

[Philosophy Buddhism] A First Look at the World of Information - Understanding Information from the Buddhist Perspective

Ruguo Ma*

Nanjing Normal University, Nanjing 210023, Jiangsu Province, China

Abstract. The information revolution is undoubtedly one of the most important technological achievements of human society; however, there is no consensus among scientists about what information is. What is information? What are the characteristics of information? What is the relationship between information and signals and between information and consciousness? In this study, we try to answer these questions from the perspective of Buddhism. We consider information to be the Buddha's sambhogakāya, similar to the Buddha's dharma body, and it is considered to be beyond time and space. Information is "not produced, not destroyed, not defiled, not pure, not increase, and not diminish." By studying these characteristics of information, the connections between traditional Buddhism and modern technology may be determined, and it can provide insights for the human society to better understand truth.

1. Introduction

An information revolution of unprecedented momentum is in full swing worldwide; we are active participants of this revolution, and it can make us feel a dread of being rendered obsolete. Though the information revolution is still gathering momentum, it has brought about a surprisingly dramatic change in the human society. However, we still do not clearly understand what information is. A building, however brilliant, will be a castle in the air if it does not have solid foundations; if we cannot accurately understand information, where is the foundation of our information revolution, and what is the significance of the information revolution? By understanding information correctly, perfectly, and comprehensively, we can better utilize information and achieve a more successful information revolution, reaching a higher level of civilization. Herein, we try to understand information from the perspective of Buddhism, hoping that it can help us further understand information.

2. Understanding Information

First, we focus on the source of the information revolution. Claude Elwood Shannon, who proposed information theory, stated, "For the study of information theory, the 'meaning' of a message is essentially irrelevant" [1]; "The basic problem of communication is, at one point, exactly or approximately reproducing the message selected at another point" [2]; "These messages often carry meaning, that is, they point to or are associated with particular physical or conceptual entities, according to some system.

*Email: jueguo@163.com, cell phone: 13851614556

But these semantic elements of communication have nothing to do with engineering problems"[3]; it follows that the message that Shannon talks about is "something that is transmitted from one point to another and may not bear meaning at all" This is also a common phenomenon in today's communication engineering. People have focused mainly on the accurate transmission of signals in communication systems; however, no one focuses on the intrinsic meaning of these signals, which is generally called narrow information theory [4].

Some scholars find it challenging to accept the meaningless concept of information. The physicist Heinz von Foerster argued: "At that time I was going to rename the so-called information theory signal theory because the information had not yet been produced in it. There were only 'beeps' there, and no information. Information is created only after this set of signals has been converted into other ones that our brain can understand - In short, information is not in the 'beeps'" [5-8]

According to Norbert Wiener who proposed cybernetics, "The mechanical brain does not secrete thought like 'the liver secretes bile,' as the materialists of the past claimed. It does not emit thought in the form of energy like a muscle makes a movement. Information is only information and is neither matter nor energy" Wiener considered information to be an objective entity similar to matter and energy, and his concept of information is the most popular concept of information in contemporary research.

Information cannot be defined because it is a fundamental concept similar to matter and energy; such a concept can be used to define other higher-level concepts, which can only be described by themselves.

Information exists in two forms, namely natural and social. Natural information includes the quality, shape,

temperature, and chemical composition of objects, which are natural attributes; social information includes the meanings of words and language, and it is created by humans. When we describe the quality and temperature of an object, we use language and words as signals, and the meaning of these constitutes information. An object itself is also a signal, and the quality and temperature of this object are also information. Thus, in an ideal situation, if language and words can accurately indicate the mass and temperature of an object, these language and words and the object itself constitute signals with the same function. They express the same information, and their utility is equivalent; thus, different signals can be used to represent the same information.

A signal is a form of information. People use signals to illustrate and perceive information, but signals do not constitute information. The relationship between signals and information is similar to that between us and our names; our names are the signals that represent us. Buddhists term signals as a finger pointing to the moon; thus, information is the moon that the finger is pointing to. We should not be confused by the finger, or signal, but should understand the essence of the moon, or the information.

