, the problem with defining any spirituality in the list provided above as “New Age” is that the history that has made the concept of “New Age” intelligible has given this word so many layers of contempt that some scholars of the “New Age” partially or fully abandon the term in favor of another. Meanwhile, in contemporary U.S. colloquial usage “New Age” is usually a pejorative term used to refer to someone else that has gone “beyond the limit,” rather than a term of self-identification. The word “New Age” seems irreparably burdened by the feeling of exclusion that has been hinged to it since at least the 1980’s (Albanese 2006:497). The trouble is, as soon as we take the word “New Age” away, it is almost as if there is no distinctive concept left to stand on, and

no other readily available word to be gleaned from the archive of sociological, historical or anthropological concepts.

This lack of such a word is suggestive of our current historical situation, wherein there is no language for describing the transcendental coordinates of scientific subjectivity, because we accept the thesis of disenchantment: that mind, like everything else, is knowable in principle if not yet in fact. Minimally, mind is knowable via its delimitation from objectivity in scientific practice, and becomes maximally knowable when it is assumed to be reducible to computation. This is an effect of a foreclosure constitutive of scientific thought, namely, science refuses to derive its legitimacy from a “metaphysics” that would describe what kind of subject constitution is necessary to afford access to its truth. This thesis also goes a long way to explain the otherwise seemingly contradictory nature of “spirituality” mentioned at the beginning of this chapter. Metaphysical spirituality (or what-would-be-called “New Age” spirituality) is both central and marginalized in the secular age because it has an intimate yet disavowed relation to science, hence my development of the concept *scientific spirituality* in this chapter.

Paul Feyerabend (1975; 1978) showed how science refers to the formation of a scientific subject merely as “education” and proclaims there is nothing about such an education that fundamentally alters the consciousness of the subject in any unique or esoteric way. Likewise, the work of Michel Foucault (1977; 2005) may help us imagine how the discourse on education as scientific discipline largely but not entirely replaces a discourse on spiritual edification during the onset of modernity.

Each author shows in his own way that the effect of education is today understood in the normative terms of a discourse whose name becomes *science*; education gives rise to “intelligence,” often understood in biological and normative terms, rather than in a language of spiritual transformation. Meanwhile, the “mind-body problem,” once a series of discourses and practices on subject constitution heralding the possibility of salvation or enlightenment, becomes merely another empirical problem for science to solve.

This chapter demonstrates how quantum consciousness scientists come into contact with neuroscience and analytic philosophy to argue scientific discourse cannot eradicate the propensity of the spiritual vector of the mind-matter problem completely (see also Chapter 1). Discourses on the “mind-matter” problem are the terrain in which scientists take stock of scientific subject constitution and ask themselves what sort of subject an individual need be or become to gain access to veritable knowledge. The spirituality intrinsic to such considerations shows its face more in some places than others, but I will argue it is never absent entirely. Scientific spirituality that recognizes and amplifies the propensity of scientific facts to become numinous and enchanting, and thereby propels what QC scientists often call “consciousness transformation,” is liable to be labeled “New Age” by detractors.

Likewise, certain scholars who cannot find the source of authority in “New Age” spirituality flounder because they have already defined that source, which is scientific spirituality, out of existence. No doubt, scholars of New Age spirituality are keenly aware that New Agers use language that *sounds like* science, but they rarely

say that New Agers *do* science. Everywhere in the literature, scholars characterize the New Age with reference to “scientism,” “scientific metaphors,” accounts of spiritual practitioners “borrowing” from the authority of science, or “playing” on scientific concepts. Sometimes these scholars mention they are disturbed by the purportedly scientific claims New Agers make. The disturbance comes from the conviction that the New Ager has incorrectly identified the locus of his or her spirituality. As if to avoid further embarrassment, the ethnographer or historian may then politely relocate the source of spirituality from the scientific *sounding* context presented by the New Ager to a cultural or historical context presented by the ethnographer.

For example, Catherine Albanese’s (1992) description of quantum healing chalks up Deepak Chopra’s discourse on quantum physics to Chopra’s creativity and entrepreneurial ethos. In Albanese’s account, Chopra is not persuaded by the facts of quantum physics to believe what he does; he is not molded by science – he molds science to his own wants and needs. The real *numinosum* (to use Jung’s term) in Chopra’s spirituality cannot be science, so it must be in his person. Chopra is misplacing the source of his own spirituality. Such misplacement gives rise to a hermeneutics of suspicion among sociologists and historians: is Chopra duping others, or is he himself a dupe?

The “New Ager,” on the other hand, maintains the insistence that the source of spirituality *is* scientific. This is to insist on the mode of appearance that makes facts speak in a manner that is enchanting in Weber’s sense: *the facts say* the world is not knowable in principle; *the facts say* there is a paradox at the heart of the

constitution of the subject of science. No doubt many in quantum consciousness would be able to recognize in Weber's thesis of disenchantment something like their own concept of "Newtonian" thought, and by this they would mean what Weber means: that disenchantment (or the Newtonian worldview) concerns a mode of appearance of facts that render the world knowable in principle.

My study of quantum consciousness deconstructs the "New Age" and reconstructs "scientific spirituality." Therefore, I will soon leave behind the term "New Age" and discuss quantum consciousness as scientific spirituality. It will be up to the reader to decide the explanatory reach of quantum consciousness for understanding New Age spirituality more generally, but I suggest that the reach is very extensive, and not limited to foundational questions in quantum physics or neuroscience. I think the reach of my argument extends to the very limits of the universality of science, both geographically and psychologically.

This chapter argues the defining moment of scientific spirituality, whether judged "New Age" or not, should be in reference to a specific engagement with scientific subject constitution. The "New Age" is not reducible to personal creativity or social processes, because scientific facts appear and speak to so-called New Agers as much as to scientists. To explain this, I will show how quantum consciousness seeks a transformation of the meaning of "consciousness" and "experience" in relation to the possibility of valid empirical observation. As we will explore in detail, the reordering of transcendental concepts in QC makes experience appear to itself as structured by the "Newtonian worldview." QC scientists are not the only physicists

who may be heard to say, “experience is classical” (as in “classical physics,” see Chapter 2), but the meaning of this phrase takes on unique meaning in QC discourse. This unique meaning provokes an anxiety about the very condition of possibility of an empirical subjectivity or “consciousness” in general. The logic of QC scientists, like that of many other empiricists, is to imagine empiricism requires access to a portion of experience that is not determined by concepts or theories and so gives access to objective, unbiased observation. In QC discourse, the very possibility of objectivity is threatened by the way Newtonian concepts condition our “classical experience.” So long as neuroscience based on “Newtonian” concepts maintains its hegemony over scientific discourses on subject constitution there is no access to unbiased, theory-free perception that would ground empirical objectivity.

An interesting aporia that emerges in QC thought comes from the fact that QC scientists share with most other physicists a tendency to think that seeing the world from a “Newtonian lens” is conditioned more by biology than by history. As discussed in Chapter 2, it is common for physicists to offer lore to students about the biological and physical inevitability that we humans see the world “as if” it were a Newtonian, classical one, rather than a quantum one. This story both relieves earlier physicists of any culpability for misdirection, and simultaneously exalts the early 20th century physicists who finally lifted the classical veil of experience to reveal a quantum physical universe. The aporia in QC exists insofar as QC scientists tend to share this story with their colleagues, and yet at the same time suggest that the source of experience is itself quantum. The aporia may be said to be a variant of the “mind-

matter problem” that QC scientists seek to resolve.

It is notable therefore that QC scientists do not always understand Newtonian concepts or classical experience as primarily cultural-historical artifacts. They are often conceived, rather, as physical-biological artifacts derived from our biological evolution at the physical scale in which we exist. From this point of view, Newtonian physics is the pinnacle of science based on the human ability to reason; it is the result of scientific investigation limited to our physical scale. In defense of this position, QC scientists will repeat a trope common in physics communities; there is, they will say, no reason why our brains should have evolved any experience or intuitive knowledge of quantum physical phenomena, since such issues are irrelevant when being chased by a sabertooth tiger. Whether or not this tongue in cheek argument convinces us, its implication is that our adherence to Newtonian subjectivity cannot be lifted by merely historical or cultural considerations without reckoning the biological historicity of humankind. Access to quantum consciousness is not just a matter of changing one’s mind: a corresponding physical change is sought as well. It may not be extrapolating too much to suggest that if for QC scientists, Newtonian physics is the human, all too human scale, then quantum physics borders on scales of creation more divine.

These are some of the reasons why escaping the “Newtonian Worldview” is not a matter of individual creativity; it is rather conditioned by the unique mode of appearance of facts to the (QC) subject of science. Classical “experience,” in contrast to “consciousness,” both *remains* and *becomes* “Newtonian” for QC scientists. The practice of interpretation of quantum mechanics specific to QC unveils to QC

scientists a truth that was always already part of scientific consciousness: experience (in general) is Newtonian. This truth is now transformed into an object of self-reflection. Taken to its limit, this implies that concepts as such, insofar as they condition and organize experience, have a “Newtonian” character. This makes possible the emergence of speculative meditation that points toward a world of consciousness that is beyond concepts but also the condition of concepts. QC scientists may refer to this realm as “universal consciousness,” “pure awareness,” “nature,” or “unity consciousness.” This is a level of consciousness wherein forms pass into one another without becoming actualized into the concepts that structure Newtonian experience. It is reached through attention and feeling rather than intellectual effort.

While QC scientists draw on Hindu or Buddhist terms to describe such states of consciousness, I primarily want to demonstrate that the conceivability and relevance for QC scientists of these conscious states turns as much on worries about empiricism as it does on empirical verification of the reality of “spiritual” states of consciousness. For QC scientists, quantum physics renders normal, everyday experience “Newtonian,” which means immediate access to an experience unadulterated by concepts is ruled out. If a mode of consciousness undetermined by concepts is to be found, consciousness shall have to undergo a transformation to access the “universal consciousness” that quantum physics points toward without describing (in fact, such description is impossible in principle according to the doctrine of intrinsic probability). Therefore, saving the possibility of a subject who

can make a conceptually unbiased observation coincides with access to a consciousness attained through a spiritual transformation. The verification of unity between the microphysical scale and the higher levels of consciousness described by sages and mystics is simultaneously the rescue of empiricism, currently compromised by its limbo between quantum and Newtonian worlds, and the exaltation of spirituality, which takes on a new, distinctly “modern” purpose; spirituality becomes the precondition for the subject to attain access to a scientific truth that has been reconfigured by the encounter of human consciousness with quantum physics.

