SCIENCE AND PHILOSOPHY IN THE INDIAN BUDDHIST CLASSICS

VOLUME 1

The Physical World

CONCEIVED AND INTRODUCED BY

His Holiness the Dalai Lama

Edited by Thupten Jinpa

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Developed by the
Compendium Compilation Committee
Translated by Ian James Coghlan
Edited with contextual essays
by Thupten Jinpa

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Preface

General Editor's Note

This is volume 1 of a four-volume series that brings together classical Buddhist scientific and philosophical explorations on the nature of reality within a framework accessible to the contemporary reader. This ambitious series was conceived by His Holiness the Dalai Lama himself and compiled under his visionary supervision.

As the Dalai Lama explains in his introduction, the creation of this compilation is grounded in an understanding that it is possible to distinguish three domains in the contents of the great Buddhist treatises of classical India. First is the *scientific dimension*, which relates to empirical claims about not only the outer physical world but also the inner world of our experience, including the underlying principles that govern their functions and relationships. Second is the *philosophical dimension*, primarily statements presenting the ultimate truth or truths about reality. Finally, there is what might be called the *religious dimension*, which relates to Buddhist practice and the path to enlightenment. The Dalai Lama believes that, as the exchange of knowledge among the world's cultures and languages becomes increasingly common, the insights contained in the works of the great Indian Buddhist thinkers, especially the more scientific and philosophical aspects, should be made accessible to contemporary readers.

The first two volumes in the series cover the scientific domain: volume 1 presents the physical world and volume 2 presents the mind sciences. Volumes 3 and 4 will focus specifically on the philosophical dimension of the Buddhist heritage. The remarkable accomplishment of the first two volumes is the gathering together in one place of insights of scientific interest from the great Indian Buddhist thinkers. Thanks to the Dalai Lama's vision, for the first time the contemporary reader has the opportunity to directly engage with ideas of these key Buddhist thinkers from a scientific perspective, read their own words, and follow the line of their arguments. In their original context, the presentations compiled in this series are embedded within a larger framework that includes philosophical reflections as well as the soteriological goal of awakening. The extraction and organization of these views within the framework of scientific inquiry is in itself a revolutionary achievement in the history of Buddhist thought. That all the classical sources gathered in these two volumes on science are drawn from the Tengyur—the Tibetan translations of the Indian Buddhist treatises—also makes this compilation an important gift to the world from the Tibetan tradition.

The Buddhist science that arose in India is as ancient as Greek science, and its methods and insights speak to us from a long bygone era. For many it is a reality

that now lives only in the pages of ancient treatises, whose sounds and smells have long dissipated, and whose logic, art, and wisdom remain obscure. But equally it may be said that such impressions are misleading, for Buddhist science and its insights have relevance to us in our time. And this is not just within traditional Eastern cultures where Buddhism remains a living tradition. Buddhist science has two components: the external science of the material universe plus the internal science on the nature of the mind itself. Each relies on the other, but it is internal Buddhist science that has achieved unique and profound insights into the nature of mind, and such insights are specifically relevant to the modern world.

Thanks to influential works like A. L. Basham's *The Wonder That Was India*, consciousness of classical India as the cradle of a highly advanced civilization rich in art, culture, and religion has long been mainstream. Scholarly research during last few decades has demonstrated the sophistication of India's rich philosophical heritage as well. In addition, archeological excavations of the cities of Mohenjo Daro and Harappa of the Indus Valley civilization have brought to light the sophistication of ancient India's technological knowledge and skills. Now these two volumes on Buddhist science have the potential to fill in one important gap in our knowledge of classical India, namely the achievements in scientific thinking that occurred within the Indian Buddhist traditions.

Perhaps the most exciting feature of these two volumes on science in Indian Buddhist classics is their contribution to the history of ideas. The current discipline of the history of ideas, especially the history of science, is undeniably Eurocentric, with little attention paid to civilizations outside the Western world. This volume clearly documents a sophisticated tradition of scientific thinking in India, with investigations of atomic theory, the relativity of time, the concept of multiple world systems, embryonic development, the function of brain, and microorganisms within the human body. As a resource for the history of ideas, these two volumes have the potential to bring focused attention to the intellectual achievements of great thinkers like Nāgārjuna, Asaṅga, Vasubandhu, Dignāga, and Dharmakīrti. These volumes also open up the possibility to engage in a more comprehensive cross-cultural comparison between the scientific thinking of classical India and the West, thus offering a basis for developing a truly inclusive global narrative of the history of ideas.

To assist the contemporary reader, the six parts of each volume are all introduced with brief essays, from myself for volume 1 and from my colleague John Dunne for volume 2. These essays aim to (1) provide a larger context to the topics in each section, (2) offer helpful signposts to the contemporary reader so that he or she can ably navigate terrain covered, and (3) draw attention to possible parallels in Western scientific and philosophical thinking.

Personally, it has been both a profound joy and an honor to be part of this ambitious project. First and foremost, I would like to offer my deepest gratitude to His Holiness the Dalai Lama for his vision as well as his leadership of this

valuable initiative. As stated in his introduction, in creating this compilation, His Holiness is sharing with the world the wisdom and insights of classical India that have been such an important resource for the Tibetan people for over a millennium. Never have I met anyone who cares so much about the world and thinks so much about the welfare of humanity with such constancy.

