

# **Buddhism and Scientific Methods**

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## ***ABSTRACT***

*Although developed originally for the elimination of human suffering, Buddhism in the pursuit of achieving its final goal has developed extremely useful methods to understand reality, to observe causes and conditions for all phenomena, and to overcome any delusions or incorrect views. This paper compares the methods used by Buddhists for enlightenment with the methods used by modern scientists, describes their similarities, and contrasts their major differences. It concludes that the methods used by Buddhists are not only in consistence with the so called "scientific methods," they exhibit additional strengths that current scientific methods fall short of.*

## **Introduction**

Although known to most people as a religion, Buddhism is somewhat unique in its approach among world religions. Most religions believe that human suffering comes from separation of human from heavenly deities or some kind of ultimate existence; Buddhism believes that human suffering comes from ignorance of human being. Most religions believe deliverance results from complete faith and obedience in these deities or the reunification with such ultimate existence; Buddhism believes that deliverance results from obtainment of wisdom. Most religions believe that a divine or supernatural power is responsible for what's happening in this world; Buddhism believes that humans are responsible for their own fate. Because of these fundamental beliefs in Buddhism, Buddhists have traditionally emphasized greatly on the understanding of the law of nature in the physical environment as well as in the psychological and social environment. They have observed and stressed the interrelation and interdependence of all things. They rely primarily on human intuition and rationality to seek truth and better solutions to human problems. The approach taken by Buddhists reminds us many basic beliefs and attitudes of scientists in their search for scientific knowledge. Because of these common beliefs and attitudes, the methods the two employed to solve human problems share many similarities. However, Buddhism and science differ in the final goal, the scope of investigation, the definition of reality and the degree of integration of knowledge. The goal of Buddhism is to use the knowledge or truth to reduce human suffering and to attain a life that is perfectly free. Science, on the other hand, either seeks knowledge for knowledge's sake or has its goal of utilizing its knowledge for the modification of nature to suit all kind of human desires, assuming that satisfaction of maximal human desires will leads to maximal human happiness. In exploration of the nature, Buddhism includes human psychology and consciousness as the primary focus of its enquiry. Science mainly deals with

physical phenomena. In Buddhism, reality are co-defined by the observer and the observed; in science, the observed and the observed are considered independent and separated until very recently. In Buddhism, all knowledge is integrated into holistic supreme wisdom; in science, knowledge is fragmented into pigeon-hole-like compartments because of specialization and the methods of compositional analyses. This paper compares the methods employed by Buddhism in its search for wisdom and the scientific methods used by scientists to accumulate scientific knowledge. It discusses certain similarities and differences between the two approaches with an attempt to identify their relative strengths and weaknesses. It concludes that there are things that scientists can learn from Buddhism and vice versa.

## SCIENCE AND SCIENTIFIC METHODS

### What is science?

The word “science” is derived from the Latin “*scire*,” which means “to know.” But what exactly is it? As it evolved through history of mankind, the meaning of science changed and varied. A definition that may be general enough to be accepted by different people may be: “*Science represents the most exact, most carefully verified, and most general knowledge available to man*” [Searles, 1956, p. 205]. In its early age of development, scientific knowledge may not be drastically different from common sense, perception, or practical knowledge, but represents refinement and extension from them. Later in its development, particularly in the last century, science has departed from ordinary knowledge through the use of systematic and sophisticated research methods and the adoption of rigorous standards for the evaluation of research results. In general, science seeks to provide insight regarding the laws of nature by obtaining confirming empirical evidence to support their theories and explanations. Its objective is to discover knowledge that has the widest validity.

Since human beings deal with all kind of problems in their life and have developed peculiar knowledge for different problems, the scope of scientific knowledge is massive. There are many ways to classify this vast body of scientific knowledge. A common classification is to classify them with a pyramid scheme reflecting the degree of objectivity commonly accorded to that particular type of knowledge. At the bottom of the pyramid are logic, mathematics, and statistics serving as the foundation of science. Immediately upon the foundation are physical sciences such as physics, chemistry and life sciences such as biology and zoology. Built upon the physical sciences are applied sciences such as psychology and social sciences, including sociology, economics, political science, and history. On top of the pyramid are normative sciences that are more subjective and difficult to quantify and test such as ethics and aesthetics. The author, however, thinks this kind of classification scheme is misleading because it implies that there is a difference in the degree of rigor or credibility among different types of sciences located in hierarchy of the pyramid.