In Chapter 3, I showed how QC scientists tend to believe that a transformation of consciousness before the New Paradigm can make its future arrival. In this sense, they understand the present to be so dominated by the Newtonian worldview that even QC scientists themselves may be under its influence more than they know. From this point of view, the difference between a “materialist-Newtonian” scientist and a QC scientist is perhaps too small to yet really be discernable as more than an ethos and metaphysical commitment. QC’s spirituality is concomitant with accepting this problematic, which includes a particular reading of history and a particular way of relating to scientific knowledge. QC recognizes the Newtonian subject as constituted by a disenchanting practice of science that imagines consciousness as fully determined by measurement. As a result, “facts” appear as compelling from an outside “material” world and are void of any psychic component. The heroic Newtonian scientist who values truth over feeling good is willing to negate the value of consciousness and the existence of free will as the bitter price of “materialist”

subject constitution. The result is nihilism and disenchantment. In contrast, QC affirms a paradoxical agency that comes from beyond immediate experience, even as immediate experience remains structured by “Newtonian concepts.” Quantum antinomies render scientific facts numinous: a psychic entity, “consciousness” or “mind” appears paradoxically on the “outside,” as part of “physics,” compelling scientists to a “transformation of consciousness” to attain that level of consciousness and escape the Newtonian worldview.

A Relationship with Oneself

In *The Hermeneutics of the Subject*, Michel Foucault (2005) opposes two truth regimes, one called “spiritual” truth and the other called “scientific” truth. These two truth regimes reside on either side of the figure of Descartes such that Descartes’ philosophy becomes a sign of the end of “spirituality” in the West, and the beginning of the natural philosophy that gives rise to science. The significance of this shift from the “pre-modern” spiritual truth to the “modern” scientific truth is that the modern subject loses the capacity to establish a relationship with the self in a manner that produces the sort of teleological subjective transformation Foucault calls “spirituality.” To compare briefly: in what is called spiritual truth, the attainability of truth is contingent upon a practice of subjective transformation entailed by one of the specific spiritual traditions by which practice is guided by a future end or *telos*. Foucault (2005:15) says, “[Spirituality] postulates that for the subject to have right of access to the truth he must be changed, transformed, shifted, and become, to some

extent and up to a certain point, other than himself.” In contrast to this, Foucault says, scientific truth is obligated to appear to anyone who observes; it is concerned with providing an adequate account of a state of affairs. A corollary of this is that scientific truth has a normalizing effect on the subject’s relation to speech. The subject comes to understand himself as “abnormal,” “average,” “depressive,” and so on, according to categories that are determined by scientific measurement. Hence, when consciousness objectifies itself, it renders itself an object of scientific categories that appear as imposed from the outside. This blocks the possibility of consciousness positing itself as the unique decision of its own singular object, since normativity implies recognition by measurement and not by “sovereign” decision. Subjection to scientific truth thereby eliminates the conditions upon which consciousness locates a *telos* that would bring about subjective transformation.

Foucault’s work suggests that he experienced an impasse within (his own?) subjectivity to be the result of a historical condition, which could be alleviated by an engagement with the past: the spirituality of the ancient Greeks and Romans.⁴⁵ The solution for Foucault is “critique,” or what Paul Rabinow (2009) called “a form of spirituality,” which is a practice that reestablishes a relation to the self through intellectual resistance to normalizing and disciplinary forms of power. Foucault gave

⁴⁵ Foucault’s pre-modern subject, as Jacques Alain Miller (1992) pointed out, seems to have access to the self without encountering an impasse within subjectivity. There is nothing in Foucault’s Greeks and Romans like what Miller would call the unconscious, understood as a primordial disturbance within subjectivity. In Miller’s reading, this is the condition upon which Foucault is able to imagine his own experience of psychic impasse as a historically contingent and escapable condition. Miller’s analysis reveals a distinction of value to articulating the possibility of scientific spirituality, and also brings to view what is distinctive about present-day QC: Like Foucault, QC’s psychic impasse is meta-historical and therefore escapable, yet unlike Foucault, QC insists that the conditions for such an escape are not yet fully realized in history. Below, I explain how QC scientists foresee such conditions being realized in the coming New Paradigm.

his lectures in France as debates rumbled in the United States on the question of whether consciousness was a computational phenomenon. Would a computer ever replicate conscious processes, and if so, would that mean the computer was consciousness? Despite quantum mechanics, the mind was becoming increasingly in the domain of computation understood classically. Neuroscientists and analytic philosophers debated over whether that last domain of enchantment, human consciousness and free will, was finally succumbing to disenchantment.

Paul and Patricia Churchland are two contemporary American philosophers known by quantum consciousness scientists and by the larger science community for arguing that consciousness is a “folk concept,” soon to be replaced by more adequate scientific concepts.⁴⁶ They describe this replacement as analogous to the way modern bio-medical concepts replaced “pre-modern” explanations of sickness such as the theories of the humors or demonic possession. The Churchland’s scientific, historical and philosophical considerations lead them to doubt consciousness as a scientific object, but their argument also necessarily pertains to experience of self. These two philosophers are certainly aware of the subject constituting character of science: imagine a community of enlightened scientists who express their experience using only the concepts of a future neuroscience. The Churchlands understand the problem of consciousness for science as a temporary aberration insofar as neuroscience has as yet failed to produce concepts adequate to replace our “folk psychological” vocabulary.

⁴⁶ See for example Paul and Patricia Churchland (1998) *On the Contrary: Critical Essays 1987-1997*. Boston: MIT Press.

QC scientists sometimes point to the Churchlands' claims as exemplary of the dangers of the Newtonian Worldview. In doing so, they presume the impossibility of consciousness establishing a relationship with itself via the discourse of neuroscience. Foucault might explain this impossibility in terms of neuroscience's normalizing effects on subjectivity, but QC has a different explanation. QC locates its origin myth in Descartes' contemporary, Isaac Newton, who also becomes a marker for a certain inability to relate to the self. For QC, as for Foucault, this is process concerns the emergence of science and is coextensive with a loss of spirituality in the Western tradition. Whereas Foucault locates this loss of spirituality in the emergence of Descartes' Cogito, QC locates it in the historical process by which the "Newtonian" principles of classical mechanics, including separability, locality and determinism, came to structure more and more domains of Western thought. In a manner comparable to Foucault's (2005) understanding of subjectification, QC discourse suggests that by infiltrating even the way the mind understands itself, Newtonian principles now constellate the imagination in a way that blocks access to the self's potential for self-transformation – its spirituality.

The singularly persuasive power of quantum consciousness derives from its capacity to draw on narrative traditions in physics, especially physics lore on the "quantum revolution." The imaginative coordinates of past, present and future that QC inherits and reinvents within physics lore make possible a historical ontology of "consciousness" (rather than "the subject") that is distinct from Foucault's. The era of Newtonian physics, unlike Foucault's era of "science" with its disciplinary and

biopower, is distinctively coming to a close. The emergence of quantum physics reveals to subjects of science their own “Newtonian worldview” and makes most (if not all) science appear “Newtonian” in its light. David Bradman, a lecturer in quantum consciousness at John F. Kennedy University in Pleasant Hill, refers to this present situation as an “ontological vacuum.” The historical revelation of quantum physics gives rise to a double movement in which the Newtonian presumptions dominant in both Western science and society become recognized only at the moment they become troubled. As QC scientists relate quantum physics experiments to each other and their classroom or conference audiences, they bring about and stage a group realization that reality is not what it was thought to be. In the gap opened by the surprising results of quantum physics, QC scientists make space to claim that science and society currently lack a firm ontological grounding, and must wait for the current “ontological vacuum” to be fulfilled by the coming “New Paradigm.”

All this is known in reference to scientific concepts that QC scientists understand to be based on empirical facts. In the interpretive style of physics, the conceptual framework of quantum consciousness makes possible judgments of “correct” and “incorrect” statements, based on a combination of empiricism and reason, while at the same time inaugurating the appearance of paradox within science to a subject who may then begin on a spiritual journey toward consciousness transformation. This coincidence of science and spirituality, I repeat, emerges from within concepts QC scientists inherit from the historical tradition of quantum physics interpretation, a tradition that contains within it the ability to transmit recognition and

persuasion by facts that can – insofar as it stops being clear facts are about objects, classically conceived – give rise to a shift in what consciousness thinks about itself.

Quantum consciousness struggles to produce a transformation within “consciousness” that makes space for a self that is not determined by “Newtonian” concepts. Therefore on one level, “scientific spirituality” is something that QC has not yet attained, but strives toward. On another level, my usage of “scientific spirituality” refers to that very striving. As physicist George Weismann explained it to me at one of his occasional “Quantum Paradigm” meetings in Berkeley, “I wouldn’t say [what QC is doing] is spirituality, I would say it is building a bridge with spirituality.” QC scientists *look forward* to a spirituality that is also a science. This science is called “The New Paradigm,” and it is conceived of as coming when quantum consciousness gives an empirical solution to the mind-body problem. The empirical nature of the solution will bestow it the capacity to compel the self to be freed from its Newtonian imprisonment. On my account, to be able to conceive of this striving already calls for the notion of “scientific spirituality.”