From the perspective of information, all objects comprise a set of information, and these objects are a collection of all information about their mass, shape, temperature, chemical composition, historical trajectory, and so on; everything constitutes a signal representing information.

Information is abstract; therefore, it does not exist as an independent physical entity. This may explain why people find it challenging to understand information. We have information about many historical events. Archaeological excavations reveal preserved signals and information about historical events, proving that although things no longer exist physically, information does not disappear. Most information about historical events is no longer available; however, it does not mean that information does not exist. It only means that we do not have access to it. We may forget what we did or said yesterday, but the related information continues to exist. We can re-perceive the relevant information through signals such as audio or video recordings or the memories of other people.

If natural information such as the mass of an object exists independently and objectively, does artificially invented social information, such as human thoughts, also objectively exist? The answer is still no. Take the act of playing chess, as an example. We think that each move is a result of our independent thoughts, but the truth is, we choose one solution among many possible options; each move has an objective reality and is restricted by the existing rules of chess. The concept of information in the universe is similar to chess. Stephen Hawking said: "Now, if you believe that the universe is not arbitrary, but is restricted by definite laws...if there really is a complete unified theory, presumably it will also determine our actions. In this way, the theory itself determines the outcome of our exploration of it!" [9] Physical events that

occur obey the laws of the universe and those violating the laws do not take place.

If we consider that certain social information does not independently and objectively exist but is dependent on events or is generated from specific physical events,[10-12] explaining the source of false information such as lies is not possible. "I am in Nanjing" is undoubtedly a true message. If it is obtained according to my current location, how are false messages, such as "I am not in Nanjing" and "I am in Shenzhen" obtained? These pieces of false information cannot be generated from the objective event of "I am in Nanjing," hence, we can only assume that information like "I am in Nanjing," "I am not in Nanjing," and "I am in Shenzhen" originally exist; the piece of information "I am in Nanjing" is consistent with reality, while other pieces of information are not; however, it does not mean that the information does not exist. The pieces of information "I am in Nanjing," "I am not in Nanjing," and "I am in Shenzhen" are similar; they are neither true nor false and are neither right nor wrong; the piece of information "I am in Nanjing" is consistent with the facts, and as a result, it is true only when it corresponds to a specific physical event, such as my current location. The pieces of information "I am not in Nanjing" and "I am in Shenzhen" are false because they are not consistent with the facts. The truth and falsehood of information depend on whether we use it correctly or not, rather than on the information itself.

Another question posed is as follows: is the piece of information "I am in Nanjing" coming from my brain? In other words, does our brain create information from nothing? After all, there are rules for playing chess, and options for the next move are always constrained by rules. However, many things in life are apparently not constrained by clear rules, and we seem to have an infinite number of options to choose from. Suppose, I call my friend and say "I am in Nanjing," and another Nanjing resident N also says the same. We do not share this message beforehand. It means that the message "I am in Nanjing" was neither invented by me nor by N, but it simply existed. We use this message today and may use it again tomorrow, and it will always be there. When we use this message, our brain just selects it and does not invent it.

If we realize that information exists independently and objectively, then it follows that truth and falsehood and good and evil also exist independently and objectively. They are not conclusions that we draw using our subjective judgments. Thus, we can explain: Why people around the world, despite being separated by thousands of miles and not communicating with each other, have similar moral standards? Why do different people, regardless of their varied histories, cultures, religions, languages, and customs, agree that theft, fraud, lying, and bullying are immoral and sinful? The reason is that all these pieces of information exist objectively and independently. If truth and falsehood or good and evil were invented by different people, maintain such similar standards would have been difficult for people. Newton and Leibniz created calculus separately and independently. Because calculus exists independently and

objectively, Newton's calculus and Leibniz's calculus have the same meaning, although they use different symbols, that is, signals.