The author believes that as long as a science derives its conclusion from the same type of scientific methods, it should be considered as equally valid as other sciences. The above classification is heavily biased toward sciences with materials and matter as their research objects. Consequentially, human knowledge regarding the material world is considered more reliable and valuable than human knowledge about themselves. The implied value judgment assumed in this kind of classification scheme is problematic and seems to be responsible for many of the dysfunctional consequences of modern society (Payutto, 1991).

### **Scientific Methods**

In order to prove the truth of a proposition or the validity of an inference or argument, scientists rely on logic to do the tricks. The word “logic” is derived from the Greek word *logos*, which has the meaning of word, reason, or discourse. In fact, the names of most sciences contain this suffix, e.g., psycho-logy and bio-logy. In the context of scientific methods, logic can be considered to be the science of evidence. There are two major types of logic commonly used. Deductive logic is used to lend support to the validity of inference or argument. More specifically, it is the correct method of reasoning from a premise or premises to a conclusion. Inductive logic, on the other hand, is the process of arriving at general conclusions of various degrees of probability based on observation and factual evidence. These two methods of correct reasoning are widely used in our daily life. If we want to convince someone with something, we will use deduction reasoning by giving reasons for our beliefs and supporting our conclusions with evidence already accepted by both parties to the discussion and by showing our reasoning follows logics. If we want, instead, to make some general statements about something based on limited observations we have, we use induction method.

To illustrate the process and methods commonly used in scientific research today, it may be helpful to look at the general format of a scientific research. The first step in the solution of any problem, whether practical or theoretical, starts with the identification and statement of the research problem. What is the problem that the researcher is interested in? Why is it a problem that deserves the researcher’s attention? The second step of the process is literature review. What has been done with this problem? Has this problem be addressed before? If yes, what was the result or conclusion of previous research? What scientific knowledge has been accumulated regarding to this problem? The third step of the process is the development of hypotheses. Based on the researcher’s observation of the facts and the scientific knowledge accumulated to date, what theory or laws does the researcher propose regarding this research problem? What are the relevant factors that might explain the phenomenon under investigation? What underlying relationships might exist among these relevant factors? The fourth step of a scientific inquiry is research design and research methodology. To identify the underlying relationship among relevant factors, what experiments will be conducted? What data will be collected under what conditions and environment? How does a researcher know that he or she has

collected enough data or number of observations to support his or her hypothesis? How likely the data collected or observations made from the sample represent the characteristics of the entire population? What statistic methods will be used to assess this likelihood? The fifth step of the research is to present the experimental or empirical results of the study and to conclude if the hypotheses are supported by the observation or the data collected. The last step of the research process is to discuss the implication of the research conclusion with respect to previous literature or with respect to its practical application in the real world. Are there limitations and unresolved issues in the research that will restrict the generalization of the research result to the entire population? What suggestions does the researcher have for future researchers or practitioners? How can others apply your research findings to solve their problems? Although research process varies somewhat in different disciplines, the process delineated above captures the scientific methods employed in many disciplines of science in their attempt to generate scientific knowledge for the benefit of all human beings.

### **BUDDHISM AS AN APPLIED SCIENCE**

Although considered by most people as a religion, for the purpose of this paper, I would like to describe Buddhism from the perspective of an applied science. There is a problem in life that Buddhism intends to address, that is, the suffering human beings seem to be enslaved from the first moment after their birth. The whole Buddhist practice is a proposed answer formulated to solve this problem.

To effectively achieve its intended purpose, Buddhism, like any other applied science, needs to first state what the research problem is all about. Buddhism does this in what is commonly known as the first Noble Truth of Suffering, namely, the statement about the existence of all kinds of suffering in life, including dissatisfaction, anxiety, sorrow, irritation, illness, aging, and finally the loss of life. Of course, the use of the words “Noble Truth” here and in the rest of the three remaining “Noble Truths” are somewhat exaggerated, possibly because of religious convictions that are understandable. The so-called truth here is probably more appropriately referred to as “observed facts” or “witnessed phenomena.”

