TAO JIANG

A BUDDHIST SCHEME FOR ENGAGING MODERN SCIENCE: THE CASE OF TAIXU

Taixu[a] was a Chinese Buddhist reformer in the early part of the twentieth century (1890–1947) whose mission was to transform Buddhism into a religion of modern persuasion. His teachings have exerted a profound impact on the development of Chinese Buddhism in the modern era. He was a pioneer in advocating a socially engaged form of Buddhism, which he called "Buddhism for human living" (*rensheng fojiao*[b]), in order to shake off the image of Buddhists as escapists.[1] A major consideration in his "Buddhism for human living" was the accommodation of the challenge posed by modern science.[2] Needless to say, as a Buddhist monk, Taixu's knowledge of modern science was limited, and judging from recent scholarship on the philosophy of science and Buddhist critiques, some of his discussion of modern science might not be very sophisticated. It would be unreasonable to demand that Taixu be well versed in the current scientific discourses, however, many of which were developed after his time, even though he did keep a rather close eye on the philosophical discussions of science that were going on then.[3] Nevertheless, his reflections on the Buddhist viewpoint in the encounter between modern science and Buddhism made him a pioneer in an evolving dialogue between the two. His comments on science from the Buddhist perspective are not just of historical interest; he actually made some very interesting, albeit tentative, observations in his effort to engage Buddhism with science. Those observations have inspired me to pursue a closer examination of the interaction between Buddhism and modern science in the contemporary context. This article is not meant to be a comprehensive and critical examination of Taixu's view on modern science per se. Rather, I will focus on some of his observations that I regard to have relevance in the current debate on science, of which he was not a part. I will use his observations as a general framework in my discussion of the interaction between Buddhism and science while disregarding some of his more outdated views on modern science and replacing them with more updated materials from practicing scientists, many

TAO JIANG, assistant professor, Department of Philosophy, Southern Illinois University, Carbondale. Specialties: Buddhist philosophy and comparative philosophy. Email: tjiang@siu.edu

Journal of Chinese Philosophy 29:4 (December 2002) 533–552

of whom are also Buddhist practitioners. In so doing, I hope to advance his view that Buddhism can be a religion for the scientific age.

It is not hard for a specialist in Buddhism to discern the syncretic nature of my presentation. That is, I am not using one particular traditional Buddhist theory or school in approaching science, but have rather chosen materials from various Buddhist traditions, following the example of Taixu. This represents an increasing recognition of the irrelevance, or unnecessary extravagance, of sectarianism within the Buddhist tradition in the face of various challenges. Since I am not assuming that there is or will be any coherent and uniform Buddhist approach to modern science, given the fact that the Buddhist tradition was not, is not, and most likely will not be, monolithic and homogeneous, my syncretic approach is simply to test one, amongst many, possible Buddhist reactions to modern science by appropriating relevant theories from different teachings. However, these theories are Buddhist precisely because they do share something in common: the nonsubstantiality and groundlessness of existence. My argument is that such a nonsubstantive view of the world is in fundamental agreement with many cutting-edge scientific theories and, therefore, Buddhism can indeed offer a new perspective in the debate between the practices of modern science and their social critics. To do this, I will first examine Thomas Kuhn's argument, which is a social critique of modern science, and then introduce what I take to be a possible Buddhist response inspired by Taixu.

Kuhn's Critique Of Modern Science

Thomas Kuhn was a philosopher of science and his *The Structure of Scientific Revolution*, published in 1962, is considered one of the most influential books of the twentieth century. Kuhn is pivotal in shaping the current debate on science. Indeed, no discussion of modern science can afford to dodge the powerful argument he presents. Kuhn gives a detailed sociological and historical account of how dramatic changes in scientific practices, or what he calls "scientific revolutions," take place. At the center of his argument is the concept of "paradigm," which is meant to

> suggest that some accepted examples of actual scientific practice—examples which include law, theory, application, and instrumentation together—provide models from which spring particular coherent traditions of scientific research . . . Men whose research is based on shared paradigms are committed to the same rules and standards for scientific practice. That commitment and the apparent consensus it produces are prerequisites for normal sciences, i.e., for the genesis and continuation of a particular research tradition.[4]

Simply put, scientific paradigms are a set of rules and standards accepted by scientists in a given field, by committing to which scientists can practice normal sciences that are "firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice."[5]

It is the normal scientific practices, governed by a certain paradigm, that enable scientists to engage in steady and detailed investigations of specific topics in that field, resulting in significant developments in the field. However, such steady development in normal scientific practices is sometimes interrupted by scientific revolutions, provoked by certain crises in the practices, such as anomalies that are irreconcilable with the guiding paradigm, which essentially overthrow the accepted paradigm of a field and replace it with a new one that can accommodate those anomalies. With the change of paradigms, old theories are overthrown, and gone with them is the old world. For there is no other way to view the world for scientists than through the lens of paradigms, as Kuhn so famously claims: "Paradigm changes do cause scientists to see the world of their research-engagement differently. In so far as their only recourse to that world is through what they see and do, we may want to say that after a revolution scientists are responding to a different world."[6] Consequently, he declares that change resulting from scientific revolutions is not a cumulative process, but a sudden switch of paradigm with the new replacing the old, and "[t]he normal-scientific tradition that emerges from a scientific revolution is not only incompatible but often actually incommensurable with that which has gone before."[7] Such a change of paradigms, however, does not necessarily mean that the new paradigm is more valid than the old; they are just different. The reason, according to Kuhn, is that paradigm choice is never unequivocally settled by logic and experiment alone: "As in political revolutions, so in paradigm choice—there is no standard higher than the assent of the relevant community."[8] Since the assent of a scientific community involves more than logical argument but includes the values of the scientists and the personal relationships within that community, the change is not a gradual process; it is more like sudden conversion.[9] In other words, a new paradigm is accepted for reasons other than pure objectivity and logic. Kuhn's critique spearheaded what came to be known as the "constructivist theory of science."[10]