Information exists independently similar to matter and energy; however, unlike matter and energy, which are concrete entities, information is an abstract entity. Additionally, unlike concrete matter and energy that can be perceived directly, abstract information can only be perceived indirectly through signals. For example, the mass of an object can be perceived through signals such as numbers shown on a scale, words, or language.

Similar to matter and energy, there is no truth or falsity, and right or wrong, about information. All information is equal. As stated in Buddhism, all things in the world are equal, and there is neither lowliness nor nobleness in them [13]. People use information to illustrate the physical world, and people's judgments about the truth or falsity of information are based on specific physical events. The world of information obeys the laws of mathematics and physics and logical rules and relationships between concepts; information obeys the laws of physics only when it is used to represent physical phenomena. For example, the relationship between two objects is influenced by the law of gravitation.

Lu You, a poet in the Southern Song Dynasty, mentioned in "Article": "An excellent article is formed by nature. Only great literary man can compose it by chance." An article is a combination of information corresponding to words, and this combination simply exists. Using a combination of words, a writer can write a good article. All information (whether the discovery of the law of gravity or the invention of computers) exists and is obtained by chance.

3.Spatio-temporal Characteristics of Information: Information is Beyond Space and Time

As independent entities, matter and energy exist in space and time and are affected by spatio-temporal changes. There is a life cycle from birth to extinction, which is known as Cheng (creation), Zhu (continuance), Huai (destruction), and Kong (emptiness) in Buddhism; there is a specific location and trajectory in space. Matter and energy exist in the four dimensions of space and time, which form the cornerstone of modern scientific building. However, a question arises that as an independent entity, is information affected by space-time? The answer to this question may be very surprising.

Information does not perish, and it does not end. Historical events are preserved (assuming that they are true, accurate, and complete), and future generations use records to learn about these historical events. Although historical events have ended, the records about those events (namely signal) are preserved, thus making information about them available, which means that information still exists and has not perished even though the historical events have ended. What if these records were not preserved? The records are only signals, and the information is independent of the signals. Even if the signals disappear, the information would still exist

independently and not disappear; however, we will not be able to perceive this information. If the lost signals are recovered by chance (e.g., an archaeological discovery), we can perceive the information again. Irrespective of whether we can perceive it or not, information always exists and does not perish; thus, information is endless and eternal and is independent of specific events and signals.

If information is eternal and has no end, which is already very surprising, was information created at a specific time? After all, all historical events occurred at a certain time. The answer to this question may be more surprising: information simply exists and has no beginning.

Let us assume that yesterday, we planned today's work, and today, we worked according to yesterday's plan. So, when was the information about today's work created? The information about today's work existed at least yesterday, and all our today's work is just a manifestation of yesterday's work plans (i.e., information). Thus, information can exist before a physical event; and it is not attributed to a physical event.

When did information come into existence? I personally believe that information existed, and there was no specific time when information came into existence, that is, information has no beginning. For example, even if no matter exists and we do not know Newton's law of gravity, the law is there and it does not change; Newton only made us aware of this information.

Irrespective of what moves we make when playing chess, the information exists. Each move is merely a manifestation of a piece of information; thus, this piece of information becomes an actual physical event, and all other information thus becomes a non-physical entity that does not happen.

If information must result from a physical event, lies, a common type of false information, should not exist, because they represent information that is not based on facts, as discussed in section xxx. The existence of false information proves that information does not result from a physical event, but it simply exists.

If the Big Bang theory is true and the universe does indeed have a beginning, was information also created from the moment of the Big Bang? The answer is no: all information we have today, whether real or false, existed before the Big Bang because information does not result from any physical event.

Matter is tangible, and therefore, there is a life cycle from birth to extinction; information is intangible, and as a result, it is immortal.

Thus, the temporal characteristics of information can be summarized as follows: information has neither a beginning nor an end, it cannot be created or destroyed, it simply exists, and it is not influenced by time.

