

The Four Noble Truths: A Scientific Perspective

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INTRODUCTION

If asked by a non-Buddhist to give a concise description of what Buddhism means, I would select the Four Noble Truths as an appropriate representation of basic Buddhism. According to various traditions, these four Truths appear in Gautama Buddha's very first teaching, which led to the enlightenment of his former attendant monk Kaundinya. Some forty-five years later on the very last day of his life on this earth, the Buddha still referred to the Four Noble Truths, this time to open the eyes of Subhadra at Kuśinagara. In the last instructions to his disciples, the Buddha is said to have repeated three times: "If you still have some doubt as to the Four Noble Truths, promptly question me in order to resolve it. Do not leave your doubt unresolved."¹ It seems, therefore, that a central theme in the teachings of the Buddha may, indeed, be the Four Noble Truths and that their comprehension may be a prerequisite to our understanding of Buddhism.

The subject of human suffering is a concern of all religions, but the Buddha's analysis of this universal human problem may be considered as having been crystallized into the Four Noble Truths. However, the world in which the Buddha lived and carried out his analysis has undergone unprecedented changes. In terms of understanding our physical and biological world of which we are an integral part, a great gulf exists between the Buddha's world and ours. Under such circumstances it is not unreasonable to examine from a modern standpoint Buddhist ideas and teachings transmitted to us through the sutras. This approach

may reveal the underlying principles that were presumably expounded by the Buddha and should be timeless as distinguished from later descriptive presentations which may no longer be valid today. In this paper, I wish to present an analysis of the Four Noble Truths based upon a current scientific understanding of our world. The readers are forewarned that the views expressed here are those of one physical scientist attempting to look into the world of Buddhism.

FORMAT OF THE FOUR NOBLE TRUTHS

A condensed version of the Four Noble Truths, which summarizes the essential points from various versions found in common Buddhist literature, is presented in the table below. The contents of this table provide the basis of the present analysis.

An Outline of the Four Noble Truths

<u>Truth</u>	<u>Subject</u>	<u>Content</u>
1	Existence of Suffering	Birth into This World
2	Cause of Suffering	Conscious and Unconscious Self-Gratification
3	Cessation of Suffering	Extinction of Self-Gratification
4	Guide to Cessation	Eighfold Path

The first step in this analysis will deal with the question of why the Buddha employed this particular format of four categories of "Truths" to represent his analysis of a very complex human problem. The phenomena of suffering cover a wide range of human experience, so why should such a far-reaching study be summarized in just these four groups of relatively brief statements? It is immediately apparent to anyone doing scientific research that this presentation has a sound logical foundation. This format is what is today referred to as "the scientific method", and it is used in the conduct of research and in the reporting of research results in scientific journals.

The First Truth corresponds to a statement of the problem or an identification of the problem. Such a statement, obvious and even trivial as it may seem, is essential in order to focus one's attention precisely on a specific problem. It also happens to correspond to a cardinal rule in an experimental research laboratory that each worker be fully aware of why he or she is doing a particular experiment so that accidents can be avoided and that any clue however small would not be overlooked. The origin or the cause of the problem is described in Truth No. 2. This is the research phase that traditionally requires the greatest amount of time and resources. For those who enjoy conducting experimental studies, this is the step that provides the greatest interest because during this phase usually more problems are uncovered than are solved. A solution to the problem is presented in the Third Truth. Often, research is terminated at this stage because a solution has now been found. However to have a properly completed research, one must go a step beyond this mere identification of a solution and consider what the solution really means and what consequences it may have. For example, some practical applications of the solution may be presented or a more general solution may be formulated so that all related problems would be solved once for all. The Buddha has done just that by proposing his Fourth Noble Truth which is a practical guide and a general solution to

the cessation of suffering.

The Four Noble Truths, therefore, represent a concise report of a carefully planned scientific study of a complex human problem of suffering. It is the product of an exceptionally logical and, at the same time, pragmatic mind.