What is especially interesting in Kuhn's critique of modern scientific practices is that it (at least by implication) ultimately attempts to eliminate the distinction between natural science, and the social sciences and humanities. He does that by drawing our attention to the fact that all three are human practices. Since subjectivity is acknowledged as a

central feature in the social sciences and humanities but not as much in the natural sciences, the practice of the latter is eventually made subordinate to the practice of the former by recognizing the common element amongst them, namely, the involvement of human subjectivity. In this way, Kuhn is a major contributor to postmodern mentality, characterized by Michael Barnes as that which promotes ideas such as the social construction of knowledge, cultural relativism, limits of verifiability and falsifiability, the interdependence of concepts and truth-claims, anti-foundationalism, and the value- and theory-laden character of knowledge.[11] Kuhn's critique of science represents an interesting reversal of another trend in the dynamic interaction between natural science and the human sciences (including the social sciences and humanities)—the latter increasingly attempts to be more "scientific."

Critics have challenged Kuhn on many fronts. One brings to light his effective but deceptive tactics[12] in obscuring the obvious fact that "there has been a great accumulation or growth of knowledge in the last four hundred years"[13] due to the developments in modern science. Others point out that his critiques of science are from a sociological, instead of philosophical, perspective.[14] A more serious challenge to Kuhn's constructivist argument has to do with its relativist implications for the truthfulness of scientific knowledge. The two sides in the debate—objectivists defend the objective and value-free nature of modern science whereas subjectivists argue for the constructive nature of scientific knowledge—have become so entrenched in their own positions that they seem irreconcilable.

In any event, the constructivist critique cannot convincingly explain the phenomenal success of modern science, whose solutions to particular problems do not seem to be paradigm-relative.[15] Extreme constructivism has led to an "anything goes" mentality that hardly accords with scientific practices; it reveals the irrational nature of such an extreme approach to modern science .[16] Gerald Holton identifies four groups in what he calls the "anti-science" movement. The first are those who assert that "science can now claim no more than the status of one of the 'social myths'" or even wish to "abolish the distinction between science and fiction." The second are those who are unable to keep up with "the fantastic growth rate of new knowledge" and this has "left them impotent" and "inflict[ed] on them a devastating 'humiliation.'" The third are what Holton calls the "Dionysians" who agree that "one of the worst sins of modern thought is the concept of objectively reachable data." The last group are those represented by Sandra Harding, who claim that physics today "is a poor model [even] for physics itself" and that "science now has the fatal flaw of 'androcentrism.'"[17] Some have therefore come to the conclusion that "much of what science studies is now a site

not of enlightenment about its subject matter but of political demagoguery, theoretical obfuscation and plain ignorance."[18] It is hard not to feel the intensity of the debate.

Upon closer examination, we can discern some confusion in the ongoing debate. Many social critics of modern science have not directed their critiques toward scientific knowledge as such but rather toward the appropriateness of its application. There is fertile ground for dismay with the consequences that modern science and technology have wrought, and Holton identifies three factors in the generation of such dismay. The first one has to do with the widespread concern "over some real or imagined consequences of science-driven technology." The second is due to the need for ecological-thinking, which recognizes "the fragility and delicacy of the interconnections that govern the well-being of all species on Earth." The last one is the increasing suspicion on the part of many Americans toward the authority that the scientific community has wielded, and this has to do with the ingrained American skepticism toward any organized authority.[19] Needless to say, all of these are legitimate concerns about the impact of modern science and technology.

However, these concerns need to be contextualized within the history of the rise of modern science. Modern science started as a dissent from the dominant, anthropocentric orientation of premodern knowledge, as the Copernican Revolution demonstrated. As Peter Gay contends, citing Freud's observation, "Freud had written that psychoanalysis confronted arrogant humans with the third of three narcissistic injuries: Copernicus had displaced humanity from the center of the world; Darwin had compelled it to recognize its kinship with the animals; he, Freud, had shown that reason is not master in its own house."[20] As a result, human subjectivity has increasingly been marginalized in scientific research. Modern science has created a huge gap between scientific knowledge and traditional human value. The constructivist critique of scientific knowledge can therefore be deemed as a reaction against the effort to render human values irrelevant in scientific practices. Yet, it is doubtful whether such a reaction can help to bridge the gap between the two.

Many religious people who challenge science side with constructivism. As Michael Barnes sarcastically comments, "Religious thought challenged by science can find a source of relief in the social constructivist approach to science."[21] Barnes advises religious teachers not to evade the claim of the limited validity and universality of scientific knowledge but rather to embrace it:

> This [a basic faith implicit in science] is faith that being a human person, exercising curiosity and intelligence, seeking to know more about reality, is worthwhile. If the scientist will go so far as to claim it is ultimately

> worthwhile, this is an act of at least implicit religious faith. Religious believers have a fairly simple choice. One option is to evade, attack, reject, or vilify the method of science in order to safeguard traditional religious belief. The other option is to acknowledge the power of that method to discriminate well between truth-claims that work reliably and universally and those that do not. Only the second option is consistent with the actual history and success of science. Science has discovered an enormous amount of fundamental intelligibility to the universe, and has thereby also vindicated the hopes of generations that such intelligibility does exist and that our minds can come to grasp it. Religious thought which does not take this quite seriously as one of its starting points will serve neither itself nor humankind well. Religious thought which does accept this may also find in it a fundamental reason to affirm the ultimate, and therefore religious, validity of being a knower in the world.[22]

Here, Barnes is clearly echoing Einstein's sentiment about the religious nature of scientific activity in search of the evidence of rationality in the universe.[23] Einstein's idea of God was not that of the biblical deity, however: "Rather, his view, derived in part from Spinoza, serves as a necessary reminder that science, from its earliest beginnings to our time, has retained the signature of that single, undifferentiated totality which motivates our inherently endless human search both for explanation and for transcendence."[24] It is one thing to regard scientific activity as a religious act, as Einstein did, but it is quite another to regard science as a religion. The confusion of the two has led to what is known as scientism,[25] which essentially makes science into a religion or a cult.