Addressing Neuroscience’s Newtonian Worldview

Christof Koch, Chief Scientific Officer and the professor of neuroscience at the Allan Institute for Brain Science in Seattle, and former Cal Tech professor arrived on the UC Berkeley campus once in 2012 and again in 2014. Both times, organizers set up Koch to converse and debate with quantum consciousness scientists. The first event took place at the California Cognitive Science Conference, run by the Berkeley

undergraduate cognitive science association. It filled a large lecture hall of perhaps 200 people, and staged a roundtable between Koch, philosopher John Searle, neuroscientist David Presti, and psychologist Imants Baruss. Undergraduate organizers understood they had set up a debate, with “mainstream” Koch and Searle in opposition to Presti and Baruss as representatives of quantum consciousness and parapsychology-friendly ideas.

Koch visited UC Berkeley again in 2014 to give a paper on “qualia” for the “Unsolved Problems in Vision” seminar, organized by physicist and vision scientist Stanley Klein and cognitive scientist Jerry Feldman. Following philosopher David Chalmers (1995), scientists and philosophers of mind define qualia in terms of the “purely subjective” as aspects of experience. Neuroscientists like Koch experimentally seek out what they call “neural correlates of consciousness” or NCC, to explain the biological substrate of qualia. For Koch’s visit, Klein organized and chaired a smaller roundtable discussion on such topics between Koch, physicist Henry Stapp, and philosopher John Searle, in front of about 10 invited guests.⁴⁷ Again, Koch was met with questioning from physicists Stapp and Klein. Klein explained to Koch that the discussion would be about “philosophical issues, including

⁴⁷ Incidentally, Stapp tells me Searle engaged with his ideas briefly, but ultimately left them behind in favor of the majority view on decoherence in the brain. Searle confirmed this with me in an interview. See also the brief discussion of quantum physics and a citation of Stapp in Searle (2004) *Mind: A Brief Introduction*. Oxford: Oxford University Press. pp. 43-44 and 305 n.4. It is a show of the power of QC in philosophy of mind that Searle maintains an engagement (if only a peripheral one) with some of QC’s main theorists. Searle also met with Stuart Hameroff in front of people from the Berkeley QC crowd including Stapp, Klein, Presti, and me, when Hameroff came to Berkeley’s Redwood Center in 2013 (see Chapter 3). The meeting consisted mainly of Hameroff updating Searle on the newest developments of Orch-OR research and theory.

qualia and free will.” The purpose of the discussion, as Klein and Stapp saw it, was to query Koch as to the possible foundations of a science of consciousness as such, as opposed to the science of “neural correlates of consciousness” that both Koch and Klein worked in.

At both meetings, I thought I recognized in Koch a hint of exasperation as to the purpose of these conversations. From his point of view, neuroscience of consciousness is a thriving scientific discipline with well-formulated problems to solve and methods to solve them. Quantum consciousness scientists did not address Koch from within the technical questions of any particular research program. Rather, they questioned him on the very possibility of neuroscience of consciousness based in classical computational models. His responses were always technical, drawing on the terms and tools of his discipline. For him, the question of whether quantum mechanics would be necessary to produce a theory of consciousness was a matter of experimental measurement, and he only saw a need to consider it should classical models fail at their predictions. As far as he could tell, current (classical) modeling was largely successful so far. Why did some of these QC scientists seem to want to sweep it all away, and in favor of what, exactly?

Meanwhile, I was viewing Koch as coming into contact with an expansive network of quantum consciousness communities, not all of it is university-based, and not all of its members are scientists. It is a community organized around the conviction that neuroscience, cognitive science, and its corollary medical and pharmaceutical discourses are inadequate modes of self-expression, an inadequacy

revealed by quantum mechanics and confirmed by experience. Quantum mechanics has revealed that Newtonian principles are wrong, and experience shows that living within the Newtonian worldview is depressing and alienating. Some of those who attended Koch's meetings with QC scientists also attended informal gatherings directed towards shifting consciousness away from the Newtonian worldview and toward the new quantum paradigm. At such informal gatherings, often in someone's home, we would meditate together and share our QC theories. These were individuals who may have balked at bio-medical explanations of depression or obsessive-compulsive disorder, for example, since such models did not adequately express the qualia, that is, the feelings and sensations, of such conditions. They were not satisfied with philosophy either, however; instead they sought to replace an "outdated" scientific discourse on consciousness with an "emerging" one. They were networked enough into the QC community to find out about and attend academic meetings like the one with Koch. QC scientists and their lay followers were convinced that quantum consciousness gives expression to consciousness – even transforms consciousness - in a way that neuroscience cannot, and they sought to convince others that this was the case.

A brief detour into the background of QC Koch implicitly encounters when he meets with quantum consciousness scientists will elucidate this point.⁴⁸ Scientists like Lawrence Berkeley Laboratory's Henry Stapp inspire forms of scientific spirituality

⁴⁸ No doubt Koch is aware of this background. In his book *Consciousness: Confessions of a Romantic Reductionist*, he states, "Laypeople and mystics alike have an inordinate fondness for the hypothesis that the weirdness of quantum mechanics must somehow be responsible for consciousness," a hypothesis, Koch correctly notes, "dates to the founding days of quantum mechanics." (2012: 102, 104-5)

that stand outside the (inter-)disciplinary science of QC but inhabit its domain of authority. Stapp is a retired staff scientist at Lawrence Berkeley National Laboratory (LBNL) and a central figure in the quantum consciousness community. In the 1970's, Stapp participated with the Fundamental Fysiks group described by historian David Kaiser (2011) and since then he has continued to develop his ideas on what he calls “the mindful universe” (Stapp 2007). Nowadays, most QC literature includes references to Stapp, including both academic journals and books written for the public. Besides his leadership in the QC world, physicists recognize Stapp for his contributions to S-matrix theory (see Kaiser 2005) and his extensive knowledge of interpretation of quantum mechanics. When Stapp's friend and colleague Stanley Klein went to the Chair of the UC Berkeley Physics Department to ask who in the department is the expert on quantum interpretations, the Chair pointed Klein back out of the physics department to “Stapp at LBNL”. Klein was amused; of course, he wanted another reference besides his old friend.

Klein is a professor of vision science at UC Berkeley. He obtained his Ph.D. in theoretical physics working on the “boot strap theory” (a precursor to modern string theory) before switching to the discipline psychophysics. Although less a central figure for scientists outside the core set of QC scientists on the West Coast, he regularly participates in QC activities with core set members, including Stapp, Stuart Hameroff, and Menas Kafatos. The academic output of figures like Stapp, Klein, Hameroff and Kafatos is absorbed by the larger QC community through popular physics books, magazine articles, and “hybrid” conferences that combine academic

and non-academic attendees (including spiritual gurus, businessmen, psychotherapists, and more – see Chapter 1 and 3). For example, I met chiropractor Herby Bell via similar networking efforts that other fledgling QC members engage in – attending meetings, making new friends, and sharing information and theories. Although he does not know them personally, Bell looks to QC scientists like those listed above for intellectual guidance in his practice of “quantum chiropractic.” He is an avid reader of quantum consciousness literature, including both its scholarly and popular genres. His readings become reflected in his efforts to help patients understand the relationship between his patient’s bodies and their worldviews. His goal is to produce an alignment between conscious awareness and the inner mind-body connection. When patients come to Bell with physical ailments, Bell encourages them to situate their physical symptoms within their worldview. Illness comes, in part, from a sclerotized worldview that is out of alignment with our present knowledge of physical reality. Like many QC physicists, Bell argues that “The Newtonian worldview” is pervasive in the West, and results from a negative or doubtful attitude toward the possibility that consciousness can have an effect on matter, and especially, on the body. In turn, the body protests its separation from the mind by producing sensations of pain and depressed or anxious emotions. Hence, Bell’s chiropractic cure requires his patients to harness the power of imagination to align perceptions with knowledge of modern physics, and especially quantum mechanics, to make conditions right for a healing re-establishment of the mind-body connection.

Meanwhile, Stapp seeks out engagement with neuroscientists like Koch to discuss the possibility of a quantum physics-based neuroscience. It is no coincidence that Stapp's reading of the Newtonian Worldview is a more technical version of Bell's, since Bell was saved from the Newtonian worldview by literature like Stapp's. In his 2007 book, *The Mindful Universe*, Stapp explains, "what we value depends on what we believe, and what we believe is strongly influenced by science" (2007:5). In Stapp's dialogue, classical physics persuades us to imagine ourselves fully conditioned by the certainty of deterministic mathematical computations. He is expressing a psyche that projects the self as constituted, even imprisoned⁴⁹, by what he calls the "causal closure" of the Newtonian worldview. If consciousness finds no recognition in the scientific worldview, the self becomes nihilistic. The "morally corrosive mechanical conception of nature" (2007:5) suggests that free will and experience as such ("qualia") are "not real." According to Stapp, free will and qualia are the basis of meaningful human experience. They must have a foundation in science, since science provides certainty, yet they must not be fully determined by science.⁵⁰

All this is not just a question of "metaphor," it is about the relative authority and persuasive powers of two discourses on scientific subject constitution. From Koch's point of view, this concerns a disagreement between neuroscience and

⁴⁹ I am reminded of Foucault's (1977) famous protest against Benthamite utilitarianism: "the soul is the prison of the body." This is conceivable, should we imagine the soul as a perverse ghost in the machinations of classical physics.

⁵⁰ Sean O'Nuallian, founder of the Foundations of Mind seminar and conference series at UC Berkeley, provided an explanation for why Islamic terrorists "hate us": our scientific worldview has no capacity to produce an "objective value system."

quantum consciousness on the adequacy of neuroscience's endeavor to explain consciousness. But from the QC point of view, the whole of the quantum revolution stands against the Newtonian presumptions of modern neuroscience. The difference concerns the mode of appearance of facts, that is, how facts appear to a subject as structuring principles, conditioning a division between consciousness and its outside, and compelling interpretation. QC scientists and followers like Bell garner the persuasive power of quantum physics, as fact and as theory, in an attempt to shift the mode of appearance of neuroscientific facts, since neuroscience is understood to impinge negatively on the thriving of consciousness.