Information is not influenced by time or space. The laws of mathematics and physics are true at all time points and in all spaces and do not change with changes in space and time. The motion of matter does not influence the correctness of the laws of mathematics and physics; however, these laws determine the motion of matter. That is, information determines the matter, but matter does not determine information. Just as everyone is equal before

the law, everything is equal before the rules of mathematics and science.

A Nanjing resident says, "I am in Nanjing," which is a true piece of information; however, this piece of information is not restricted to Nanjing. A New York resident may also say "I am in Nanjing." He does not need to transport the piece of information from Nanjing to New York, which means that the information does not exist only in Nanjing but also in New York because information has no place, is not limited by space, and is ubiquitous.

According to the space-time theory of general relativity, as the speed of an object changes, time expands, space bends, and mass changes. Does information change as speed changes? Because information is invisible and ubiquitous and has no mass, it is eternal and unchanging.

Similar to quantum entanglement, information is not limited by space and time. Additionally, "information entanglement" exists in the information world: although associated entities have the same information, their information is not limited by space and time. For example, when German Democratic Republic (GDR) officially joined the Federal Republic of Germany (FRG) on October 3, 1990, the nationality of all former GDR people was immediately changed, regardless of their location in space and time. Even if a former GDR astronaut was traveling in space and had not yet obtained information about this new development, their nationality was immediately changed from GDR to FRG.

This eternal and unchanging nature of information is perfectly consistent with the Buddhist worldview [8]. According to the Heart Sutra Prajna Paramita Hridaya Sutra, "All Dharmas are empty of characteristics. They are not produced, not destroyed, not defiled, not pure and they neither increase nor diminish!" "Dharma" refers to all dharma, which includes all information, and not just in the narrow sense of Buddhism. According to the broad Buddhist perspective, all dharma is Buddha dharma, there is no worldly dharma that is not Buddha dharma, and worldly dharma is also dharma. The Sad-dharma Sutra says [14], "All production activities are not contrary to Dharmatā," and worldly dharma is the Dharmatā Dharma. The Heart Sutra points out that information is the vacuum Dharmatā that is not produced, not destroyed, not defiled, not pure, not increased, and not decreased. Hence, we believe that the world of information is a component of the One True Dharmadhātu.

For example, the number "1" has the same meaning in Chinese, English, or any other language; we cannot say that it exists or does not exist in Nanjing or New York; we cannot say that it exists or does not exist at a certain time. An infant is unable to understand this information not because the information does not exist but because of the lack of cognitive ability. As stated in Buddhism, information is everywhere, it does not have a beginning and end, and it simply exists. Thus, we can understand the following Buddhist thought: "A wide area can be placed on a single hair"[15], "one is all, and all is one"[16], and "all Dharma is not produced"[17].

According to some people, the characteristic of "not produced, not destroyed, not defiled, not purified, not increased, and not decreased" refers to Buddha nature

rather than information. Buddha nature cannot be produced, destroyed, defiled, purified, increased, and decreased. It is the Buddha's Dharma body. The Buddha has three bodies: the Dharma body, sambhogakāya, and incarnation. Sambhogakāya is the wisdom body of the merits and virtues of Buddha's Dharma body, and wisdom is the mastery of information, that is, information is the Buddha's sambhogakāya. The Dharma body cannot be "produced, destroyed, defiled, pure, increased, and decreased"; similarly, sambhogakāya cannot be "produced, destroyed, defiled, pure, increased, and decreased." The Western Pure Land of Amitabha Buddha is the pure land of sambhogakāya that cannot be "produced, destroyed, defiled, pure, increased, and decreased"; hence, information cannot be "produced, destroyed, defiled, pure, increased, and decreased" too.

4. Information and Consciousness

There is still no clarity about what information is. What is the source of consciousness? What is the relationship between consciousness and information? Modern science has not yet been able to clarify these questions; however, there must be some very close connection between information and consciousness.

Many people also argue that traditional Buddhism is superstition, is contrary to modern science, and has no practical value. This, of course, has something to do with the vague nature of Buddhism theories.