Barnes, in echoing Einstein, does not side with scientism, but he does not explain how it is possible to reconcile views of reality presented in traditional religious thought and modern science. A traditional religion requires faith on the part of its practitioners in their salvation, whereas Barnes suggests that the premise of scientific practices be accepted as faith in the intelligibility of the universe and that the practitioners be recognized as the knowers of that universe. If both have the element of faith, and if Barnes is trying to bridge the two through this common element, his optimism might be somewhat misplaced; their similarity is only semantic. To be more specific, faith in scientific practices is the faith to know, and faith in religious practices is the faith to be saved.[26] How can the two be brought together? Barnes's dilemma is how to reconcile modern science with religion without either making science into another form of religion or rejecting scientific knowledge in the defense of traditional religious values. What he needs is a form of religion that is consonant with the basic scientific spirit and its claim of knowledge about reality, while offering a value system that is not based upon the rejection of the truth claims of scientific knowledge. There is indeed a religious tradition that can assume such a role, and that is Buddhism. If Barnes's

suggestion is to be taken seriously, Buddhism appears to be well equipped in dealing with the challenges from modern science, to which we now turn.

Taixu's Recommendation

It is a fact that the birth of modern science had nothing to do with Buddhism. Asia, where Buddhism has been a powerful cultural influence, felt the impact of modern science as the result of Western domination of the world, and science was recognized as the power behind such domination. To many Chinese of the early twentieth century, science, fondly addressed as "Mr. Science" (*Sai xiansheng*[c]), was one of two powerful weapons of the West, the other being democratic ideology, "Mr. Democracy" (*De xiansheng*[d]). Despite some initial resistance against modern science and technology in China, a consensus was reached among the elite that in order for China to stand up to the West, acquiring modern science and technology was a must. Science and technology were advocated as a necessary means to shake off colonialism and modernize China. The challenge science poses to humanity in general was not adequately recognized amongst leading Chinese intellectuals, however, because of their overwhelming concern with modernizing China by utilizing modern science and technology in the fight for survival.[27]

Taixu was an interesting exception, however. As a Chinese, he was deeply concerned with the crushing national crises in the late nineteenth century and early twentieth century, which found China at the mercy of European and Japanese imperialism powered by modern technology. But as a Buddhist, he had a much broader concern with the crisis facing humanity. His observations and analyses of the modernity characterized by the overwhelming success of modern scientific development on the one hand, and the consequent loss of a theological foundation for moral values on the other, were indicative of his Mahāyāna Buddhist religiosity, which is concerned with the liberation of all humanity (and beyond). Taixu represented a unique voice among Chinese intellectuals in recognizing the challenge of modern science to humanity as a whole, beyond its immediate threat to his fellow Chinese under the yoke of imperialism.

As a devout Buddhist, Taixu was, of course, concerned with the future of Buddhism in a world increasingly dominated by modern science. He was prompted to keep a close eye on new scientific developments in order to have a better understanding of what may be needed to reform Buddhism. As a result of his observations and reflections, he became acutely aware of a dilemma that characterizes modernity:

> We know that the special gifts that science has bestowed on the lives of human beings can be said to be considerable. However, when the impact of science on human morality is carefully examined, it has not had a beneficial effect. In fact, not only has science not had a positive influence, but in the past few decades moral principles that have been established on a philosophical basis have experienced an increasingly critical attack from science and indeed have lost their foundation. [Furthermore,] moral principles that have been established on a religious basis of divine authority have also been overturned. Because of these developments, throughout the world the central point of orientation for moral behavior has been completely lost.[28]

The vast advancement of material wealth and the loss of the traditional theological foundation for ethics, both resulting from the great strides modern science has made in modern history, characterize the dilemma of modernity into which much of humanity has been thrown. Even though his observation of the challenge posed by scientific knowledge to modernity is not very sophisticated by today's standards, it is nevertheless indicative of an acute and caring intellectual mind that was not blinded by the suffocating national crisis; Taixu was also concerned with the crisis facing humanity as a whole.

What is especially interesting for our purpose here is that Taixu blamed the ills of modernity on the failure of the theologically grounded ethical systems to offer adequate moral guidance due to their fragile foundation:

> Modern science has effectively swept away all god-language by correctly identifying it as a form of mere wish-fulfillment, and as an ultimately debilitating self-deception. Therefore, Taixu concludes that any ethic for the present or future that is established on the injunctions, prohibitions, or expectations of heavenly deities has been totally undermined by science.[29]

Here, he is aiming at the ethical systems that are grounded in theological traditions, such as Christianity. Because modern science has been extremely effective in dealing with the physical world, theological understanding of the world has been called into question. Consequently, the ethical systems that are built upon such a theological foundation have been seriously undermined.