Back at the small roundtable between Koch, Stapp, Searle and Klein, discussion was able to continue in a register that appeared to all to as scientific, which is to say that all agreed the litmus test for the relative authority of a statement was its capacity to be tested empirically. Disagreement emerged not on this point, but rather on the point of whether neuroscience and cognitive science together have a monopoly in making scientific concepts about consciousness, or whether quantum physics provides a legitimate set of concepts about consciousness in its own right. Indeed, Henry Stapp argued even further, suggesting brain sciences must adopt and incorporate the concepts quantum physics provides about consciousness if it wants to have any hope of producing an adequate science of consciousness. The hierarchy of physics over brain science is defended by the claim that brain science is not conceptually self-sufficient but rather takes classical mechanics as its paradigm. As is often the case in debates between "mainstream" neuroscientists and quantum

consciousness scientists, the discussion therefore quickly turned to the question of whether a classical mechanics is an adequate basis for brain science, despite the subsequent emergence of quantum mechanics to describe the micro physical domain. In short, does quantum mechanics have any relevance to the “classical” world of our experience?

Koch presented to Searle, Stapp, and Klein a theory that he developed with another leading neuroscientist, Giulio Tononi (Tononi and Koch 2015). Koch’s theory, which would be the subject of the main seminar as well, hypothesized that the amount of “qualia” present in a physical system could be calculated in relation to that system’s information complexity. The theory, Koch emphasized, was testable, and its implication, he felt, was exciting. Consciousness is “here, there, but not everywhere,” Koch said. This was the tagline for his theory, a tagline that contained within it another implication of the theory: that “qualia” could be calculated in quantities.

Everyone in the room knew that a testable theory of qualia is the holy grail of consciousness studies. To explain how qualia, or experience as such (the “redness of red” or “what it is like to be a bat”) can emerge from biological processes would be nothing less than an empirical solution to the mind-body problem. Such an accomplishment is not just one scientific discovery among others; at stake is the empirical explanation of subject constitution, which would “close the explanatory gap” of the sciences so as to guarantee the universality of scientific subjectivity (see also Chapter 1).

As everyone in the room knew, things can get really slippery if allegiance to a

particular way of speaking is not held tight. Koch could hear Stapp speak of the “classical world of experience,” but there is a deep ambiguity in that phrase. Is the “classical world of experience” encapsulated by “consciousness,” being nothing other than a picture our brain makes, while the true physical world is better described by quantum mechanics? In other words, should the classical world be conceived with the same realism as the quantum one, or is it better thought as a representation deeply transformed by that unknown medium called the “mind-body connection,” indeed, the very medium which is under discussion here? Given these difficulties, how could an empirical question about the mind-body problem be formulated at all? At one point, John Searle replied to Koch that what had been provided was not a *theory* of qualia but merely an *assertion* on the nature of qualia. Then Searle knocked on the table in front of him, and explained, “There is a physical theory that explains why my hand does not go through the table.” Koch’s explanation of qualia was not a theory of that sort, Searle said.

Miraculously, everyone knew what it meant to knock on the table, how to order in the imagination the touch of the knock, which only Searle experienced, with the sound and the sight, which we all experienced, and what relation all this had to the physics, a whole marvelous process for which we all agreed that someone understood the physics underlying the process but that no one understood how, when, or where the physical process gave rise to “qualia.” This placed Stapp in the perfect position to demonstrate his point. After all, he was the only one in the room who actually knew the physics of knocking on the table, and he was able to correct and clarify a point

Koch had made about forms of scientific explanation in physics and neuroscience. Stapp pointed out that quantum physics, unlike Newtonian physics, recognizes that science refers to qualia (and free will) as the basis of scientific knowledge and therefore qualia cannot be reduced to scientific knowledge. For Stapp, who is a reader of William James and Alfred North Whitehead, there is no experience that is purely “passive” in this sense; rather, all experience contains a kind of intentionality. Stapp then argued that asserting that qualia is calculable in the manner Koch described is to claim, in another moment, that experience is determined from the outside by what Stapp calls “causally closed” natural law. He then shifted through his copy of Koch’s paper, finding what for him was the key sentence: a sentence that declared that Koch and Tononi’s theory is neutral as to the *function* of qualia. Conveniently for Stapp’s rhetorical purposes, Koch and Tononi had written that consciousness may have no purpose but is assumed as given, just as mass is given in physics. Stapp declared Koch was wrong that mass has no function in physics, and was likewise wrong to suggest consciousness may have no function – an assertion he considered equally disproven by quantum mechanics. In finding this passage, Stapp winnowed in on the classical presumptions of neuroscience: experience, in Koch’s paper, has no function, no purpose, and no efficacy. At best, it just “rides along” the physical action of the brain.

Koch evaded this questioning and remained neutral as the paper declared. Koch, for his part, already knew of Stapp and had ready-made responses to the quantum consciousness hypothesis, prepared with the help of physicist Max Tegmark

(Koch and Tegmark had been colleagues at Cal Tech.) Koch mentioned Tegmark's (1999) paper on decoherence in the brain, intended as a rebuttal to the Penrose-Hameroff hypothesis that consciousness involved quantum computation in microtubules, but he was ultimately unable to argue about the interpretation of quantum physics. Koch eventually deferred, "maybe you are right," yet remained convinced of the unlikely relevance of these questions to his discipline.

The conversation did not progress, but for a few audience members who had an allegiance to Stapp's point of view, Koch's inability to be persuaded by Stapp was evidence of the persistence of the Newtonian worldview amongst neuroscientists who did not understand the ontological implications of quantum physics. Neuroscience would continue to block consciousness' access to its own unique reality. For Stapp and his QC colleagues, however, there was a more looming issue: there was Max Tegmark, and other very good physicists, who shared Koch's opinion.

The Persistence of the Newtonian Worldview

In Chapter 2, I argued there is a real limit to a physicist's ability to integrate knowledge of quantum physics into experience, and I called this limit a constitutive demarcation. I also argued that constitutive demarcation appears in the ethnographic observation of a physicist's working through of everything he or she is able to say concerning quantum interpretation. I showed how physicists avoid awareness of constitutive demarcation by the insistence that what appears necessarily appears the same way for everyone, which is to say that what appears necessarily are *facts*. In

debates among physicists at UC Santa Cruz, any element that did not appear as fact was recuperated into the domain of the subjective, which for physicists included “metaphysical speculation” as well as just being “plain wrong.” Still, Rosenblum, Kuttner, and their detractors were all nevertheless cognizant of the constitutive demarcation resists recuperation to the “merely subjective,” in so far as every pragmatic “boundary-making” distinction was justified in reference to a limit in the capacity for human knowledge that bordered on the physical. Individuals conceived such a limit sometimes as psychological and other times as physical in alternating moments, as part of their description of intrinsic probability. For me, this process revealed traces of constitutive demarcation of subjective and objective, inside and outside of the psyche.

QC scientists refuse what they consider to be the pragmatic strategy to avoiding the perils of constitutive demarcation. However, they concur that when I have called constitutive demarcation is a threat to objectivity in science since it has the capacity to reveal elements of a singular psyche in the necessary appearances of facts in physics. QC physicists insist that if there are differences in the interpretation of quantum mechanics between physicists, such differences should not be elided by pragmatic reference to the predictive success of the theory. Instead, the element of “constitutive demarcation,” or the psychic element “within” the facts, must be revealed in a way that does not threaten objectivity but saves it. Here, a crucial difference emerges between my own understanding of quantum interpretation and that of quantum consciousness. For me, constitutive demarcation is revealed in one

individual's concrete elaboration of quantum interpretation, such that singular traces of a psychic limit to the integration of quantum "facts" are discovered in the tracing and retracing everything one is able to say about it until repetitions are recognized. For QC, the effects of working through quantum physics are directed toward and elaborated in terms of an abstract consciousness, or a "universal consciousness" that persists as the basis of both individual experience and physical reality. Hence, when a QC scientist finds the psychic component that animates the appearance of a scientific fact, he or she conceives of that psychic component as a "pure awareness" shared among all individuals. It is therefore not a threat to shared understanding among physicists, as my own account might have it.

Nevertheless, just like UCSC physicists discussed in Chapter 2, QC physicists also revealed an awareness that constitutive demarcation (in my sense) in quantum interpretation may be problematic to the foundations of scientific thought when they insist that the coalescence of "pure awareness" with science is coming *in the future*.

For example, one QC physicist wrote to another by email as follows:

"The way I see it is that universal consciousness at this point is a subjective experience of some individuals. [...] Do we have enough data to attempt equating the ground of physicality, apart from the fact that it is a proposal at this point and not a proven theory, with universal consciousness, which is so far a subjective experience of some? John [Hagelin] seems to imply in his email that we have come a long way in this direction. That would be quite an important step, for it will relate the physical with consciousness in a fundamental way, the core of what we are trying to do."

This email contains many of the elements of the problem at hand: the "equation" of "universal consciousness" with the "ground of physicality" (note he does not refer to "physics" here but its *ground*), the futurity of the accomplishment,

and the assertion that some, but not all, have achieved awareness of universal consciousness via a spiritual practice that stands outside of science and is hence potentially “subjective,” but shall become revealed as “objective” when QC accomplishes its goal⁵¹. QC scientists regard the future convergence of science and spirituality as the condition of escaping the disjuncture in scientific “consciousness” brought on by the emergence of quantum mechanics.

The majority of “mainstream” physicists take a pragmatic position that avoids addressing this disjuncture, argues David Bradman, lecturer of the course “Quantum Approaches to Consciousness” at John F. Kennedy University. Bradman says the disavowal by so many “mainstream” physicists of the problems at the foundations of physics creates an “ontological vacuum” in scientific thought. Since most physicists respect and uphold the division of labor in the sciences, especially between neuroscience and quantum physics, the unhappy result according to QC physicists is the continued persistence of the Newtonian Worldview, even after the latter has been delimited and brought into new relief by quantum physics. To understand why QC scientists believe the authority of science is to be saved by the convergence of universal consciousness with the ground of physics, it is necessary to first understand how they evaluate the “pragmatism” of the majority as part of their larger assessment of the present state of science.

⁵¹ This letter references QC physicist John Hagelin as a master in meditative practice, a common perception among QC scientists. Hagelin will reappear in this leading role toward the end of the chapter.