Science aims to reveal the truth about the world, and there is only one truth. If Buddhism is the truth, it should reveal the truth of the world to us as well. Any false and erroneous theory cannot clarify the meaning of existence.

Traditional Buddhism's understanding of information and consciousness can provide inspiration for using precise modern scientific concepts and ideas to replace those in Buddhism that are not easily understood by modern people.

According to Buddhism, human beings have six roots: eyes, ears, nose, tongue, body, and mind; the world has six sense objects: color, sound, fragrance, taste, touch, and dharma. The six sense objects act on the six roots to produce the six senses: Color (color of matter) acts on the eye root (eye) to produce eye sense (vision), sound acts on the ear root (ear) to produce ear sense (hearing), fragrance (smell) acts on the nose root (nose) to produce nose sense (smell), taste (the taste of food) acts on the tongue (tongue) to create tongue sense (taste), touch (objects) acts on the body to create body sense (touch), and dharma (information) acts on the mind (brain; mind is generally called the heart by ancients because the role of the brain is not clear) to produce consciousness. The six roots, the six sense objects, and the six senses are referred to as the "eighteen realms" in Buddhism. Thus, it can be considered that Buddhism has already realized that information (dharma) exists independently like matter (color, sound, fragrance, smell, and touch) and that consciousness can be construed as the role of information in the human mind (brain). According to Buddhism, the five senses, namely eye sense, ear sense, nose sense, tongue sense, and body sense cannot act independently (they all act through

consciousness), which is consistent with the viewpoint of modern science: the eyes transform the optical signals received from the outside world into the visual signals of the human body, and the nervous system transmits the visual signals to the brain, thus imparting the sense of vision. The senses of hearing, smell, taste, and touch are also formed through a similar process, and these senses are ultimately formed through the actions of the human brain. Since traditional Buddhism lacks the rigor of modern science, and the purpose of Buddhism is not to conduct scientific research, some of its ideas may not be expressed in a standardized manner. For example, the concepts of “color” in the six sense objects and that in the five yin are not the same; the above ideas about eye sense are relatively simple and not based on modern physiology and optics; nevertheless, these fundamental ideas are still correct.

A question posed here is as that since all the neural signals received by the brain, such as visual and auditory signals, are electrochemical signals, how does our brain transform the physical signals into information (e.g., the meanings expressed by words and sounds) and then form mental consciousness?

If we consider information as an inherent and objective entity, our thinking process should not be viewed as what is invented from scratch, but like panning for gold (searching a gold mine) or playing chess, that is, working out the best solution from a series of available options. The thinking process involves simply gathering and selecting information from the information base, just as an information system collects and processes signals that already exist.

Our brain is like the CPU of a computer. The physical CPU can only process physical electrical signals, but the computer cannot understand the information in physical signals such as words, sounds, and graphics because the meaning of the signal—the information—is given by human beings, rather than being inherent in the signal itself. Similarly, the physical human brain can only process physical electrochemical neural signals but cannot directly process information; thus, we must explore how this transformation from physical neural signals to mental information consciousness occurs.

We can obtain relevant information and generate relevant consciousness even in the absence of physical signals. For example, in our sleep, we may have consciousness related to vision and hearing, and we may feel that we have seen or heard something; however, we did not receive any external visual or auditory signals. This phenomenon proves that information is independent of signals and that people do not necessarily have to rely on a signal to obtain information. The fundamental difference between human consciousness and computer information processing is as follows: in the absence of external signals, human beings can interact with information directly and generate consciousness; they can also receive external physical signals through their senses, understand the information, and form consciousness; however, computers cannot work without signals because they can process only signals but not information.