NATURE OF SUFFERING

The focus of the Four Noble Truths is suffering as it is clearly specified in the First Truth. This fact has been occasionally used to advance an argument that Buddhism presents a dismal view of human life and that Buddhists are overly concerned about human suffering and death. Such a view can be justified particularly with respect to practices in traditional Japanese Buddhist temples where activities often appear to be devoted almost exclusively to memorial and funeral services. However, such practices ignore a basic Buddhist principle of the Middle Way which, while acknowledging that there are always two opposing extremes in every human behavior and experience, teaches us to be aware of but avoid all such extremes. Accordingly in a discussion on human suffering, it must be remembered that there is also happiness and pleasure in our lives. Because we appreciate happiness and pleasure, we can also comprehend suffering. Suffering enhances happiness just as salt enhances the sweetness of sucrose, as every chef knows. It is interesting to note that in the very first teaching of the Buddha the discussion of the Four Noble Truths is preceded by an introduction to the Principle of the Middle Way. This sequence in the presentation of his teaching may be another reflection of the Buddha's logic.

Our understanding of suffering changes with time and place; or in scientific language, suffering is a time- and space-dependent phenomenon. Advances in science and medicine as well as knowledge gained through global communication and travel continually modify our view about the nature of human pain and suffering. What was considered to be an example of suffering yesterday

may not be one today. There are many diseases that caused human suffering previously but not presently. It was not too long ago that a proof of immunization against many contagious diseases was required for overseas travel, but now such requirements have been greatly relaxed. A practice may be a cause of suffering in one community but not in another. Personal difficulties arising from various social rules or from dietary restrictions such as those concerning consumption of certain kinds of food are examples of suffering derived from social or religious customs. Most importantly, suffering is fundamentally a personal experience. Any pain that one feels is one's private experience, and no amount of sympathy from others can cause its total elimination. Suffering is a non-transferable experience, an experience one faces because one is alive and living in this world.

If suffering is dependent on our existence, can there be suffering in the absence of human species? Does nature, including all other living beings, experience suffering? Geological and fossil records show abundant evidence of fires, floods and extinctions of living species long before humans evolved on this planet. In fact, extinction of species seems to have been the rule rather than an exception. Who is to say whether such extinctions, regardless of their causes, represent suffering or non-suffering? Humans have no more control over such natural events than they have in preventing our sun from rising from the eastern horizon each morning. The concept of suffering is a human invention. Suffering exists because we exist. This conclusion is just what seems to be summarized in the First Noble Truth.

CAUSE OF SUFFERING

Why our existence is the cause of suffering is not difficult to trace. Each of us has personal likes and dislikes, perhaps addictions, phobias, and biases of one sort or another. These traits cause suffering, the object of which is always ourselves. To answer why this is so requires us initially to

establish what this object, our individual "self", is. We need to define this "self," and it must be done scientifically so that it will describe one and only one individual uniquely and completely. It must distinguish this individual from all other beings of the past, the present, and the future.

There are two features with which all of us are endowed that can be used as a satisfactory definition of the "self". One is the individual's set of genes that is present in the nucleus of every cell in his or her body. The second is the set of information that is stored in a person's brain at any given moment. These representations of the "self" can be called the "genetic self" and the "cerebral self", respectively. Each of these definitions identifies an individual partially but together they characterize him or her completely and uniquely. Our individual identity has this dual nature of "mind" and "body", and it depends totally on our cerebral and genetic selves. Since it will be informative to examine this view of ourselves in greater detail, let me describe, as an example, the origin of my genetic and cerebral self.

DUAL NATURE OF SELF

My set of genes was first assembled when my mother's egg cell, which contained only a half-set of her genes, united with my father's sperm cell with his half-set of genes. The resulting full set of human genes in the nucleus of the fertilized egg cell transmitted to me all hereditary information from my parents and their ancestors as well as genetic information that developed through countless life-cycles from the very beginning of life on this planet. Encoded in my genes is this evolutionary history of life that eventually led to my present existence. My genes make me what I am, that I am Japanese by ethnic origin, and Asian in racial origin, a homo sapien, and a warm-blooded, omnivorous biped. My physical characteristics represented by my features, fingerprints, etc., and my physiological characteristics such as blood type and the immune system are all governed by my

genes. All this amazing amount of information was encoded in the very first set of genes that formed in the fertilized egg cell from which I developed. This is my genetic origin; it is my genetic self, a self that I inherited.