To repeat, the fact that scientific spirituality comes *in the future* implies there is something intractable about the Newtonian worldview: you cannot just escape by personal creativity. It has to be worked through. For example, Henry Stapp often reminded his colleagues that Niels Bohr, one of the seminal quantum physicists, explained quantum mechanical equations are addressed to a physicist who has Newtonian concepts at his or her disposal to comprehend the world. More technically, quantum mechanics gives probability distributions for observations that are described by parameters originally derived from Newtonian physics: position, momentum, time, and energy. Since quantum physics addresses a subject who describes the world with Newtonian concepts, we cannot simply escape the Newtonian worldview. We are in some sense embodied “within” it. (Interestingly, Bradman as well as many individuals at the Carl Jung Society of Monterey were well versed in UC Berkeley linguist George Lakoff’s work on embodied cognition and employed these theories in describing how we come to have a “Newtonian Worldview.”)

Even as we are embodied within the Newtonian Worldview, there is a way that the quantum equations address the subject from beyond the Newtonian worldview, but still from within science. To understand why, it is necessary to recall that quantum probabilities are intrinsic probabilities. Intrinsic probability means ontological probability, probability that is part of the physical system itself. It is not epistemological, the result of human error or ignorance. One of the consequences of intrinsic probability is that quantum mechanics cannot provide a definitive cut between the subjective and objective domains in the way classical mechanics does.

This situation gives rise to paradoxes of the kind immortalized by the figure of Schrodinger's cat, who is in a superposition of living and dead states prior to observation. The poor cat is an example of how the line between physical reality and our description of it has been destabilized by the intrinsic probability of quantum physics.

Henry Stapp explains that most physicists follow Niels Bohr in resolving such paradoxes of quantum mechanics "pragmatically." From this point of view, there is no need for an overhaul of the meaning of concepts that structure experience in general, because quantum mechanics always gives prediction for unsurprising experience. Quantum mechanics never predicts a cat will be found in a superposition of live and dead states, and it never predicts an electron will be in two places at once. In the pragmatic view, the mathematical entity physicists call "superposition" has no ontological consequences; it is merely an artifact of the probabilistic nature of the theory.

In Chapter 3, I showed how creative imagination is central to the form of social reproduction of QC that, following Feyerabend, I named proliferation. We saw that QC physicists reject pragmatism because it limits the imagination's ability to grasp hold of physical facts and generalize them in experience. Here, I want to dive deeper into the conceptual implications of this theme. The consequence of pragmatism is that quantum facts are not generalizable beyond a specific experimental set-up. Bohr's interpretation (in Stapp's reading) required a specification of the experimental arrangement or "apparatus" that would be

considered separable from the experimental object or physical state to be measured. This specification results in a pragmatic bifurcation of the world into measuring agencies described “classically” and the quantum state described by the quantum wave function. The truth of experimental facts is tied to a specific classically described experimental setup, which is to say, tied to a description that is not a description of “the way the world really is,” since it is described “classically.”

Insofar as Bohr insists the description of the quantum state is tied to the specification of an experimental apparatus, classical parameters remain elements of observation and cannot be said to give a description of the quantum state itself. “Pragmatism” allows the “Newtonian Worldview” to remain intact because it halts the imagination’s attempt to make contact with the quantum physical realm. This would put strong limits on the imagination’s authority to envision experiments as having realistic implications about the world in general, and deprives quantum physics of its capacity to constitute the imagination anew in light of the quantum’s paradigmatic example. In that case, consciousness remains constituted within the Newtonian worldview, since quantum mechanics is blocked from access to a legitimate discourse on consciousness, and so neuroscience remains the primary authoritative scientific discourse on subject constitution.

In Stapp’s reading, the positive aspect of Bohr’s interpretation is that Bohr brings classical objects into the domain of “experience,” and therefore does provide a reconfiguration of concepts that denies the classical world of its materiality. Classical objects can no longer be understood as “material,” except “pragmatically.” This is a

first step in destabilizing the connection between realism and materialism, a movement Stapp seeks to complete as a precondition to a successful quantum consciousness research program.

This can be understood as follows. Two moments of ontological indeterminacy mediate Bohr's pragmatic "cut" between classical and quantum descriptions of the world. First, "choice of experiment" requires human freedom to perform a "probing action" or measurement upon the classically described apparatus. Then, a second moment of indeterminacy enters insofar as the outcome of the probing action upon the physical state is described probabilistically, where such probabilities are intrinsic. For Stapp, providing a *realistic* interpretation of quantum mechanics requires these two elements of indeterminacy be affirmed as giving *generalizable knowledge* about the physical world, and even about the relation of the physical world to the mental. I would add that recognition of such generalizable knowledge is a moment of subject constitution and grounds QC's discourse on that topic. The QC theory of scientific subject constitution reverses the "mainstream" binaries in a way that may surprise those "stuck" in the Newtonian Worldview: "realism" becomes an assent to statements like "consciousness is the basis of (physical) reality," and "pragmatism" amounts to a refusal of such statements. Hence, the term "realism" has shifted significantly away from a meaning like "there exists a material world irrespective of subjectivity," or the more technical but related definition of reality given by Einstein, Podolsky and Rosen in their famous 1935 paper (see Chapter 1). By locating a consciousness beyond conceptual determination, QC offers a theory of

subject constitution it deems adequate for “realist” empiricism in the age of quantum physics.

Stapp calls the mind-like foundation of reality in his interpretation “Nature,” and he agrees that this nature could as well be called “universal consciousness,” and although he prefers not to use the word “God,” at times he affirms the identity of the three words. Let’s now turn to Stapp’s reading of John von Neumann, and explicate some of the difficulties and paradoxes about quantum physics and consciousness found there. Von Neumann is probably the main hero of QC’s way of narrating the history of quantum mechanics and quantum interpretation, and Stapp has been pivotal over many decades in directing how QC scientists read him. Stapp considers John von Neumann’s 1932 interpretation of quantum mechanics to be of fundamental importance, because in Stapp’s view von Neumann refuses pragmatism in quantum interpretation and instead explicitly formalizes the dynamics of the observer within the quantum physical process. If the great achievement of early 20th century physics (attained by Bohr, Heisenberg, Pauli, Schrodinger and many others) was to overcome the prejudices of the Newtonian worldview and include an active role for the mind in physical processes, Stapp thinks von Neumann represents this accomplishment’s full mathematical realization. In other words, by mathematically formalizing the role of the observer in quantum mechanics, consciousness obtains self-certainty of its own existence via its recognition within the certainty of mathematical physics. Such self-certainty in the existence and efficacy of consciousness occurs because von Neumann gives a mathematical demonstration of the movability of the “cut” between the so-

called classical and quantum world's: the "cut" between the "classical" apparatus and the "quantum" state is no longer a pragmatic distinction, but transposed into a mathematical argument whose result is decisive to QC.

Stapp clarified this point at one of the informal QC meetings between philosopher Michael Epperson of CSU Sacramento, Stanley Klein, and me. He explained that, at the 1927 Solvay conference, the quantum founders discussed the meaning of quantum probability. Heisenberg explained the role of the free choice of the experimenter, while Paul Dirac described "intrinsic probability" as a choice on the part of nature. These two domains define a separation between a domain of experience and a domain of physical dynamics that became known as the "Heisenberg cut." The key point, Stapp emphasized to his agreeing listeners, is that von Neumann demonstrated mathematically that the "cut" is "movable." This means there is nothing in the quantum theory that specifies where to draw a line between the physical and the mental, only that such a line must be drawn. As a result, the definitions of "physical" and "mental" are reworked by concepts derived from quantum mechanics, but in a way that comes to the limit of experience *in general*. Quantum mechanics therefore obtains a unique and privileged position from which to understand and to experience "consciousness."

Von Neumann's explication of quantum theory demonstrates that the application of the rule of conditional probability (the so-called collapse of the wave function) can be understood as "movable" in the theory of the physical process of quantum measurement. In a passage famous among QC physicists, von Nuemann

proposed splitting the universe into three parts: the observer, the experimental apparatus, and the quantum physical system. Von Nuemann demonstrated that the collapse of the wave function could as well be theorized to occur between the experimental apparatus and quantum physical system, or the observer and the experimental apparatus. In the latter case, the experimental apparatus is subsumed into the quantum system. It is for this reason that physicists like Stapp will say “the cut” between the quantum and classical descriptions is movable. This proof is generally referred to as the Von Neumann chain. The mathematical logic of this proof proceeds by a logical regress that moves the “cut” between the classically described apparatus and the quantum state. At some point, it even becomes possible to describe the experimenter’s brain as the measuring device, which can “collapse” a quantum state that now includes the machine normally conceived as a measuring device, but which is here supposed to be in a superposition of states along with the rest of the quantum system. Finally, the experimenter’s brain can also be supposed as in superposition, and the last measuring device available is consciousness. The regress is shown to have a limit, and consciousness is defined as the limit of the physical.

Therefore, according to von Neumann, the only logical point where the conditional probability rule *must* be applied is in the transition from the physical system to consciousness, or what von Neumann calls *das Ich* (“the I” in German). If “consciousness” collapses the wave function, it is because consciousness is defined as the limiting point of quantum physical description, a proposition that, if generalized, gives rise to a discourse on constitutive demarcation that reveals a trace of

consciousness on the “outside,” in the domain of the physical. This is the basis of my claim that QC renders scientific facts numinous, which implies that something of the nature of subjectivity can appear as part of the non-human or non-organic world. It is not just the “interpretation” of the facts that is the source of QC spirituality. Instead, QC spirituality is generated from within the constitutive demarcation of fact from interpretation, and more fundamentally, the subject and its object.

Universal Consciousness

In his novel *The Elementary Particles*, Michel Houellebecq (2000) argues that New Agers believe in science more than anyone else. Looking back on the late twentieth century from an imagined future, Houellebecq writes: “New Age thought appealed to a very real suffering symptomatic of psychological, ontological and social breakdown...New Agers had a genuine desire to break from the twentieth century, its immorality, its individualism, and its libertarian and anti-social aspects. It testified to the anguished awareness that a society cannot function without the unifying axis of some kind of religion; it was, in effect, a call for a new paradigm” (260). Houellebecq reads the New Age movement as an attempt to sacralize science: “they believed only in science; science was to them the arbiter of unique, irrefutable truth” (262).