According to modern scientific methods, a research problem is always followed by a literature review examining what has been done in the past by all researchers about this problem. Although not formally described in the Buddhist canon as such (as literature review), the contents of this part of a scientific research were scattered in various places of Agama Sutra and the subsequent scriptures, and many of the data might even be personally collected by Buddha himself during his six years of secluded life conducting his own research and experimentation (a long sabbatical period all modern scholars definitely would like to have). In the early Buddhist scripture, six different types of approaches based on various philosophical presuppositions and beliefs were described and their weakness were discussed and criticized. The traditional meditation techniques used by

Hinduism practitioners, The Four Meditative Steps or the Eight Stages of Absorption were also directly tested by Buddha himself and found out to be unsatisfactory or ineffective in the cessation of suffering.

The next step of the modern scientific research after literature review is the derivation of theories or hypotheses. In this step, the researchers are supposed to present their proposed theories on the correlation or the causal relationships of observed phenomena or data. Buddhism does this in what is normally referred to as the Second Noble Truth. (Again “Truth is a little bit strong use of language, it probably should be called a hypothesis). What it proposes is the theory of dependent arising involving with twelve variables. Referred to as the “Twelve Dependent Arising,” the theory posits that the observed dependent variable of “suffering” is *associated* with birth, two behavioral variables of grasping and possession, two affective variables of feeling and craving, and six cognitive variables of perceptual contacts, six sensory faculty, discrimination of subject and object, consciousness, egoistic volition, and ignorance. Buddha used aging, illness, and loss of life as proxies for human suffering, because these are losses or suffering that are commonly and directly experienced by everyone. The association between suffering and the first ten variables are directly observable by an average person either at Buddha’s time or our time. The last variable, ignorance of reality, is a unique contribution of Buddhism which justifies a little more clarification. It refers to the failure of most people to recognize the fundamental characteristics of life: impermanence, suffering, and the nonexistence of a permanent and independent self. If people had the wisdom of knowing the three fundamental characteristics of life, they would not develop the subsequent cognitive delusions, affective and behavioral habits of grasping and possession, then all suffering will cease. This belief or hypothesis that suffering can be eliminated by the development of wisdom and the eradication of related cognitive, affective, and behavioral afflictions is stated as the third Noble Truth in Buddhism.

After the hypotheses are stated, a researcher is supposed to defend the validity or “truth” of his or her theories/hypotheses by deduction reasoning or by induction method through the collection of empirical data. As mentioned in the above, the association of suffering with the first nine variables (from egoistic volition to possession) is directly observable and supported by many instances in the daily life of an average person. For example, if a person does not discriminate or care about something, the loss or infliction of it will not result in suffering for the person. Buddha encouraged anyone who is in search of liberation to obtain direct and personal experience about the validity of this hypothesis in the Kalama sutra.

The association between ignorance as defined in Buddhism requires more convincing proof. First, ignorance here does not mean unawareness or lack of knowledge about something. Instead, ignorance refers to the incorrect view of permanence and the existence of an eternal and independent self. The incorrect view was the dominant belief in Indian society under the Hinduism tradition at

Buddha's time. Buddhist proof of this fallacy is through the deductive reasoning method of *Reductio Ad Absurdum* (Searles, 1956, p. 133). In earlier Buddhism, the proof is less elaborate. The argument went something like this: suppose that such independent and permanent self exists, then a person with such self shall be insulated from all the afflictions or suffering observed in our daily life. But nobody is immune to afflictions and suffering, therefore there is no such permanent and independent self. Later, this hypothesis of the lack of any permanent and independent entity within human rationality, referred to as Sunyata (non-substantiality or emptiness), was elaborately defended in a much more rigorous way by Nagarjuna in his treaties on Madhyamaka.

The last step of a scientific enquiry usually ends with the statements of implications of the verified theory on how the theory contributes to the body of scientific knowledge or how the theory can be applied to solve some problems in real life. Buddha expounded and stated the implication of the theory of Twelve Dependent Arising in the fourth Noble Truth: The Truth on the Path to Liberation. If the theory is valid, then the starting point would be to obtain the correct view on the reality, followed by development of correct thought, correct speech, correct action, and right livelihood. Finally, techniques instrumental to the implementation of the formulated approach were suggested: mindfulness, constant reinforcement (correct effort), and concentration. These are proven methods for the development of wisdom and the resulting affective and behavioral conditions conducive to the cease of suffering.