As Taixu saw it, the current crisis facing humanity provided a fertile ground for the gospel of Buddhist teachings. Indeed, in the current crisis, he saw where the future of Buddhism lay, as is evident in his claim that "Buddhism is the only religion which does not contradict scientific truth."[30] Therefore, he declared that "only the Buddha Dharma is the scientific view on human life."[31] We can only imagine how exciting it must have been for him to be able to make such a remark after following the recent developments of modern science. His response to the

challenge posed by modern science was to try to prove the compatibility between Buddhism and science, instead of rejecting the truth claim made by modern science. In this sense, he was not a religious apologist; he was ready to embrace scientific knowledge as a legitimate form of truth and tried to bring the moral and spiritual discourse to the level of the scientific discourse.

To make his recommendation of Buddhism feasible, Taixu took two steps. First, he claimed that science and Buddhism were fundamentally in consonance with each other. Second, he maintained that Buddhist teachings could not be exhausted by scientific knowledge since the former transcended the latter. Let us examine his strategy more closely. Because I am only using Taixu's theoretical framework in the dialogue between Buddhism and modern science, the examples that I will use in validating Taixu's vision are not limited to Taixu's own; they will be significantly supplemented by some recent scholarship on this topic.

Buddhism Is both "Scientific" and "Unscientific"

From his writings, we can clearly discern that Taixu was impressed, and pleasantly surprised, by the amazing compatibility between recent scientific findings and the core doctrines in many of the traditional Buddhist teachings. As a result, he even defended modern science to a certain extent since it clears away the many superstitions that people had held for centuries. Taixu did recognize that many of the critiques leveled against modern science were directed at some of the bad consequences it brought about, such as the production of lethal weapons designed for massive killing.[32] Even though he acknowledged the legitimacy of such critiques, he was quick to point out that the spirit of modern science lay in its highly refined methods, which should be taken seriously by their social critics.[33] Behind such an embrace of modern science lay Taixu's conviction that "the more progress science makes, the closer it gets to the Buddha dharma [Buddha's teaching and its truthfulness], because what the Buddha dharma reveals is the true nature of the universe."[34]

Recently, some scientists have also started to take notice of the "scientific" nature of some Buddhist teachings, and a number of works have tried to bring Buddhism and science together. As Jeremy Hayward astutely observes, modern science and Buddhism have a great deal in common in their view and methods of inquiry: "In both the Buddhist and scientific traditions, one doesn't come to something through blind faith, but looks at things with the intention of overcoming personal bias."[35] The examples that these scientists have used are mainly from

cognitive science, quantum mechanics, relativity theory, nonlocality theory, and so on. As scientists, and in many cases, also as Buddhist practitioners, the Buddhist theories they are attracted to are emptiness (Skt: *śūnyatā*; Ch: *kong*[e]), dependent arising (Skt: *pratītya-samutpāda*; Ch: *yuanqi*[f]), no-self (Skt: *anātman*; Ch: *wuwo*[g]), Buddhist meditation practice, and the like. Many of the comparative studies have built strong cases for the compatibility between the core Buddhist teachings and some cutting-edge scientific theories. These approaches echo Taixu's in spirit, with much more sophistication and expertise on science, to be sure. Interestingly, what is common to them all is that they embrace science and the pictures of the world that it depicts, and that they are enthusiastic about associating Buddhism with science. The traditional conflict between science and religion, often witnessed and dramatized in the West, is nowhere to be found. Let us take a look at two examples from the more recent scholarship on the dialogue between Buddhism and science to show that Taixu's intuition about the fundamental compatibility between Buddhism and science was not just wishful thinking on his part, despite his limited exposure to modern science.

The first example comes from what is generally known as cognitive science, which we will use to illustrate the Buddhist doctrine of the emptiness of the self and reality. Our presentation here is based largely on the findings of the book *The Embodied Mind: Cognitive Science and Human Experience*, jointly authored by Francisco Varela, Evan Thompson, and Eleanor Rosch. In this book, the authors aim to demonstrate the truthfulness of the Buddhist teaching of nonsubstantiality and groundlessness of reality in light of new developments in cognitive science. Its central argument is that "cognition is not the representation of a pregiven world by a pregiven mind but is rather the enactment of a world and a mind on the basis of a history of the variety of actions that a being in the world performs."[36] On the one hand, this argument challenges the necessity of a unified self for cognition; on the other hand, it rejects a world as pregiven waiting to be discovered by such a self.

Some recent works in neuroscience argue that the self is nothing more than the emergent properties of "a patchwork of subnetworks assembled by a complex process of tinkering, rather than a system that results from some clean, unified design."[37] In other words, the mind, with which the self is usually taken to be closely associated, is like a society which, instead of being a centralized and unified agent, is nothing other than the emergent properties out of the localized or specific cognitive processes that operate in the specific domains. These domains are connected to form effective larger systems, and in turn, these systems become higher level systems.[38] The connection and interdependency of those subnetworks is what gives rise to the mind, and as such, the mind

is an emergent property or the result of a bottom-up process, not that of a top-down one. As the three authors see it, the emergent model of cognition echoes the Buddhist Abhidharma systems. To them, the Abhidharma systems are studies of the emergent formation of direct experience without the ground of an ego-self.[39]

What is even more interesting as a result of analyzing the mind into networks of localized cognitive processes is its implication on the object of such decentralized cognitive processes:

> Such networks do not fall into the class of systems defined by external mechanisms of control (heteronomy) but rather into the class of systems defined by internal mechanisms of self-organization (autonomy). The key point is that such systems do not operate by representation. Instead of representing an independent world, they enact a world as a domain of distinctions that is inseparable from the structure embodied by the cognitive system.[40]

Since such decentralized cognitive processes do not operate by representation, cognitions now become, instead of the result of representing a pregiven world, the result of enacting a world that cannot be separated from the very structure of such cognitive processes. In this way, both the realist theory of cognition as a recovery of a pregiven outer world and the idealist theory of cognition as the projection of a pregiven inner world are transcended, through a rejection of their common premise: "These two extremes both take representation as their central notion: in the first [realist] case it is used to recover what is outer; in the second [idealist] case it is used to project what is inner."[41] Such a rejection of representation leads to the consequence of groundlessness of cognition. That is, there is neither an objective ground nor a subjective ground in our cognitive experience. Instead, cognition is the result of mutual specification of the perceiving and the perceived.