According to Buddhism, in addition to the above six senses, we have a seventh sense, *kliṣṭāmanas*, and an eighth sense, *Alaya*. *Alaya* can be considered as the subconsciousness in psychology, and *mantra* can be considered as the channel between the conscious and the subconsciousness. *Alaya* is an information bank with four functions: the cognition of self-cognition, self-cognition, seeing-portion, and seen-portion. External information belongs to the seen-portion of *Alaya*, and the inner seeing-portion of *Alaya* can see the information of the external seen-portion, just as the eyes can see colors and the ears can hear sounds. The five roots, that is, eyes, ears, nose, tongue, and body can generate the five senses separately. The seventh sense *kliṣṭāmanas* is the channel linking the sixth sense (mind) to the eighth sense (*Alaya*), which is equivalent to information system channels. *Kliṣṭāmanas* focuses on the seeing-portion of *Alaya*, which is called *Atma-graha* in Buddhism. It is equivalent to the source of interference in a channel, and it makes the consciousness love and hate information according to a person's interests. Emotion is equivalent to noises in information system channels. Buddhism calls it the “continuance phase” and “separate mind.” The seventh sense, *kliṣṭāmanas*, thus passes the information of seeing-portion to the eighth sense, *Alaya*, as well as *Atma-graha* (noises) to the sixth sense (consciousness). As a result, the consciousness has objective information as well as subjective emotional noise generated by *Atma-graha*, which distorts the information and makes the consciousness misinterpret the information according to people's needs. Thus, we cannot fully understand the information objectively and fairly.

Seeing-portion and seen-portion of *Alaya* are similar to the seeing-portion and seen-portion of the eye sense; the eye can be used to see something, which is the seeing-portion of the eye sense, whereas the objects seen by the eye are the seen-portion of the eye sense. After the brain receives the corresponding visual signals of the objects seen by the eye, *kliṣṭāmanas* passes the relevant information from the eighth sense *Alaya* to the sixth sense consciousness, simultaneously forming the emotions of love and hate according to *Atma-graha*, thus influencing the consciousness and resulting in judgments that are not completely objective. If consciousness is considered equivalent to the CPU of a computer, *Alaya* is the database, *kliṣṭāmanas* is the data channel connecting the CPU with the database, and the five roots of the eyes, ears, nose, tongue, and body are the signal collection terminals.

In this manner, we connect signals with information in the brain through consciousness and simultaneously produce subjective emotional noise.

If we acknowledge that information exists objectively and is independent of signals, according to the Buddhist viewpoint, only *Alaya* can perceive information. This viewpoint can be explored in further scientific research to obtain deeper insights.

For the time being, we will not introduce the function of the cognition of self-cognition and self-cognition of *Alaya* because this article does not intend to introduce Buddhist thought. Buddhist practice aims to completely cut off *Atma-graha* and return to the “original situation,”

that is, to deaden the noise of information systems. According to Buddhist thought, the original information obtained by the five roots, namely the eye, ear, nose, tongue, and body, is pratyaksa information that is real and will not distort; eye sense signals formed by the objects seen with the eye are like plane mirror images and will not distort. Because of consciousness, we logically analyze, compare, and distinguish information corresponding to the eye sense signals and use reasoning, thus generating anumana information. Furthermore, based on Atma-graha, we generate emotional noise, which leads to the transformation of distorted information into anumana information. Therefore, ordinary people's perceptions of the world are like images seen in a distorted convex (or concave) lens, which are not real. Through Buddhist practice, we can repair this defect, completely remove Atma-graha, and convert our consciousness into a flat mirror to truly reflect all external situations, all of which can make our minds healthier [14] Based on the aforementioned analysis, consciousness can be construed as the impact that physiological signals and objective information have on a person's mentality, which comprises three parts, namely the physiological signals, positive information (including the pratyaksa information corresponding to the physiological signals, and the anumana information formed by logical analysis), and non-quantitative information and its corresponding physiological signals, which are negative physiological and psychological reactions of a person caused by positive information, such as emotional noise, which generally lead to information distortion.

Animals also have emotions, so do they also have Alaya? According to the Buddhist viewpoint, animals are also creatures and have Buddha nature; hence, they also have Alaya and the ability to perceive information. The difference between animals and humans lies in their different levels of ability; there is a difference in vision (eye sense) between humans and animals, and all creatures have different Alaya. It may be challenging for other religions to accept this viewpoint.