The single fertilized egg cell, which marked the beginning of my genetic self, soon divided into two cells with the original set of genes cloning into two identical sets, one set for each cell. The two cells then divided into four cells, the four into eight, and so on with gene cloning taking place each time. As the number of cells increased, cells began to form groupings and to develop specialized functions leading to the formation of my brain and other body parts. Just when a human brain starts to store non-genetic information is not clear, but it is not unreasonable to assume that as soon as my brain cells began to develop, I started to accumulate cerebral information arising from external stimulations. After birth there was undoubtedly an exponential growth in the amount of information that was generated by my six senses and was stored in my brain. This process is expected to continue throughout my lifetime until my brain ceases to function and I am brain dead.

My set of cerebral information that I developed in the above manner is undergoing perpetual change. Nevertheless, at any instant it is a unique representation of my "self". An exact reproduction of this set of information by another individual, be it my identical twin if I had one, is not possible. This cerebral self is an acquired self, for I cannot inherit a ready-made set of information. I must accumulate every bit of data, one by one, personally, through a time-consuming process of learning.

The cerebral self and the genetic self are interrelated. One cannot survive without the other unless there is external intervention. Under laboratory conditions, human cells and tissues can be kept alive essentially indefinitely. Since the donor's genes are still present in such living specimens, one has in effect the survival of a donor's genetic self in the absence of its cerebral self. A

donor's body organ that is functioning in a transplanted patient is another example of the survival of a genetic self without its associated cerebral self. In general, however, without such heroic intervention a genetic self cannot exist without its cerebral counterpart. Our bodies require a functioning brain to survive.

CEREBRAL ORIGIN OF SUFFERING

Having established that we can be represented by our cerebral self, we can now examine why a functioning brain becomes a source of suffering. Terms found in everyday language such as "mental health", "nervous breakdown", and "psychological problems" provide ample evidence that without the cerebral self these problems could not be experienced. What about physical or bodily pain and suffering? It is less obvious in these cases, but all physical pains are also brain-based experiences. An electrical signal originating from a malfunction site in our body, be it a broken bone or an empty stomach, must reach the brain and be recognized as a pain signal before we feel any pain. If this signal is short-circuited, for example, by some chemical anesthetics or by an acupuncture treatment, we would not experience this pain. A functioning brain is absolutely necessary for us to experience physical and mental sufferings.

A brain may be necessary to feel pain, but why should a brain distinguish between pain and non-pain signals? What makes us avoid actions and behaviors that lead to the generation of pain signals? To say that we learn from experience to avoid pain is too simplistic and furthermore does not answer the fundamental question of why we try to avoid pain in the first place. We avoid pain because its cause may threaten our life. That is, our survival instincts make us avoid all painful experiences. These same instincts also encourage us to repeat experiences that enhances our life. Our brain which represents our cerebral self is trying to gratify the cravings of our genetic self.

GENETIC ORIGIN OF SUFFERING

Our genetic self protects us from external threats and prolongs and propagates our life. Wanting not to die, wanting to live longer, and craving to procreate are all powerful manifestations of this inherited self. Just how powerful such an instinct is can be illustrated by a few examples.

We have all experienced hunger pains. These are signals that our stomach sends to our brain telling of its need for nourishment in order for the body to survive. If the brain does not respond or is unable to fulfill this requirement, the body will start to feed on itself. Body fat, body tissues, and even bone marrow begin to be consumed to sustain the body. Eventually, the body turns into skin and bones and perishes. This is the phenomenon of starvation, and the cerebral self is incapable of preventing the genetic self from such self-destructive acts. The same survival instincts give rise to our bodily immune system that protects us from foreign bacterial attacks, to the clotting of our blood which prevents us from bleeding to death from superficial wounds, and to our natural reflexes that automatically cause us to blink our eyes or shield our face and body with our hands and arms when an unexpected sudden external movement occurs.