> This insistence on the codetermination or mutual specification of organism and environment should not be confused with the more commonplace view that different perceiving organisms simply have different perspectives on the world. This view continues to treat the world as pregiven; it simply allows that this pregiven world can be viewed from a variety of vantage points. The point we are making, however, is fundamentally different. We are claiming that organism and environment are mutually enfolded in multiple ways, and so what constitutes the world of a given organism is enacted by that organism's history of structural coupling. Furthermore, such histories of coupling proceed not through optimal adaptation but rather through evolution as natural drift.[42]

Structural coupling here refers to the interaction between the environment and the organism in maintaining the integrity of the organism, the failing of which leads to the breakdown of the self-organization of the organism; hence its demise. Due to the need to maintain the self-

organization of the organism, the organism would respond to a change in the environment in ways such that a need is fulfilled. However, there is no one-to-one correspondence between changes in the environment and in the organism, because the response an organism makes depends as much on the changes in the environment as the changes in its structure. As such, it challenges the view of natural selection through optimal adaptation of an organism to changes in the environment. Accordingly, natural evolution does not mean the best fit of an organism to the environmental changes, which presupposes a one-to-one correspondence. Rather, it means a natural drift, which allows many possibilities so long as the integrity of the self-organization of an organism is maintained.[43]

The sense of groundlessness of reality is further validated by another scientific theory, that is, quantum mechanics. My presentation here is based upon the popularized version offered by the astrophysicist Victor Mansfield in his highly acclaimed book, *Synchronicity, Science, and Soul-Making*. Judging from its empirical success, quantum mechanics has been the most successful hypothesis in theoretical physics. However, at the core of such a theory is a dilemma that is, in principle, unsolvable. This is the famous dilemma concerning the nature of light, whether it is a wave or a particle, as manifested in Niels Bohr's celebrated "Complementarity Principle":

> Light manifests both wave and particle behavior. Both properties are essential for an understanding of light. One property is not more fundamental than the other. We cannot reduce light's wave behavior to particle properties, nor can we reduce its particle behavior to wave properties. Nevertheless, we cannot simultaneously know both the wave and particle nature of light. We must choose either to measure the wave nature of light (its interference pattern) and forgo knowing along which arm the light traveled, or to know along which arm the photon traveled (its particle behavior).[44]

This is what is known as the Copenhagen Interpretation of quantum mechanics.[45] This seems to suggest, as Mansfield puts it, "*Light only has a contextual nature, not one that independently exists*."[46] If this is true, its natural implication is that "in the deeper quantum mechanical sense, we must actively participate in defining the universe. It's not sitting 'out there' fully objective waiting for us to reveal its pre-existent, well-defined, intrinsic nature."[47] This lack of substantiality of the quantum world, and the participation of the subject in determining the nature of the object, point to the empty, nonsubstantive nature of reality, and the interdependency between the subject and object in our cognition of the world. It is not hard to detect its agreement with the well-known Buddhist doctrines of emptiness and dependent arising, which crystallize a picture of the world as one of interdependent processes that are empty of inherent existence.

These two examples, one from cognitive science and the other from quantum mechanics, show an astounding agreement between modern scientific theories and the traditional Buddhist doctrine of nonsubstantiality of reality and groundlessness of experience. However, despite his enthusiasm in embracing modern science as a vindication of the truthfulness of many Buddhist teachings, Taixu was also quick to point out that scientific knowledge in no way exhausted Buddhist teachings.

> Buddhist truth is also "unscientific" and not limited to the truths discovered through experimental research. While always in consonance with the insights of science, Dharmic truth transcends and perfectly completes them.[48]

Taixu obviously had his own rationale in rendering Buddhist teachings inexhaustible by scientific knowledge. This move has the apparent advantage of leaving room for Buddhist teachings in the forever-changing world of science, wherein later developments may well overthrow the existing scientific theories and hypotheses. As Barnes observes, "The adaptation of religious belief to the conclusions of science can be dangerous for religion. The conclusions of science can change."[49] Taixu was clearly aware of this pitfall.

Such a move does not automatically render Taixu a Buddhist apologist, although it certainly appears to do just that. This will become clearer when we compare his defense of Buddhism with the strategies taken by other religious traditions in the face of scientific challenge. Barnes lists four ways in which religious people have tried to exempt religious beliefs from being judged by the scientific method: The first "is the fundamentalist conviction that revelation of God is always superior to the products of the weak and sinful human mind"; the second is to argue that "religious beliefs are about the 'sacred,' a dimension quite distinct from empirical reality, which is therefore exempt from scientific investigation"; the third is to "deny that religions make truth-claims"; and the fourth is to say that "science, religion and other aspects of life are each part of a language game and are therefore incommensurable."[50]

Interestingly, Taixu's Buddhist engagement with science did not fall into any one of the four ways. His effort did not begin by separating truth into two incompatible or incommensurable domains, one religious and the other scientific. Rather, he relegated scientific knowledge to a lower or limited realm while regarding core Buddhist doctrines as belonging to a higher realm, or a realm without boundaries (*fofa wubian*[h]).[51] The two realms are compatible and commensurable, but the higher one transcends or encompasses the lower. However, such encompassment of scientific knowledge by some core Buddhist doctrines used in this article does not mean that those Buddhist teachings are truer vis-à-vis scientific research. Rather, it is because scientific knowledge of the world is, in

principle, limited, although this does not deny the open-endedness of modern science. To Taixu, the limitedness of scientific visions of the world, powerfully effective as they are, are due to the fact that