## **COMPARISON OF BUDDHISM AND SCIENTIFIC ENQUIRY**

### **Research Spirit and Open-mindedness**

Scientists are usually credited for their research spirit in their relentless attempt to find out the most fundamental laws of the nature and their open-mindedness in the pursuit of truth. In science, no body has the final words. No authority existed. There is not an omnipotent and omniscient figure that provides the last words about truths and reality. Theories and laws are constantly challenged and revised. There is a belief that scientists possess an attitude of "disinterestedness" in their mind when it comes to scientific enquiry. It is said that scientists "sit down before the facts as a little child, and let the facts lead the scientist to where they will." (Pearson, p.6)

The spirit of inquiry in Buddhism and the open-mindedness of Buddhist practitioners are not surpassed by the scientists. I mentioned about the experimental spirit that Buddha advised the Kalamas to have. The Kalams were advised not to believe something simply because they have heard it, have learnt it, have practices it from ancient times; or because it's rumored, in the scripture, on logic, through guesswork or reasoning, conforms to their theory, seems credible, or out of faith in their teachers. Similar attitude was suggested by the Ch'an masters to their students. The Ch'an practitioners were encouraged to always keep

doubt in their learning of Buddhism. The greater the doubt, the greater will be their faith in Buddhism. If there is no doubt, their will be no faith at all.

Whether in reality, scientists can keep a disinterested attitude is rather doubtful. First, science was developed through human history in response to human problem and not through a purely disinterested attitude toward discovery of the laws of nature. Secondly, in conducting scientific enquiry, a scientist has to select his research problem and his hypothesis among several competing hypotheses. The process is influenced by the peculiar nature and the training of the scientists. Third, one can argue that even logical reasoning can not be totally free of personal bias, because logic involves with thinking and thinking is a psychological process. The psychological factors of an emotional and volitional character often interfere with and hinder the attainment of objectivity in judgment and disinterestedness in science. From this perspective, Buddhist practitioners may actually have an advantage over scientists because of its emphasis on removing psychological bias in their practice. Buddhists are constantly reminded to have great insight in themselves by purifying their mind from all kinds of delusions and vexations until their mind is clear and un-obscured as a mirror. According to Adhyatmavidya (a Treatise on the Inner Meaning of Buddhism), it is only by eliminating both vexation- and passion-hindrances that the reality be clearly perceived. In Mahayana Buddhism, practitioners are advised not to attach to any theory or belief, including Buddhism itself. This is very clear from sutras expounding the concept of emptiness.

### **Research Methods**

Both science and Buddhism rely on logic to seek the truth in life. The deduction logic, of course, is heavily used in science as in the case of mathematics and statistics. Buddhism employs a lot of deduction reasoning too. The discussions on the use of deduction reasoning in Buddhism are contained in Hetuvidya (the Science of Understanding the Cause). The arguments are made in three forms, consisting of preposition, reason and example. In general, the tri-statement formula of Hetuvidya corresponds to the three syllogisms of logic but in reverse order. In Hetuvidya, the first statement is the preposition, the second is the cause and the third is examples subdivided into (a) analogy and (b) opposite; in logic, the major premise comes first, then the minor premise and the last is the conclusion. The differences are illustrated in the following example:

#### A) Syllogism in Logic

1. The major premise: All metals conduct electricity.
2. The minor premise: Aluminum is a metal.
3. Conclusion: Therefore aluminum conducts electricity.

#### B) Tri-statement Form of Hetuvidya

1. Preposition: Aluminum conducts electricity.
2. Cause: because aluminum is a metal.
3. Examples:

- a) Analogy: as far as it is known today, other metals conduct electricity.  
(e.g., copper).
- b) Contrast: as far as it is known today, those things unable to conduct electricity are non-metals. (e.g., glassware).