Probably, some people do not support the use of Buddhist thought to explain scientific theories. Is Buddhist thought necessarily absurd? Have we obtained sufficient evidence to prove that they are wrong? According to Hu Shi, "make assumptions boldly and produce proof carefully." When we prove or disprove the truth, we should present scientific evidence instead of insisting on preconceived bias. People search for truth through trial and error. Traditional Buddhism must be supported by modern scientific ideas to realize its goal of spreading Buddhism. Modern science has the responsibility and obligation to explore all scientific fields unknown to mankind, including the truth or falsity of all religions. Truth must be universal. If Buddhism is the truth, it must have a connection with modern science, can eventually be confirmed, and provide help for the development of modern science and civilized society; otherwise, using modern science to prove Buddhism is absurd. Buddhism has also the responsibility to be challenged by others and prove its correctness to the world. Furthermore, Buddha dharma requires empirical

evidence, which has strikingly similarity to the empiricism of modern science. Any theory (whether worldly dharma or Buddha dharma) that has not been verified in practice should not be accepted as truth.

5. Is It Necessary to Introduce Two-Dimensional Information Outside the Physical World of Four-Dimensional Space and Time?

Modern science uses four-dimensional space and time to explain the physical world, and all matter exists in space and time. According to the Big Bang theory, the universe originated from a Big Bang that happened 13.8 billion years ago, which produced matter, space, and time; whether the universe existed previously remains unknown. In addition to the four-dimensional space-time theory, do we need to introduce other dimensions, such as the information dimension, into our world? The reason for introducing other dimensions is based on the following three points:

1. The Big Bang theory assumes that the state of the universe before its creation is unknowable. However, we have determined that information is eternal, that is, it has been existing before the birth of the universe, and it does not disappear after the extinction of the universe. If this hypothesis is proved, with technological advancement, we can obtain and understand information regarding the universe before the Big Bang in the future. According to Buddhist thought, everything in the universe goes full circle following the path of creation, continuance, destruction, and emptiness, which is strikingly similar to the Big Bang theory. The difference between the two is as follows: according to the Big Bang theory, the world has a beginning and an end, but the beginning and end of the universe remain uncertain. According to Buddhist thought, everything in the universe goes full circle, which is like playing chess; when a game is over, the next game starts. Although the chess manual of each game is different, the rules of chess remain the same, and information about the chess manual is also everlasting. Considering the current technological achievements, the laws of mathematics and physics have nothing to do with space and time. Newtonian mechanics, relativistic mechanics, and quantum mechanics all obey the same mathematical laws, thereby proving that information is eternal.

2. If we do not introduce the information dimension, the current four-dimensional space-time theory cannot completely explain the world. A pair of shoes contains a left and a right shoe, both of which carry different information since they were produced; by the time they are unusable, the two shoes show varying degrees of wear, proving that they carry different information, even though they have gone through the same spatio-temporal process from the beginning to the end. How can we explain this phenomenon if the information dimension is not introduced? For instance, two people have exchanged information in the same space and time so that their cognitive level has improved; if there is a third person in

the same space and time who has not participated in such an information exchange, his cognitive level has not changed, indicating that the difference occurs due to information within and not because of space and time. The development of human society has shown that humans' cognitive level and the level of civilization are dependent on information rather than space and time.