> scientists solely rely on improving the machines they use [in their research] but cannot fundamentally transform what the eyes can perceive [by themselves]. Our sense organs and their objects, as well as our body and mind, have an inherent ignorance in their nature. If there is no fundamental transformation [of such an inherent ignorance] and if a scientist only pursues objects and becomes attached to them, how can he not be like a blind person who has great difficulty in getting into the house while stumbling around it?[52]

The message here is very clear: Scientific knowledge is, in principle, a form of disembodied knowledge because scientists rely on machines in their research. Taixu suggests a reorientation of scientific knowledge from its disembodiment to embodiment through the practice of ethical conduct, mental discipline, and wisdom—the Buddhist Eightfold Noble Path—to break through ignorance and achieve enlightenment.[53] This is how the relevance of values and ethics are brought back into scientific discourses. That is, values and ethics do not lie in another domain separate from science. Rather, they are rooted in the very embodiment of scientific knowledge through Buddhist meditation practice. Obviously, values and ethics in this sense are not grounded in abstract and absolute principles separate from the lived experience of human beings, but are instead predicated upon a mindfulness and awareness of our concrete experience acquired through meditation practice.

Therefore, it is only natural to expect that at the center of Taixu's recommendation of Buddhism as a scientific view on human life is the Buddhist yogic practice, which, according to him, should be the direction of science in the future. As Taixu saw it, the modern scientific method is itself a lower form of yogic method, whereas the Buddhist yoga is the scientific yoga.[54] This is a very interesting, albeit peculiar, way of looking at both the scientific method and Buddhist meditation practice. If we are to paraphrase his words, what he means here is that Buddhist yogic method is the scientific method of scientific methods. Only the scientific yogic method, namely Buddhist meditation, can transcend the limitation of ordinary scientific methods, thus leading one to the ultimate wisdom that sets human beings free. Based on his earlier observation that scientific practice is predicated upon disembodiment, we can interpret what Taixu is saying here as advocating the Buddhist meditation practice as the way to redress the problem of scientific practice. In other words, through the Buddhist meditation practice, scientists can embody their knowledge, instead of simply treating it as a theory that does not have a direct bearing on their daily life.

Very interestingly, Taixu's observation of the disembodied nature of scientific practices is shared by the authors of *The Embodied Mind*, wherein they clearly distinguish the departing point of Buddhism from science, especially cognitive science, as it is practiced today. Accordingly, Buddhism makes a crucial distinction between the coherent pattern of dependently originated habits that we recognize as a person and the ego-self that a person may believe one has and constantly hanker after, but which does not actually exist.[55] Despite the great strides cognitive science has made on the nature of the self or the lack thereof, this is a distinction that cognitive scientists have so far failed to make.[56] Failure to make such a distinction indicates that those practicing cognitive scientists have found it difficult to take their theories seriously in their daily life. If the insight of no-self is incorporated in their daily life, the feeling of loss is seen as inevitably accompanying people's life. Therefrom arises nihilism, defined as a predicament "in which we know that our most cherished values are untenable, and yet we seem incapable of giving them up."[57] Hence we have the interesting phenomenon of practicing scientists leading a dualistic life—recognizing the power of their scientific theory about the lack of a self while rejecting it in their daily life. That is,

> although there is no room for a truly existing self in cognitive science, we cannot give up our conviction in such a self . . . And since we cannot choose between the two, we are ultimately left with a condition of schizophrenia, in which we are "condemned" (by our constitution) to believe in something we know not to be true (our personal selves).[58]

On the other hand, the groundlessness of an independent world also seems to point to the same nihilism, since we can choose to either believe in a world to which we have no access, or feel at a loss in simply accepting a groundless world. Neither case seems to be desirable.

Yet are we so condemned that we can either accept the truthfulness of nonsubstantiality and groundlessness of reality, which results from scientific inquiry, thereby living with nihilism, or knowingly reject its truthfulness in order to have a meaningful life? A practitioner of Buddhist mindfulness meditation would answer with an emphatic "no." The purpose of Buddhist mindfulness/awareness practice "is to become mindful, to experience what one's mind is doing as it does it, to be present with one's mind."[59] As the experience of such a practitioner shows, nihilism arises only when groundlessness is accepted as a theory. When it is experienced through the mindfulness/awareness meditation—that is, when it is embodied—it generates a sense of freedom instead of loss.[60] In other words, the embodiment of groundlessness or emptiness through mindfulness/awareness meditation practice transforms a suffering human being to a liberated one:

> Taking groundlessness as negative, as a loss, leads to a sense of alienation, despair, loss of heart, and nihilism. The cure that is generally espoused in our culture is to find a new grounding (or return to older grounds). The mindfulness/awareness tradition points the way to a radically different solution. In Buddhism, we have a case study showing that when groundlessness is embraced and followed through to its ultimate conclusions, the outcome is an unconditional sense of intrinsic goodness that manifests itself in the world as spontaneous compassion. We feel, therefore, that the solution for the sense of nihilistic alienation in our culture is not to try to find a new ground; it is to find a disciplined and genuine means to pursue groundlessness, to go further into groundlessness. Because of the preeminent place science occupies in our culture, science must be involved in this pursuit.[61]