Whereas many scientists see the New Age as an enemy of science, Houellebecq argues that the New Age is science’s best ally. Therefore, rather than ask, as many physicists do, “How did quantum physics become part of New Age spirituality?” one might as well ask the reverse question: “How did the New Age become part of

quantum physics?” The answer can be found in quantum consciousness research, where interpretive questions give rise to what I have called a scientific spirituality. I have justified my usage of the phrase “scientific spirituality” by arguing that the most basic facts of quantum physics “speak to” the subject and, for some, give rise to an activity of self-transformation that may be justifiably called spirituality. In some sense, there is no need to sacralize science, as if the sacred were something outside science that must be added on. Rather, all one needs to do is uplift one’s attitude of doubt toward one’s own active imagination and allow the wheels of proliferation to take hold (Chapter 3). The sacred within science will *come to you*; it will speak to you, if you are willing to allow it to do so. This is the experience reported by QC scientists, and by fans and followers of scientific spirituality.

For those in connection with academic science, the so-called mind matter problem articulated by analytic philosophy, neuroscience, and computer science is generally considered best studied as an empirical question as to how the brain might produce consciousness. However, the encounter of QC with this hegemonic scientific discourse demonstrates that as a problematic, the mind matter problem may be more fundamentally described as a discourse on scientific subject constitution. That is to say, at its foundation, the mind matter problem is a question of what kind of thing consciousness would have to be in order that empirical knowledge is granted authority. QC scientists tend to feel that most scientists and philosophers beg the question when confronted by the foundational question of subject constitution in science: “mainstream” scientists assume the answer is, “the brain must cause

consciousness to emerge,” and move forward on that basis. Anything else, from that point of view, borders on religion, nonsense, or both. To imagine oneself as a product of one’s brain is a mode of subject constitution that QC scientists have named the Newtonian worldview and that other scientists may think of as simply the hard truth given by science.

Meanwhile, I have shown that QC develops a contending scientific discourse on subject constitution and that the building of such a discourse depends on efforts of the active imagination toward proliferation (counter-induction plus realism qua Chapter 3). Concretely, this may mean obtaining a self-awareness that imagining oneself as a product of one’s brain is itself an act of the imagination, and that one may as easily imagine one’s brain as an emergent effect of elementary particles, for example. Neither act of imagination can be called less scientific, as far as I can tell. Why then shouldn’t the active imagination constitute itself in the quantum realm, if you will, rather than in the image of one’s own brain? It is difficult for me to see how one could answer such a question by recourse to scientific data, very much for the reasons of the arguments presented in Chapter 3 on proliferation. Furthermore, these philosophical speculations and fantasies are not idle but subject constituting; they concern how to ground authority of knowledge in a theory of the subject, in this case, a scientific subject.

So what sort of thing must consciousness be such that empirical knowledge is authoritative knowledge? QC gives a tough answer, one that most scientists prefer not to accept: consciousness is fundamental, but at the same time, we lack access to the

fundamental nature of consciousness because we are embodied in the Newtonian worldview. If empiricism requires recourse to a consciousness that can make observations free from the prejudices of theory, quantum mechanics has placed such empiricism in a state of crisis.⁵² In the QC reading, quantum mechanics reveals certain concepts intrinsic to our very perceptual apparatus, such that our Newtonian Worldview is at least partially an effect of our embodiment and not only of culture. We cannot make observations free from conceptual prejudice since our observations are themselves steeped and embodied Newtonian concepts. The way to save empiricism from the Newtonian worldview is to find a consciousness free of concepts, a consciousness that is a universal ground of being. That is to say, only a certain sort of scientific spirituality can eventually transform the subject from someone biased by the Newtonian worldview to someone with access to a true empirical certitude by virtue of his or her contact with universal consciousness. In Chapter 3, I emphasized that such a transformation is figured as coming in the future. Yet for some, at least a glimpse of such contact has already been achieved.

John Hagelin is professor of physics at Maharishi University, the academic cornerstone of the Transcendental Meditation Movement (abbreviated as TM). Hagelin received his PhD in physics working on super string theory before he decided to concentrate his efforts on TM, which he considered a more spiritually worthwhile

⁵² The reader may here raise the objection that empiricism need not be so naively articulated, and point to the very many scholars who have articulated a more robust notion of empiricism (e.g Feyerabend 1981; Longino 1990; Deleuze 1991; Galison and Stump 1996). Be that as it may, the ethnographic case I encountered showed very little if any knowledge of that vast literature. Instead, QC works to build its own more robust notion of empiricism according to its own conditions and desires – and it is that process I am intending to describe here.

endeavor. Nevertheless, physics remains a central part of Hagelin personality. Hagelin has also garnered himself some recognition as a public intellectual and spiritual leader as a result of his various professional, political and civic efforts. He is a three-time candidate for President of the United States for the TM's Natural Law Party, director of the TM movement and president of the David Lynch Foundation, named for the Hollywood film director. Hagelin has appeared numerous times on popular television shows (especially during his presidential runs) and remains busy giving lectures and seminars around the country and the world. Hagelin is well known in the QC community; he is a regular at the Science and Non-Duality Conference (SAND), an annual science and spirituality conference where high-status QC researchers reconnect with one another. SAND is a typical "hybrid" conference in that its keynote and plenary speakers, often QC researchers, attract fans and followers who attend to see "celebrity" QC researchers like Hagelin give talks to large audiences.

These fans and followers, who have paid hefty registration fees, usually give their own presentations during concurrent sessions to much smaller audiences. This may not seem unlike other academic conferences, but for the fact that most of the fans and followers are mostly not academics, and are not seeking academic recognition. Rather, they are professional engineers, doctors, yoga instructors, aspiring gurus and others, seeking recognition and feedback from the spirituality community and its media networks. Meanwhile, to the side of the networking circus, the 10-20 academic QC researchers organize private meetings at such conferences to discuss future

directions of QC research. It is clear enough that to be invited into the elite circle, it is best to have an academic degree and title, preferably a Ph.D. and professorship in a science. Yet simple persistence, time commitment, and an aptitude to make oneself useful can also get you in.

Among the QC scientists I worked with regularly on the west coast, Hagelin was a respected figure. He had received his PhD at Harvard, and was on collegial terms with most of the better known and more influential QC scientists I had come to know through fieldwork. For those QC scientists who are especially interested in meditation, Hagelin was a model member of the QC community. One of his colleagues told me he is probably the most spiritually advanced member of the QC community. Meanwhile, his status as a string theorist also gave him high sway as a theoretician of QC. Yet since he has yet to publish much material pertaining to QC, preferring to deliver by medium of seminars and talks, his presence in QC's world of written discourse was most noticeable in his occasional posting to the QC message boards. Even on the message boards however, it was clear that Hagelin's words carry weight in the conversation.

Hagelin's presence in the QC community was forged largely by his attendance at science-and-spirituality conferences like Science and Non-Duality and Toward a Science of Consciousness. He had obtained something of a celebrity status, as spiritual leader, even among QC researchers themselves. His ability to gather audiences and obtain fans gave him the position that many lesser-known QC researchers found desirable. In contrast, the even more influential Henry Stapp

eschewed the attempts of members of the spiritual community to make him into any kind of celebrity or spiritual leader. Stapp denied any special knowledge of spirituality and seemed concerned that too much emphasis on spiritual language would take away from the centrality of the physics in his work on quantum mind. But for Hagelin spirituality was central, and physics was an exceptional way to convey the spiritual message, since both pointed toward the same fundamental truth of universal consciousness.

I met Hagelin in Beverly Hills, California. He had just finished a meeting with the David Lynch Foundation. When I asked how he was doing, he said he was very busy. The Lynch Foundation was taking up most of his time and he was also being asked to give lots of talks to various groups. "It is better to be busy than to have no one who wants to talk to you though," he quipped. He asked me about my project, and assured me it was interesting. Yet he worried there will be only a very small group of people who really knew both physics and consciousness. As we sat down to lunch at a Thai restaurant, Hagelin made clear to me that for him, quantum consciousness was not quantum consciousness without a deep meditative practice. He lamented that the work of QC is difficult and takes more time than most physicists have. By "work," he meant the effort of moving consistently between the practice of meditation and the practice of theoretical physics. Indeed, he admitted he was not having enough time to truly keep up with string theory the way he wanted to, although he said he did stay on top of the major developments.

As we ate, Hagelin explained that quantum mechanics and quantum field

theory are difficult for physicists to gain an intuitive understanding of because they have not developed and expanded their own consciousness. He spoke of an experiential understanding of quantum mechanics, quantum field theory, and string theory that could arise from the practice of meditation. Meditation is an empirical practice of a different kind from physics, but the two practices could compliment and even verify one another.

I asked Hagelin whether the relation between meditative state and physical states described by physics was something literal, metaphorical, or something else. He said this was a very good question and he gave a very subtle response. One finds an equivalence of forms, which is a question neither of literalism nor metaphor *per se*, between experiential states and physical states. Hagelin emphasized that he works at understanding how the kinds of mathematics necessary to comprehend deeper and deeper scales, “down to the strings,” are replicated in the forms reached in meditation as one explores the “emergence of experience.” Hagelin mentioned he plans to write a book on the topic but has not yet found time.

Hagelin’s double expertise in string theory and TM allowed him to speak as a scientific mystic in the sense that his words marked a failure to convey a certain ecstatic experience understood as more real than what Hagelin called the “classical world of everyday experience,” where *classical* refers to classical or Newtonian physics. A speech that connotes a failure to express oneself may appear at first as something quite different than the sort of speech intended to be clear, certain, emptied of all personality, so that inter-subjective and hence objective certainty could be

reached. Yet Hagelin's weaving of words showed me these were two sides of the dialectic of scientific spirituality. To find objectivity after classical physics, one must find the universal consciousness that corresponds to the objective discourse of science. This universal consciousness is not something we immediately have access to, rather it is cultivated via meditation on forms expressed in the mathematics of physical theories.