Our identity started with the formation of a single fertilized human egg cell and then from its subsequent successive divisions into numerous cells. What drove the sperm cell to unite with the egg cell? What caused each cell to divide one after another? These events are also consequences of the genetic self, and they represent a basic human desire to prolong and to propagate life.

A genetic self is present in all living things, but what distinguishes humans from other living species is that the human genetic self is moderated by its cerebral counterpart. Our bodily instincts are tempered by our minds. In fact, a human mind can overcome completely these genetic instincts and can lead to self destruction of the body as in cases of martyrdom and suicides. However, while one

remains alive, there is no way that one's cerebral self can have complete control over the genetic self. Being born a human, one can never overcome this fundamental limitation set by one's genetic self.

THIRD NOBLE TRUTH AND ITS REALIZATION

The cessation of suffering is the subject of the Third Truth. Before we examine the way to cessation suggested in this Truth, let us review other available methods of eliminating suffering, particularly those arising from bodily malfunctions. It was implied earlier in our discussion of the cerebral self that physical pain or suffering is becoming less of a problem for us. With the availability of many kinds of painkilling chemicals, there is no longer any reason for anyone to suffer prolonged physical pains. Advancements in our knowledge of physiological and neurological origins of pain are expected to lead to better and more effective drugs, and it may not be long before all humans can expect to live a life almost devoid of pains and sufferings originating from our bodies.

A better understanding of various forms of mental sufferings is also being gained today. Some mental distresses have been traced to genetic origins or to some lack, or an over-abundance, of specific chemical substances, making clinical treatments a possibility. We are now recognizing many mental sufferings as symptoms of diseases and hence medically treatable. There has been a rapid growth in the number of medical professionals, psychologists, therapists, and counselors who specialize in studying and treating mental disorders. Although progress in relieving such sufferings has been relatively slow compared to that in treating physical pains, future prospects seem promising. Therefore, cessation of suffering arising from our cerebral self appears to be realizable, and some day that goal may no longer be a major consideration of the Third Noble Truth.

Cessation of suffering arising from the genetic self is entirely a different problem. The im-

possibility of a complete denial of this self by the cerebral self has already been mentioned. As long as we remain alive, mentally and bodily, we are under the ceaseless influence of the genetic self. Basic instincts originating from this self cannot be turned on or off consciously or unconsciously. Even a practice of celibacy is unlikely to lead to a complete suppression of our sexual desires or our instinct to procreate. Neither can meditation nor dietary practice absolve us from the fundamental requirement of life, that of taking other lives to sustain our own. Making a dietary distinction between animal and non-animal sources is an arbitrary gesture, for there is no scientific justification for drawing any such line. All beings, humans, insects, animals, fish, plants, and even microbes, have survival instincts and resist death. No living thing deserves or desires death to become food directly or indirectly for another life. Living by killing is a natural law, neither good nor bad, that all beings are destined to follow.

It should be evident from this analysis that our instincts or cravings arising from the genetic self cannot be eradicated. It can only be moderated by our mind. A complete denial of this genetic self is beyond the power of a mortal being. This seems to be a disturbing conclusion because it implies that we are incapable of realizing the goals of the Third Noble Truth. Fortunately, such a pessimistic conclusion is not necessary because a solution to our difficulty is given in the Fourth Noble Truth.

THE FOURTH NOBLE TRUTH

A way of achieving cessation of suffering is presented in the last category of Truths. Amazingly, we find here no mention of the denial of one's self, either of cerebral origin or of genetic origin. Neither are we told to abandon our secular life in order to eliminate suffering, nor are we given any specific remedy for curing these pains. What we find here instead is a set of eight actions, all very positive and practical, that is said to lead to the cessation of suffering. These suggestions,

rather than being religious rules, seem to be straightforward guidelines for an active but sensible and harmonious life in this real world. There is a quality of timelessness and universality in these suggested actions; they can be followed easily by anyone regardless of his or her religious background. These guidelines hold true not just for the Indian society of 2,500 years ago but also for our own technologically advanced world. It is truly remarkable and totally unexpected that such a pragmatic solution represented by the Eightfold Path was proposed by the Buddha as a way to the cessation of human suffering. This solution is so surprising and at the same time so simple that a careful analysis of this solution is called for, especially since this Path is fundamental to all Buddhist traditions.