Such a happy marriage between modern science and Buddhism was envisioned by Taixu when he taught that Buddhist meditation practice, culminating in the direct experience of no-self, would give rise to a sense of equality and a profound connectedness amongst fellow human beings.[62] Furthermore, when we realize that "these various forms of groundlessness are really one—organisms and the environment enfold into each other and unfold from one another in the fundamental circularity that is life itself," there will be a deeper appreciation of mother nature and our kinship with other sentient beings.[63] This is the cultivation and realization of wisdom and compassion in Mahāyāna Buddhism. Only when this is achieved can we eventually hope to solve the problems of alienation and meaninglessness that modern science has brought upon us. Otherwise, our way of dealing with our current crisis would be merely reactive and the result would only be temporary solutions, which in the long term would only increase human anxiety and suffering.[64]

Conclusion

In this article, I have endeavored to engage Buddhism with modern science, offering a Buddhist perspective on the ongoing crisis that modern science has brought upon humanity, namely, nihilism. I have briefly examined Thomas Kuhn's famous critique, its constructivist implications, and its challenge by defenders of science. I have attempted to locate a possible Buddhist position in such a debate, inspired by Taixu's effort in the early twentieth century. In Taixu, we see a Buddhist who tried to revitalize Buddhism through an engagement with modern science. His relegation of scientific knowledge to a lower realm, and his elevation of the core Buddhist teachings to a higher realm, signify an acceptance of the knowledge claim of modern science and the compatibility between Buddhism and modern science, while recognizing its fundamental limitations.

Taixu's critique of science does not, in my opinion, make him a Buddhist apologist, and to some extent, he was even a defender of scientific knowledge, regarding it as effective in eradicating superstitions. The problem he had with modern scientific knowledge was its disembodiment. Many contemporary Buddhist-leaning scientists share his view regarding scientific knowledge as a disembodied form of knowledge that generates nihilism, and his recommendation of Buddhist meditation practice as a means to embody the fundamental scientific insight of groundlessness of reality to redress the modern malaise of nihilism. What renders Taixu's recommendation of Buddhism as a viable alternative approach to ethics and values in our scientific age compelling is his acceptance, not rejection, of scientific knowledge claims. However, in accepting such knowledge claims, Taixu did not simply go along with science. Instead, he wanted to "spiritualize" science, not in the Einsteinian sense that regards scientific pursuit itself as a religious act, but in the sense of existentializing the fundamental scientific vision of groundlessness of reality in realizing the ultimate freedom and liberation. If both science and Buddhism aim at setting human beings free, the former advocates freedom from intellectual ignorance and the latter from existential ignorance. In overcoming existential ignorance by following Buddhist meditation practice, we can come to a deeper sense of connectedness with our fellow human beings and our surrounding world. Indeed, we are existentially inseparable from others and the environment. If anything, what Taixu and some Buddhist-leaning scientists propose for our scientific era is that the current crisis can well be a catalyst for a genuine spiritual awakening, if only we try.

SOUTHERN ILLINOIS UNIVERSITY
Carbondale, Illinois

Endnotes

1. Canteng Jiang, *Xiandai Zhongguo Fojiao Sixiang Lunji*[i] [A Collection of Essays on Modern Chinese Buddhist Thought], vol. 1 (Taipei: Xin Wenfeng, 1990), pp. 95–100.
2. As Don Pittman points out, "Taixu located the convergence of the three religio-cultural elements required for addressing the contemporary crisis—namely, a tradition that transforms both the self and the world, that transcends local culture, and that is in harmony with science." See *Toward a Modern Chinese Buddhism: Taixu's Reforms* (Honolulu: University of Hawai'i Press, 2001), p. 169.
3. See Taixu, "Scientific View on Human Life" (*Renshengguan de kexue*[j]), in *The Complete Works of the Venerable Master Taixu* (*Taixu dashi quanshu*[k]), vol. 23 (Taipei: Committee in Charge of the Reproduction of *The Complete Works of the Venerable Master Taixu*, n.d.), and "Buddhism, Philosophy of Religion and Philosophy of Science" (*Foxue yu zongjiao zhexue ji kexue zhexue*[l]), in *The Complete Works*, vol. 21.
4. Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962), pp. 10–11.

5. Ibid., p. 10.
6. Ibid., p. 110.
7. Ibid., p. 102.
8. Ibid., p. 93.
9. Ibid., p. 150.
10. As Michael Horace Barnes summarizes, constructivist theory of science is characterized by
    1. the interdependent or "network" character of all knowledge;
    2. historical evidence of social determination of knowledge;
    3. the notion that science is guided by values rather than by objective criteria or evidence;
    4. belief that the idea of "fit" is hopelessly vague;
    5. the Kantian point: all of our ideas of reality, even if they were not socially conditioned and were not biased by values, are nonetheless constructions of the human mind and senses.