3. We can illustrate the theory of space and time through information, but we cannot illustrate information through the theory of space and time, which proves that information is the basis of space and time. Four-dimensional space and time are only the annotations for the information world, just as a chess game is an annotation for the rules of chess. The physical world of matter and energy, space and time, and others should be represented by corresponding information. Without information, space and time would be meaningless, and matter and energy would be unknowable and have no practical value. We can assume that matter and energy or space and time are all information agents comprising different types of information, with each object having different information quality and density. Information should be construed as a more fundamental entity than space-time and matter. Arguably, the physical world is characterized by space and time, and the information world is the foundation of the physical world, untrammelled by space and time of the physical world and guiding the development of the physical world. The Theseus ship is still the original one after constant physical replacement or even conversion because the characteristics of things are determined by their identity information. A ship is essentially a physical signal that corresponds to the original background information; if a change in its background information leads to a change in its identity (such as a name change), it is no longer the original one from the moment its name was changed (even if its physical structure does not change). For example, the aircraft carrier *Varyag* was renamed *Liaoning*, whereas the ship was converted, and there was no relationship between the conversion and the name change. All aircraft carriers are converted, but they are not renamed because of the conversion. The nationality of a ship is determined by the country where it is registered. Irrespective of how it is converted, its nationality remains the same. The Yellow River has changed its course many times in history, and although its form has changed, it is still the Yellow River because its corresponding background information has not changed. According to the *Alta Sutra*, "if you want to seek true immobility, there is immobility in motion." Only the appearance of the physical world changes, and the rules governing the physical world remain unchanged.

Information has quantity as well as quality. Therefore, we must use two-dimensional parameters (namely, quantity and quality dimensions) to measure information. In this information age of "everything is bit," understanding the quantity of information is easy, but comprehending the quality of information is difficult. However, it does not mean that the quality of information does not exist. For example, when playing chess, although there are rules for each move, the difference between a good player and an average player is obvious. Likewise,

advanced mathematics and elementary algebra are obviously not at the same level, and an intellectual with a good modern higher education and a primitive tribal shaman cannot have the same perception of the world. Sociologically, the ability to perceive information differs among people in the same time and space, which determines their position in the information dimension. For example, prophets who lead human society to the future outshine their contemporaries in the information dimension; people who insist on misconceptions are at a relatively low level of the information dimension, which is usually called "behind the times" - not in the spatio-temporal dimension, but in the information dimension. The dimension of information is not only a manifestation of individual quality but also a measure of the level of social civilization. On our planet, primitive tribes, agricultural societies, industrial societies, and information societies coexist, and they differ not in space and time but also in the overall information level. Nevertheless, measuring the quality of information is challenging, warranting in-depth studies.

6. Conclusion

Although modern civilization is derived from science, the history of human religion may be older than the history of science, and science and religion seem to have existed throughout the development history of human civilization. Although some links between science and religion exist, such as the relationship between Christianity and Copernicus, Galileo, and Newton, and today's civilized world still insists on freedom of religion, there seems to be no reliable connection between science and religion. There can be only one truth in the world. If science and religion are both true, they can reach the same goal by different means, shining like the sun and the moon in the sky of human civilization. All scientific theories and religious thoughts may not be true, but there is only one truth, irrespective of the name. Information can be this connection between modern science and traditional Buddhism, and this viewpoint must be verified by researchers as well as the Buddhist community.

Scientifically, information revolution in the human society is in its early stages, though it has brought striking changes; thus, we should be cautiously optimistic about the future. Even if we are accustomed to celebrating the past, technological advances are not always smooth, and the threats to modern civilization do not seem to have diminished. The fact remains that the development of human society has been accelerating. In contrast, Buddhism seems to be stagnating. Although the goal of the "Pure Land on Earth" has long been established, in reality, Buddhists are still under the delusion that they live in the "Sad-Dharma Age," displaying pessimism and feeling disappointment. Perhaps, there are no signs of revitalization. There have been several religious reforms in the history of Christianity, which led to the Renaissance and the birth of modern industrial civilization and brought vitality to Christianity. Therefore, until the people who are searching for the truth (no matter what kind of faith they have) do not refuse to try anything new and embrace all

criticism and questioning, this is the right path to achieve the merits and virtues.

The research object of traditional science has always been the concrete and measurable physical world, while information is abstract and probably cannot be measured in the traditional physical manner. According to the analysis placed in this study, it may be a non-physical objective entity, and studying information may provide new insights into the human civilization. Traditional Buddhist thought and practices may contribute to the study of human information, and it is expected that Buddhism will contribute to modern civilization as a new starting point for realizing its goal of the “Pure Land on Earth.”

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