Apart from slight difference between the major premise and the example statement, the other parts of these two systems of deductive reasoning are much the same. Note that the example form in Hetuvidya contains both an analogy and a contrast component, which conveys more explicit information than the single statement contained in the major premise of the syllogism in logic. Moreover, the conditional clause “as far as it is known today” clearly indicates that the example statement is conditional and can be changed in the future. On the other hand, the major premise in the syllogism is arbitrarily stated and problematic. Pending a conclusion whether aluminum can conduct electricity or not, to say that ALL metals can do so is illogical and contradictory. Thus, it can be seen that, the tri-statement form of Hetuvidya has some advantage over the syllogistic form of logic.

In the area of induction reasoning, science definitely has developed more quantitative tools and procedures for the verification of propositions and hypotheses such as probability theory and the related statistical procedures. This advantage of science definitely has something to do with the objects studied by science. Most of the objects studied by science are materials or phenomena that can be quantified and manipulated by mathematical procedures. Since the focus of Buddhism is more psychological than physical, the quantitative methods and procedures are less applicable and less useful. Instead, direct experience by the subjects is emphasized in verifying the truth of certain propositions and claims regarding the path to the cessation of suffering.

### **Objects of Research**

There is an apparent difference between science and Buddhism with respect to the objects of their study and in the relationship they assume between objects and subjects. Most scientific research deals with physical aspect of natural or social phenomena. The target under study usually has physical existence, is observable and subject to certain kind of measurement. If phenomena can not be objectively measured or quantified, they are usually excluded from the domain of science. In addition, the objects under study are always assumed to be independently existing and completely separated from the researchers who observed the phenomena. It is not until very recently that scientists started to realize that the objects of their study may not exist physically through the wave-particle duality observed in the field of quantum physics. The uncertainty principle discovered through experimentation in quantum physics also established the dependence of the observation on the observer and the instruments used.

From beginning, because of the problem it established to resolve deals with both



physical and mental aspect of human beings, Buddhism has to investigate all aspects of human experience including physical, psychological, and mental activities. To search for a complete solution to the cessation of suffering, Buddhists need to seek knowledge from all disciplines as long as it sheds some light on the solution. Buddhism divides human knowledge and the laws of nature into five areas, called *niyama* (laws):

1. *Utuniyama* (physical laws): the natural laws dealing with objects or phenomena occurring in natural world or physical environment;
2. *Blianiyama* (biological laws): the natural laws dealing with animals and plants, in particular heredity;
3. *Cittaniyama* (psychic laws): the natural laws dealing with mind and consciousness;
4. *Kammaniyama* (karmic or moral laws): the natural laws dealing with human behavior, specifically intention and the actions resulting from it;
5. *Dhammaniyama* (the general law of cause and effect): the natural law dealing with the relationship and independence of all things.

Even though both Buddhism and modern science study all natural laws regarding nature and human society, they definitely have different emphases. Buddhists spent much more of its attention on psychic, karmic laws, and the general laws of cause and effect. Scientists have concentrated its efforts on physical and biological laws. It is only until very recently that scientists started to expand their enquiry from physical science to psychology and social science.

Two things are noteworthy. First, scientists collect data exclusively from the experiences arising from the five senses, while Buddhists includes direct experiences from the sixth sense (the mind) as verifiable truth. When there is feeling of fear, anger, comfort, peace, or contentment, people knows it directly from their mind even though such feelings definitely contain certain subjective arbitrariness. There is no potential bias here because the practitioners are well-trained in removing their own convictions and prejudices and because practitioners have a lot of stakes in seeking the truth for themselves. As an applied science, Buddhism gives a prominent role to the sixth sense, the mind and its function. Because direct experience from the sixth sense is ignored in science, an immense amount of sense data, such as love, hate, anger, and fear are deprived. As a consequence, scientists have to resort to instruments designed for the other five senses to study the mind and the thinking process. For example, scientists may attempt to find out what people are thinking by using a machine or by analyzing the chemicals secreted by the brain. These data do have a factual basis, but what they reveal and reflect is probably like Sir Arthur Eddington's "shadow world of symbols." (Eddington, 1984, p.208) It is not reality, but a shadow of reality. In a strict sense, therefore, the truth obtained from scientific enquiry is distorted by the instruments they used.