    See idem, *Stages of Thought: The Co-Evolution of Religious Thought and Science* (Oxford: Oxford University Press, 2000), pp. 187–199.
11. Ibid., p. 123.
12. David Stove lists two literary devices to explain how Kuhn and others make their "irrational" arguments against the contribution modern science has made to the accumulation of knowledge: neutralizing success-words and sabotaging logical expressions (*Scientific Irrationalism: Origins of a Postmodern Cult* [New Brunswick, NJ: Transaction Publishers, 2001], pp. 27, 54).
13. Ibid., p. 21.
14. Barnes, p. 188.
15. Stove observes, "When Kuhn speaks of science as having solved problems, he no doubt often uses this phrase in the sense in which people normally understand it: which, whatever it is, may certainly be called an *absolute* sense. But—the idea naturally suggests itself—perhaps he sometimes also uses it in another and weaker sense: one which is more consistent with his repeated assertion that what *constitutes* the solution of a problem is relative to the paradigm, the group and the time" (p. 27).
16. Stove, *passim*.
17. Gerald Holton, *Science and Anti-Science* (Cambridge, MA: Harvard University Press, 1993), pp. 153–154.
18. From Keith Windschuttle's foreword to Stove's *Scientific Irrationalism*, p. 14.
19. Holton, pp. 154–157.
20. Peter Gay, *Freud: A Life of Our Time* (New York: W. W. Norton and Company, 1988), p. 580.
21. Barnes, p. 188.
22. Ibid., pp. 231–232.
23. Holton, p. 139.
24. Ibid., p. 139.
25. Huston Smith gives a nice summary of the difference between science and scientism: "Accompanied by technology (its spin-off), modern science is what divides modern from traditional societies and civilizations. Its content is the body of facts about the natural world that the scientific method has brought to light, the crux of that method being the controlled experiment with its capacity to winnow true from false hypotheses about the empirical world. Scientism adds to science two corollaries: first, that the scientific method is, if not the *only* reliable method of getting at truth, then at least the *most* reliable method; and second, that the things science deals with—material entities—are the most fundamental things that exist" (*Why Religion Matters: The Fate of the Human Spirit in an Age of Disbelief* [New York: Harper San Francisco, 2001], pp. 59–60).
26. I am here assuming a cognitive view of science and an experiential view of (Western) religion as a general rule, with the recognition that they are not mutually exclusive since religion also has a cognitive side and science an experiential side for their practitioners, respectively. According to George Lindbeck, there are three major ways to interpret religion: cognitive or prepositional, experiential-expressive, and cultural-linguistic. The cognitive or propositionalist aspect of religion is analogous to philosophy or science as a source of knowledge, but such an aspect is not primary, although it is often important (*The Nature of Doctrine: Religion and Theology in a Postliberal Age* [Philadelphia: Westminster, 1984], pp. 30–35).
27. Denis Fred Simon and Merle Goldman point out in their introductory article, "The Onset

of China's New Technological Revolution," in *Science and Technology in Post-Mao China*, edited by Denis Fred Simon and Merle Goldman (Cambridge, MA: Harvard University Press, 1989), p. 6:

> In the early decades of the twentieth century, the Westernizers in the May Fourth era trumpeted the slogan of "science" along with "democracy" to discredit the traditional culture. Their humiliation by the Western nations and disillusionment with Confucianism created a spiritual vacuum which was filled with the idealization of Western science and technology as a solution to all China's problems, an idealization that has many parallels in the post-Mao era. Their faith in science became what Baum has called "the functional equivalent to their previous faith in Confucianism." But their uncritical embrace of Western science and technology reflected little understanding of what it was; they did not absorb even the spirit of skepticism and inquiry into the unknown necessary for its development.

28. Pittman, pp. 159–160.
29. Ibid., pp. 160–161.
30. Ibid., p. 165.
31. Taixu, "Scientific View of Human Life," in *The Complete Works*, vol. 23, p. 22.
32. Taixu, "Buddha Dharma and Science" (*fofa yu kexue*[m]), in *The Complete Works*, vol. 22, p. 804.
33. Ibid., p. 805.
34. Ibid., p. 807.
35. Jeremy W. Hayward and Francisco J. Varela, eds., *Gentle Bridges* (Boston: Shambhala, 1992), p. 6.
36. Francisco J. Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind: Cognitive Science and Human Experience* (Cambridge, MA: MIT Press, 1991), p. 9.
37. Ibid., p. 105.
38. Ibid., p. 106. Varela, Thompson, and Rosch are here using the argument presented in Marvin L. Minsky's *The Society of Mind* (New York: Simon and Schuster, 1986).
39. Ibid., p. 123.
40. Ibid., pp. 139–140.
41. Ibid., p. 172.
42. Ibid., p. 202.
43. Here, I rely on Jeremy W. Hayward's interpretation in his *Shifting Worlds, Changing Mind: Where the Science and Buddhism Meet* (Boston: Shambhala, 1987), pp. 110–111.
44. Victor Mansfield, *Synchronicity, Science, and Soul-Making* (Chicago: Open Court, 1995), p. 103.
45. Richard Healey, "Quantum Mechanics," in *A Companion to the Philosophy of Science*, edited by W. H Newton-Smith (Malden, MA: Blackwell, 2000), p. 377.
46. Mansfield, p. 104 (italics in original).
47. Ibid., p. 105.
48. Pittman, pp. 165–166.
49. Barnes, p. 220.
50. Ibid., pp. 222–223.
51. Taixu, "Buddhism, Philosophy of Religion and Philosophy of Science," p. 573.
52. Taixu, "Buddha Dharma and Science," pp. 811–812.
53. Ibid., p. 812.
54. Taixu, "Scientific View of Human Life," p. 25.
55. Varela, Thompson, and Rosch, p. 124.
56. Ibid.
57. Ibid., p. 128. This is a rewording of Nietzsche's famous definition of radical nihilism in *The Will to Power*: "the conviction of an absolute untenability of existence when it comes to the highest values that one recognizes."
58. Varela, Thompson, and Rosch, p. 107.
59. Ibid., p. 23.
60. Ibid., p. 126.
61. Ibid., p. 253.
62. Taixu, "From the Idealist Cosmology of No-self to the View on Human Life as Equal and Free" (*Cong wuwo weixin de yuzhouguan dao pingdeng ziyou de renshengguan*[n]), in *The Complete Works*, vol. 22, p. 984.
63. Varela, Thompson, and Rosch, p. 217.
64. Taixu, "Scientific View of Human Life," p. 38.

Chinese Glossary

a. 太虛
b. 人生佛教
c. 賽先生
d. 德先生
e. 空
f. 緣起
g. 無我
h. 佛法無邊
i. 現代中國佛教思想論集
j. 人生觀的科學
k. 太虛大師全書
l. 佛學與宗教哲學及科學哲學
m. 佛法與科學
n. 從無我唯心的宇宙觀到平等自由的人生觀