Hagelin had verified for himself a theory of scientific subject constitution born of his efforts in the two practices of theoretical physics and Transcendental Meditation. He showed a little anxiety over his ability to convince others of this truth. I sensed this was because he had found something he knew was not communicable over the period of an hour, or even a week. He seemed at times settled with that, and at other times less so. At one point he hinted that his meditation sometimes directed him away from worldly concerns, including, I inferred, all the talks he was giving on the subject of physics and consciousness. "When you gets to very high state such as that called Nirvana, where 'I am all,' and where thoughts, concepts, and relationships emerge and disappear, you no longer care so much about the world and you want to stay in the world of Nirvana," he explained. At times like this, his persona as quantum celebrity seemed to fall away and instead I saw a person caught between worlds, somewhat unsure. There was the desire that others share what he knew, and at the same time an acknowledgment that if such a thing were possible, it would take years of effort. He would move then to discussing something more grounding, exciting even, such as his successes in helping move celebrities like Oprah and David

Letterman to embrace the Transcendental Meditation movement. These were positive, tangible developments that could help change lives.

Then, as lunch was over and we parted ways, Hagelin reminded me that quantum mechanics gave only a glimpse of how to think about consciousness. Hence, most of the people who I was talking to, who speak of *quantum mechanics* and consciousness, have seen only a small piece of the puzzle. Quantum field theory (the newer physics that combines quantum mechanics and special relativity into a field theory) is better, and super string theory is excellent, he said. Yet the number of people who know consciousness and string theory very well is probably zero, he lamented. I could not help but think of the implication of this was that he felt he was the only one who had seen such connections. There was ambivalence here: was Hagelin the pioneer of the field whose time was still to come, or lone traveler in the depths of consciousness? Perhaps both.

Science and Spirituality

The difficulty in theorizing “spirituality” is that QC understands its spirituality as a form of thought that is non-conceptual. It is, as John Hagelin put it, “beyond concepts.” While I am not sure I can confirm with Hagelin that consciousness beyond concepts is equivalent to “the ground of being,” I do have the certainty that there is thought that is not conceptual, which is to say, a form of thought that does not submit to the demand for sense-making or forms of logic that undergird that which a subject recognizes as meaningful. Of course, spirituality can be conceptualized, but as a

psychic process it is neither reducible to a concept nor to the capacity to make concepts (that would for example bolster a self.) To study thought as primarily conceptual (while admitting the existence of “affects” and “sensibilities” that are usually conceived as something other than thought) gives the result of making impasse and paradox always appear as originating “outside” of the subject, in society, and never also in the individual’s psyche.

In the beginning of this chapter, I described how in *The Hermeneutics of the Subject*, Michel Foucault opposes two truth regimes, one called “spiritual” truth and the other called “scientific” truth. There is, however, an objection to be expressed regarding Foucault’s formulation of science *versus* spirituality. That objection may be raised by way of an earlier meeting between Foucault and Descartes, found in Foucault’s (2006) *The History of Madness*, which resulted in a debate between Jacques Derrida and Foucault over the meaning of Descartes “I think therefore I am.” Derrida’s (1978) objection to Foucault on Descartes and madness runs parallel to my objection to Foucault’s on Descartes and spirituality. The problem is not that Foucault is wrong when he claims that Descartes excludes madness as a legitimate form of thought in the course of his meditation. Rather, it is that madness returns in the forms of an evil demon at the very core of certainty, at the penultimate moment before Descartes establishes the cogito ergo sum, “I think therefore I am.” The truth of Cogito escapes the threat of madness because it is true “*even if I am mad*” (Derrida

1978:55).⁵³ Similarly, scientists cannot fully avoid the kind of truth Foucault (2005) named “spiritual” in his lectures on spirituality. Rather, they must elaborate a theory of subject constitution “even if it is spiritual,” if it smacks of spirituality, or even madness. Foucault’s characterization of how the normalization characteristic of scientific thought blocks access to the kind of *telos* of the self necessary to establish a spirituality was evident for me in my fieldwork. Yet, at the same time, quantum consciousness demonstrates that spirituality returns from within scientific thought. Debates over what sort of subject must be cultivated to access truth are not separate from those practices of self-cultivation. Divisions may therefore emerge between different factions within science over how to cultivate scientific subjectivity.⁵⁴ Such divisions, I have shown, can be traced in certain auxiliary discourses of science, such as the discourse on the “mind-matter problem” and the “quantum measurement problem.” While at first sight, such discourses may appear to be inconsequential philosophy, I have shown that they are in fact fields of struggle over how scientific subjectivity is cultivated and reproduced. Essentially, such struggles are not only between individuals; they also take place within individuals. They can, as QC shows us, signal and perhaps de-naturalize the some of the psychological changes a subject undergoes to be recognized as “scientific” by the self and others.

⁵³ The full quote goes as follows (Derrida 1978: 55, emphasis original): “The Cogito escapes madness only because at its own moment, under its own authority, it is valid *even if I am mad*, even if my thoughts are completely mad.”

⁵⁴ For this reason QC demands a kind of conversion. It is no coincidence that in his discussion on Descartes and spirituality, Foucault mentions a demand for conversion as one of the marks of a pseudoscience. “If it is true, as all scientists say, that we can recognize a false science by the fact that access to it requires the subject’s conversion and that it promises enlightenment for the subject at the end of its development...” (Foucault 2005: 28)

Chapter 5: Conclusion

“[D]eep conceptual shifts within twentieth-century science have undermined this Cartesian-Newtonian metaphysics...”

Alan Sokal, “Transgressing the Boundaries”

By way of ending this dissertation, I would like to offer an unlikely reading of a certain text to show how I have come to think about QC as an example of a kind of secularity. The text in question is Alan Sokal’s famous 1996 hoax paper, “Trangressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity,” published in *Social Text*. This article mirrors and traffics with QC while emphatically distancing itself from QC. It concerns ethical norms that govern how a subject ought to relate to language whose meaning is not readily ascertained by known principles of scientific observation, experimentation and theory. My analysis means to demonstrate how a certain scientist attempted to demonstrate to everyone, by a prank, how to be a proper scientific subject, and hence a paragon of at least a certain type of secularity.

After publication of “Transgressing the Boundaries” paper, Sokal revealed in the journal *Lingua Franca* (1996b) that the *Social Text* paper (Sokal 1996a) was a hoax, that it contains multiple physics errors and was “liberally salted with nonsense” (see Sokal 1996b). It is difficult to say what the main argument of Sokal’s paper could be. Rather, the prose starts and stops, free associates; it speaks in different academic registers and tones, makes surprising associations, and contains far too many quotations from other authors to the point of parody. If there is a main

argument in the paper, it is probably that there is some relation between the theory of quantum gravity and postmodern philosophy. What strikes my attention to this text, long after the “science wars” of the 1990’s have fizzled down, is that it contains ideas Sokal claims to have invented from his own fancy which nevertheless are shared in earnest by other individuals less academically knowledgeable than he, who are nevertheless trying to understand the knowledge of the present and situate themselves in it. Sokal makes connections, for example, between the theory of quantum gravity and biologist Rupert Sheldrake’s (1981) long-marginalized theory of “morphogenetic fields” as a way to explain biological development (Sheldrakes’ critics claim “morphogenetic fields” amount to introducing a sort of creationism or purpose into the theory of evolution). Hence, in his paper, Sokal puts forward a sarcastic argument that the physics of a quantum gravity theory will eventually redeem a very marginal theory (in 1996b Sokal calls it a “New Age” theory, not without reason). He makes bold, clumsy remarks in the relationship between physics and ontology, for example in stating, “Already quantum mechanics, earlier in this century, shattered the ingenuous Newtonian faith in an objective, pre-linguistic world of material objects ‘out there’; no longer could we ask, as Heisenberg put it, whether ‘particles exist in space and time objectively’.”

I have many times watched burgeoning and aspiring QC theorists, the ones who were not stars of this dissertation, but on the sidelines, ask whether there may not be some connection between quantum mechanics and Sheldrake’s morphogenetic fields. They were the retired engineers who attended the conference, or the students in

the courses I audited. These truth-seekers tried to squeak out intelligible sentences about physics and philosophy, only to find themselves making vague statements that they in retrospect felt a little embarrassed to have uttered. They were doing their best, nonetheless! They were learning. They made a lot of statements that could have come out of Sokal's hoax paper. The difference is, they were speaking in earnest, whilst Sokal was not. Sokal was speaking with cynicism, sarcasm, and doubt toward his own speech. Sokal's hoax was successful in part because, just as Sokal wagered, no one at *Social Text* was able to see the signs of irony and deceit that Sokal felt any reasonable person ought to be able to recognize in the text. Sokal's hoax was realized as a hoax because the message he tried to send was "do not take this seriously," and the response he received was, "Yes we are taking this seriously." Sokal blames *Social Text* for this miscommunication, and defenders of *Social Text* blame Sokal (he was being dishonest, etc.)

Sokal's hoax paper no doubt contains errors, vagaries, and lots of silliness. Yet what interests me is that where Sokal's text does become partially intelligible, it reads like amateur QC writing. As I said above, not QC writing of the academic scientists, but of the kind written by an acupuncturist or computer engineer who had recently really gotten interested in QC, started to go to the conferences, found others like him or her, and started making up his or her own original QC theory. The basic message is: a new paradigm is coming, it has something to do with modern physics, it will save us from our old, bad ways of thinking and give us a new way of thinking that will free us mentally and politically. This sounded so much to me like a

simplified or even vulgarized copy of of QC discourse that I sought out Alan Sokal to find out whether his hoax effort was indeed in part a parody of quantum consciousness science. He said it was not, but rather it was specifically attacking humanities scholars' misuses of quantum mechanics. As for quantum consciousness theories like those of Roger Penrose, Stuart Hameroff, and Henry Stapp, Sokal reported that he considered those "unlikely, but not totally crazy."