Second, because of the need for specialization, scientists often take a reductionist approach to their study. They often investigate a small portion of the

phenomenon, holding other conditions constant in a controlled setting such as a lab. The solution it provides is always in a piece-meal format. Integrating the piece-meal knowledge into holistic wisdom to reduce human suffering receives very low priority in science. In science, matter and mind never intersect. The external world and the internal world are totally disconnected. The amassing of knowledge is completely divorced from concerns of lifestyle. The division of mind and matter and the exclusion of mind in its exploration not only impose a severe limitation in the scope of science. It leads one to doubt if knowledge obtained through science is always partial truth and if acted upon, it might cause dysfunctional consequences to humans and environment. An eminent scientist, Mr. Max Planck, the Nobel laureate for Physics in 1918, once commented: "...Science cannot solve the ultimate mystery of nature. And that is because, in the last analysis, we ourselves are part of nature, and therefore, part of the mystery that we are trying to solve." (Planck, 1984, p. 153)

Many scientists, without realizing the severe limitations of scientific knowledge, have helped to promote an over-optimistic attitude toward science, believing that science will solve all the human problems. Behind this optimism are hidden values and beliefs that man can conquer nature, that human wellbeing depends solely on the abundance of material goods, that ethical problems can be resolved without the need for ethics. All these beliefs about science have contributed to potentially disastrous consequences, such as global warming, unhealthy air and water, and unsustainable economic growth.

In contrast, Buddhism takes a holistic and integrated approach in addressing the problem of human suffering. In Buddhism, mind and matter are considered inseparable; reality is a combined phenomenon of both mind and matter. One can not exist without the other. The external world and the internal world determine each other. The study of one can not be isolated from the investigation of the other. In Buddhism, knowledge is integrated under the general conceptual framework of dependent arising. The method of attaining knowledge is part of the way of life, instrumental for the pursuit of the ultimate goal of cessation of suffering. In fact, it is the way of life. In Buddhism, body, mind, and soul are integrated as one. In science, they are split in a schizophrenia fashion. In Buddhism, knowledge heals. In science, knowledge produces tension and conflicts.

### **WHAT CAN SCIENTISTS LEARN FROM BUDDHISM?**

In order to seek the whole truth about the universe and about human race itself, science can not continue its current research methodology of limiting its scope to measurable and quantifiable natural phenomena, it has to expand its scope of inquiry into the intangible and subjective world of mind and consciousness. By bifurcating the universe into matter and mind, science is at the risk of studying an artificial reality created by their instruments and measurement, not the reality relevant to human beings. It may be more objective, but it is less useful because a lot of human problems relate to human perception, emotion and values. It is

very difficult to defend the truth of scientific knowledge if we have little understanding of our self and how human consciousness works. All scientific knowledge is developed through the mind and consciousness of scientists. As human beings, scientists may not be immune to blind spots and cognitive limitations that characterize human specie. A clear understanding of mind and consciousness will minimize such risk and ensure the knowledge obtained represents the most consistent and comprehensive knowledge known to the human being.

To expand their horizon of inquiry, scientists need a philosophical foundation upon which they can integrate knowledge about matter and mind. They need a conceptual framework which can unite external world and internal world. They need a philosophy of science which allows them to avoid conflicts in the scientific world divided by extreme views such as instrumentalism and realism. The theory of dependent arising, discovered by Buddha, and later perfected by Buddhist scholars such as Nagarjuna (in his treatises on Madhyamikas) is such a conceptual framework that will unite matter and mind, internal and external world, theory and practice. The theory of dependent arising, often called “king of reasoning,” does not presuppose any thesis or belief other than the fact of co-interdependency among all phenomena. It requires the least assumption, implied or explicit, compared to any theory or hypothesis known to the human race. Therefore, it can serve as the philosophical foundation for any field of enquiry. It avoids the fallacy of all sorts of extreme views and isms and the dysfunctional consequences they bring to human beings. Buddhism, therefore, could serve as the foundation of science, as argued by Bhikkhu Prayudh Payutto (1991).