A common representation of the Eightfold Path consists of right view, right thought, right speech, right action, right livelihood, right effort, right mindfulness, and right meditation. While there may be some minor variations in the translated English terms (e.g., view vs. understanding, thought vs. aspiration, action vs. behavior, mindfulness vs. thought, and meditation vs. concentration or contemplation), there appears to be a general agreement on the order in which these actions were proposed by the Buddha. Our first question, therefore, concerns the significance of this ordering. After all, the Buddha appears to have been an extraordinarily logical teacher, and it is unlikely that he would have presented the results of his analysis of human behavior in a random manner.

First we note that the actions recommended in the Eightfold Path involve neither our survival instincts nor our natural reflexes. All are associated with our cerebral self and are consequences of a functioning brain. In fact, by considering the Eightfold Path as a representation of a general human brain activity, we discover that there is indeed logic in the order of presentation of these eight categories of actions. This logic can best be shown by considering our brain and its activities to

be equivalent to a modern electronic computer and its workings. The analogy between a human brain and a computer is a good one, and there is much similarity in how each works and is used. At the present time, however, a human brain seems to be superior to a computer except perhaps in computing speed and in data retention. A computer seldom forgets but we often do.

The "brain" of an electronic computer is called the central processing unit (CPU), and it is usually located in a box below the video monitor in most personal computers. The CPU learns to do things by being "programmed" in various, non-English, machine languages which we fortunately are not required to learn. For a computer to be functional, it must have in addition to a CPU, an input system and an output system. An input system, usually consisting of a keyboard and disk drives, is very much like our six sense organs, and it permits our "brain" to acquire data and to receive additional instructions. After the data is processed by the "brain", the results are directed to the output system where they may be printed out on some device or be translated into mechanical motions as in automation processes. The CPU can also be programmed to optimize the output data in some specified manner by including a feedback mechanism in the computer. By such feedback processes, both the input and output data can be selectively screened.

With the above brief description of the use and workings of an electronic computer, we can now view the Eightfold Path. Firstly, "right view" and "right thought" correspond to the computer's input process, and through them our brain acquires knowledge (data). Information generated through our six senses all channel through these input activities. Secondly, the brain's output system is represented by "right speech", "right action", and "right livelihood". In this case, "speech" gives directly the brain's output by audio means whereas "action" and "livelihood" more closely resemble the output in automated systems controlled by the CPU. Finally, the functions of the CPU itself are

represented by "right effort", "right mindfulness", and "right meditation". Here, "effort" may be considered to be the power supply of the CPU, and without effort nothing can be accomplished. Inclusion of an optimization feedback process in the CPU is also implied by the qualifier "right" attached to "mindfulness" and "meditation". Through these feedback processes, the optimum choice between "right" and "not right" can be made, thereby satisfying the Principle of the Middle Way. Under such circumstances, the input data will become a source of not just new information but of wisdom, and the output activities will automatically reflect true compassion.

The above analysis provides once again strong evidence of the Buddha's logic and of his astounding understanding of the workings of a human brain. What he presents in the Fourth Noble Truth is not just a way to the cessation of suffering but the essence of Buddhism itself. One cannot help but develop the two basic goals of Buddhism, wisdom and compassion, by following the Eightfold Path.

CONCLUSION

A critical examination of the Four Noble Truths from a scientific standpoint reveals that these Truths are based on a truly remarkable understanding of human brain and bodily functions. The concise statements that summarize the Truths concerning the existence, the origin, and the cessation of suffering are in complete accord with conclusions derived by tracing the origins of human suffering to genetic and cerebral sources. Difficulties due to human limitations in achieving a cessation of suffering by the elimination of cravings may have been foreseen by the Buddha, because a surprisingly pragmatic solution is offered in the Fourth Noble Truth. The Eightfold Path that requires a deep and critical awareness of our real world can, indeed, serve as a rational guide to a life of compassion and wisdom.

REFERENCE

1. *Buddha-Dharma*, ed. K. Tokunaga
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