We may ask about the exact nature of the "crime" that Sokal denounced by enacting his hoax. Is the real transgression that Sokal used explicit physics errors in his hoax paper, and no one caught them? Or is it in fact "worse," in Sokal's opinion, that Sokal's paper included sentences whose meaning was not clear to him, and which he thought should not be clear to anyone? If the later, then Sokal would be suggesting that one should not speak about science in ways that experts like Sokal cannot understand or may find vague and ambiguous. One should not say things like, "Already quantum mechanics, earlier in this century, shattered the ingenuous Newtonian faith in an objective, pre-linguistic world of material objects 'out there'; no longer could we ask, as Heisenberg put it, whether 'particles exist in space and time objectively'." From this point of view, the Sokal hoax is another edition in debates over the authority of scientific knowledge. Its example would encourage non-scientists who speak about science to limit their speech to what the expert scientists can properly diagnose as true or false. As I have shown, what makes some scientists queasy about scientific spirituality is not that it is wrong, but that they are not sure what it means at all.

Scientific spirituality, on the other hand, seeks to allow sufficient ambiguity in scientific speech such that it becomes possible to transform oneself by speaking about oneself in new ways. One does not always know what one means while one is saying it, but maybe that person will figure it out a few years later. In that spirit, I refer to a comment on Sokal by UC Berkeley psychology graduate student and QC theorist Justin Riddle. I showed Riddle Sokal's paper and asked him whether it did not read like amateur QC theorizing. His response surprised me:

I read a good chunk of the Sokal hoax paper and I totally agree with your opinion. It is so offensive that he retracted this paper. It seemed to represent the "new age" mindset, this was definitely written by his unconscious mind breaching consciousness. Also his use of feminism is compelling and reminds me of how his unconscious sexism prevents him from critically considering feminism as having value to science or quantum mechanics. Anyways, clearly infuriating when reading the wikipedia page on this but the paper itself is quite fun. Reminds me of one of my earlier facilitators who wanted to add feminism as a critical theory in the class but we struggled to see the connection to quantum. I think I see it clearer after this paper.

Riddle's interpretation of the paper is the inverse of Sokal's, since what is significant to Riddle about Sokal's paper is what Sokal says *without meaning to say it*. For Riddle, the fact of the hoax was offensive, yet almost secondary, since something else is going on. Sokal, by free-associating and saying things he is not fully sure about, even things that he disbelieves, manages to speak something that is of the order of truth to Riddle. Sokal even convinces Riddle of the importance of feminism as a way of thinking about quantum mechanics (mind you, Riddle is not totally ignorant about quantum mechanics). Sokal retracted his paper, but Riddle knows that the retraction is not everything; Sokal's unconscious is still present in the paper, "breaching consciousness." From Riddle's point of view, Sokal has scientific

spirituality within him, and was able to let it out a little bit, but only under the guise of a hoax.

To understand scientific spirituality, we must recognize that “spirituality” not a concept. Rather, spirituality designates a discourse on conceptual breakdowns, ambiguities, and reconstructions. Scientific spirituality is, on the one side of the coin, a discourse on the constitution of the subject in science, which is to say it a discourse by scientists on the make up and contours of human subjectivity in general. The flipside of the coin is scientific spirituality is also a discourse on scientific subject constitution, which means it is a discourse on how to become and be a good scientist. We have seen the many ways that these two valences of scientific subject constitution are threaded into one another. I have also shown how both mainstream and QC scientists tend to hold their own discourses on subject constitution under a skeptical kind of doubt. This leads to a further complication in analysis. On one hand, scientists produce their discourse on subjectivity using scientific concepts, inevitably held together by some speculation and transcendental or metaphysical considerations. On the other hand, scientific subject constitution (how to be a good scientist) requires that speculative systems on subjectivity, however populated by scientific concepts, be held in suspension, or as I put it in Chapter 3, the time for metaphysical judgment is not yet. In a sense then, to produce a discourse on subject constitution in general is for a scientist a risky and borderline thing to do, even if one’s discourse is as fully structured by scientific concepts as possible. It is best to insure one’s own subjectivity as scientific, which requires the exclusion or at least constant deferral of the

possibility of scientific knowledge of subject constitution in general (such as for example a science of consciousness).

This opposition of diametrical aspects of subject constitution in science makes it difficult to recognize how both aspects are held in dialectical tension throughout scientific thought. It is for this reason I believe many scholars have emphasized the normative and epistemological aspects of science, and minimized its metaphysical valences. This is no coincidence, but is a result of the structure of what Jean-Pierre Dupuy (2013) playfully calls “scientific theology.” Dupuy argues science establishes its difference from theology by forestalling “theological” or metaphysical questions to the future, as I showed in Chapter 3. In scientific theology,⁵⁵ we have faith that sometime in the future, we can settle what is now a metaphysical question by a coming experiment. Indeed, in its non-theological theology, science redefines metaphysical and theological terms in its own image.⁵⁶

Quantum consciousness has a potential to help us rethink secularism in new ways because of what we may call its opposition to science from within science. QC helped us see, for example, how physicists relate to themselves and others as speaking subjects (Chapter 2), how QC scientists relate to future expectations

⁵⁵ Scientific “theology” is discussed by Jean Pierre Dupuy’s (2013) in Chapter 2 of his book *Mark of the Sacred*, called “Science: A Theology in Spite of Itself.”

⁵⁶Metaphysics, for example, becomes “untestable assumptions” such that when scientists do become aware that they do “metaphysics,” what they are becoming aware of is that every research program requires speculative, “untestable assumptions.” (Shapin and Schaffer 1985) What metaphysics does *not* refer to in this context is the whole historical tradition and corpus of knowledge as handed down from Plato and Aristotle through the Abrahamic religions – or, it refers to it only to negate it. If *that* kind of “metaphysics” is to be discussed, it shall be discussed under the rubric of humanities, yet there it is no less transformed.

differently from mainstream scientists (Chapter 3), and finally, how QC practices a specific kind of discourse on subject constitution intended to “transform consciousness” to heal the alienation of the self in relation to the social (Chapter 4).

As in Charles Taylor’s (2007) *A Secular Age*, I have made an effort to define how the modern Western subject, in this case QC scientists, take a specific relation to something transcendental, rather than insisting that nothing of the transcendental can ever peep into history or become the subject of a social science investigation. Yet, quantum consciousness spirituality requires a conceptual makeover for the West’s “Religion Today” far beyond the transcendental concepts Charles Taylor (2007) provides in his chapter by that name. QC challenges us to recognize the importance of specific scientific concepts in the constellation of beliefs and practices we may come to call secular or not-so-secular.

While theorists of secularism often point out how “nature” or “science” becomes the ground of a secular “society” or “politics,” they too often use historically abstracted figures such as John Locke or Charles Darwin to make arguments about how science or nature ground secularism. Really existing discourses of scientific subject constitution, as in quantum consciousness, are not often analyzed in detail. Emphasis is placed on the moment everything has been sorted out neatly into “nature” and “society” (or the “individual”) to make the point that this bifurcation has something to do with secular regimes. Yet QC does surprising conceptual work that shows scientists themselves do not simply sort things out; they also worry over the place of the subject in science. They also tarry with conceptual ambiguity and

paradox. For QC, for example, it is not the case that human “choice” easily fits in the realm of “society”; instead, choice becomes a physically described object of scientific speculation. If Charles Taylor’s spiritual subject seeks out a freedom to express an internal belief system, in quantum consciousness, “freely” refers to the intrinsically probabilistic behavior of atoms as much as to free will, and “inside” refers to the concrescence of mind and brain at the atomic scale.

All this brings us back to why I am surprised that Taylor speaks of the New Age as exemplary of modern (or Western) spirituality: not so much because it may not be true, but because of what Taylor must leave out to produce his narrative of an autonomous and self-expressive spiritual subject that could be worthy of the honor of representing “the West.” Let us suppose for a moment, as both QC scientists and New Agers do, that it is possible to find a “pure” spirituality not confined by the strictures of religion, one that could be an autonomous and self-expressive subject. Well then, Western and non-Western onlookers alike hardly hold *actual practices* of “non-religious spirituality” as the most warmly regarded and celebrated projects of Western culture. Instead, such projects (like QC) tend to give rise to suspicion, embarrassment, censure, disgust and even horror. Taylor seems to try to make this derision exclusive to uppity intellectuals, but the “New Age” also gains little acceptance in government, churches, science, medicine, or law.

The ambivalence of spirituality is clear from the feeling-tone conveyed by the word “New Age.” If a “pure” spirituality is really regarded by liberal or secular Westerners as their high achievement and gift to the world, why do scientists, doctors,

preachers, and post-colonial theorists alike tend to regard so-called “New Age” spirituality (which most everyone agrees is *not* a religion) as embarrassing, or even revolting? And, correlatively, why is spirituality’s most “pure” form, the “New Age,” so populated by symbols of traditions that signify the “outside” of the West, as from yoga, shamanism or Sufism?

The answer to these questions lies in the universality of science today, which, like capitalism is debatably “Western” and yet certainly not reducible to the “West.” Spirituality emerges within scientific knowledge, and inheres in scientific truth, since its mode of thought becomes “not-religion” in relation to science. Or most simply, lots of people think there are facts about the world, and they hold that those facts contain spirituality. The case of QC suggests that the historical constitution of spirituality as “not-religion” is intelligible because of science,⁵⁷ and this has very significant effects upon that “universal” spirituality channeled by Charles Taylor. Spirituality is central to secularism, but it is not for that reason a subject of celebration in societies or institutions that have faith in science (today found all over the globe). Instead, spirituality is a subject of deep ambivalence and sometimes revulsion. Understanding this ambiguity requires us to realize the essential tie between science and its intimate yet always excluded other half, which is barely given a name, but which I call scientific spirituality.

⁵⁷ A similar point is made in Tomoko Masuzawa (2005) *The Invention of World Religions*, especially Chapter 4, “Buddhism, A World Religion.”

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