### **WHAT CAN BUDDHISTS LEARN FROM SCIENCE?**

Although the Four Noble Truths were handed down twenty-five hundred years and have been tested by numerous Buddhist practitioners with their own personal experience, I am not aware of any systematic research effort attempting to test their truth using current scientific methods. If we follow the research spirit of Buddha, there are a lot of questions that we can raise concerning the Four Noble Truths. For example, with respect to the first Noble Truth, we can ask the following questions:

1. What is suffering? How should it be defined? What makes people suffer? Are there factors other than those mentioned in the scripture?
2. What is the percentage of people in a country agree with the first Noble Truth?
3. If they do not agree with the first Noble Truth, what prevents them from seeing the truth?
4. What kind of people, from what culture, with what kind of life experience, tend to agree with the first Noble Truth?
5. What is the best way to elucidate the first Noble Truth so more people can see the truth?

Similarly, numerous research questions can be raised about the Second Noble Truth:

1. Does ignorance really lead to suffering? What about the old saying: “ignorance is happiness?” Why do they seem to contradict?
2. If ignorance truly causes suffering, is it a sufficient or necessary condition? Or both? Does it have to go through the remaining ten links to produce suffering or can some of the links be skipped? Which link is the most important and instrumental in causing people to suffer?
3. Are there other factors that are not included in the twelve links that could also cause people to suffer?

With respect to the Third Noble Truth, the following questions seem reasonable:

1. Can one completely eliminate suffering? Is it a practical goal for average human being?
2. If it is not attainable by average people, what realistically is achievable?
3. Is the attainment of wisdom a necessary or a sufficient condition for the elimination of suffering?
4. Are there other ways that suffering can be eliminated?
5. Despite the theory, in practice, which link is the most effective in eliminating suffering?

One can also pose a few questions for the Fourth Noble Truth:

1. Do the Eight Noble Paths work for everyone? If not, what kind of people should follow what kind of variation to achieve Nirvana?
2. In a modern society, how to define “correct” or “right?” Shall we use the same definition as described in the scripture?
3. What is right livelihood? Do capitalist society follows the spirit of right livelihood?
4. What is the role of technology in the implementation of the Eight Noble Paths?

All these questions can be further researched using modern scientific methods involving probability and statistics. Massive data and observations can be collected to answer these questions. Resolutions of these questions will help the spread of Buddhism in our modern society. It will also assist the integration of science and Buddhism.

## **BIBLIOGRAPHY AND REFERENCES**

Dalai Lama, *From Meditation to the Atom in the Universe*. Morgan Road Books, 2005.

Dharmawardena, Granville. “Buddhism and Modern Science.”

<http://purifymind.com/BS.htm>

Eddington, Arthur Stanley. "Defence of Mysticism." In *Quantum Questions*, ed. Ken Wilbur. Boston: New Science Library, 1984.

Haig, Dan. "An Analysis of Madhyamaka Particle Physics." <http://www.tibet.org/madhyamika/index.html>

Kukula, Jim. "Toward a Buddhist Philosophy of Science." <http://purifymind.com/BuddPhiSci.htm>

Payutto, Prayudh. "Buddhism as the Foundation of Science." National Science Day Lecture, University of Chiang Mai, August 16, 1991. <http://purifymind.com/FoundationSci.htm>

Pearson, Karl. *Grammar of Science*. London: A. & C. Blake, 1900.

Planck, Max. "The Mystery of Our Being." In *Quantum Questions*, ed. Ken Wilbur. Boston: New Science Library, 1984.

Santina, Peter Della. "The Philosophy of Middle Way." *The Tree of Enlightenment: An Introduction to the Major Traditions of Buddhism*. <http://www.ecst.csuchico.edu/~dsantina/tree/>

Searles, Herbert L. *Logic and Scientific Methods*. New York: The Ronald Press Company, 1956.

Verhoeven, Martin. "Buddhism and Science: Probing the Boundaries of Faith and Reason." *Religion East and West*, Issue 1, June 2001, pp. 77-97.

Wang, Chi Biu. Translated by P.H. Wei. "Scientific Outlook of Buddhism." <http://www.purifymind.com/drfsu30.htm>

Wikipedia, "Buddhism and Science." [http://en.wikipedia.org/wiki/Buddhism\\_and\\_science](http://en.wikipedia.org/wiki/Buddhism_and_science)