I thank the Tibetan editors who have worked so diligently, over a period of several years, in creating this compilation and patiently putting up with the frequent critical feedback and editorial changes I offered as the general editor. I would like to thank Ian Coghlan for taking on the most challenging task of translating this important volume into English, and patiently incorporating the extensive suggestions offered for fine-tuning the language of the English text. I would like to thank our editor at Wisdom Publications, David Kittelstrom, and his assistant Mary Petrusewicz for their careful copyediting of the English translation for publication.

Last but not least, I would like to offer my deep gratitude to the Ing Foundation for its generous patronage of the Institute of Tibetan Classics, and to the Scully Peretsman Foundation for its support of my own work, which made it possible for me to dedicate so much time to the creation of the Tibetan volumes, help edit and refine this English translation, and prepare the contextual essays.

Through the publication of this English volume may the wisdom of the great Buddhist masters of classical India touch people everywhere, across boundaries of geography, language, culture, and religion.

Thupten Jinpa

Translator's Note

The main sources of Buddhist material science are the early sūtras, Abhidharma works, and the treatises of Nālandā University scholars, treatises often composed in Sanskrit and tested through exacting academic debate. Centuries later these works were translated into Tibetan by Tibetan lotsāwas, many of whom travelled to India, enduring the heat and dangers of the Indian plains. Contemporary translators of Tibetan works may often draw therefore on two source languages, Sanskrit and Tibetan, each acting as an authoritative normative reference. But in terms of a living tradition, only the Tibetan system survives, and it alone remains a genuine living resource, one that can be consulted to unravel the many difficult terms and concepts encountered.

Having two source languages aides in identifying the intention of the early authors. The extant Tibetan tradition provides insight into how early Tibetan translators dealt with issues such as ambiguity and etymology involved in translating Sanskrit works, and how they located viable indigenous Tibetan terms that spoke to a Tibetan audience. There are times also when the terms remain obscure in both languages, and the translator must persevere until a

word or phrase becomes clear and some light is cast upon the meaning.

In brief, translation implies compromise, for in general a translator cannot reproduce every element of the original work. Translation also implies interpretation, for the translator must identify and present what he or she considers the central elements of any passage, with the understanding that other elements may become secondary, lose importance, or even be discarded. Balancing the demands of accuracy and readability, the translator's job seems to be more an art than a science. Since the reader who lacks access to the original work in Tibetan must rely on the translator, it is my hope that the energy expended by the reader in tackling this work will be rewarded.

I wish to thank His Holiness the Dalai Lama, whose vision has inspired this project, whose guidance has ensured its completion, and whose admonition to maintain a good motivation remains a constant goal. I wish also to thank the Compendium Compilation Committee, and in particular the committee chair Tromthok Rinpoche, abbot of Namgyal Monastery, for his valued and generous assistance. I had the privilege of first meeting Rinpoche in Sera in 1980, when he, at the request of Geshe Ngawang Dhargyey, kindly agreed to teach me Tibetan grammar when I first began my debate studies.

In terms of the translation project itself, I wish to thank Thupten Jinpa, the general series editor, for his suggestion to join the project and for his continued encouragement and assistance. I also express my gratitude to the four Tibetan edition editors with whom I had the privilege of meeting frequently to consult on issues concerning this volume: Geshe Jangchup Sangye of Ganden Shartse, Geshe Ngawang Sangye of Drepung Loseling, Geshe Chisa Drungchen Rinpoche of Ganden Jangtse, and Geshe Lobsang Khechok of Drepung Gomang. They proved to be a delight to work with, a wealth of knowledge and information regarding the Tibetan and Sanskrit sources, and insightful commentators on difficult and obscure points. Also I wish to thank the committee advisory members—Geshe Yangteng Rinpoche of Sera Me, Geshe Thupten Palsang of Drepung Loseling, and Gelong Thupten Yarphel of Namgyal Monastery—for their valued and generous assistance.

The editing of the English translation was supervised by Thupten Jinpa, who undertook a thorough edit of my initial draft translation, and I am indebted to his counsel and advice on a wide range of issues related to rendering this work in English. So too I wish to thank senior editor David Kittelstrom for his assistance in navigating the complexities of readability, grammar, and syntax, and copyeditor Mary Petrusewicz for her valued input in many areas.

Also I wish to thank Dechen Rochard, the translator of volume 2 in this series, for her input on the many and varied issues related to translation, to Tenzin Tsepak, translator of His Holiness, for our conversations on terminology and related issues, and especially to Jampel Lhundrup for his valued assistance on the ground in Dharamsala for the duration of the project.

May the translation of this work provide ready access to these materials for

the Western reader.

Ian Coghlan

Introduction

My Encounter with Science[1]

In my childhood I had a keen interest in playing with mechanical toys. After reaching India in 1959, I developed a strong wish to engage with scientists to help expand my own knowledge of science as well as to explore the question of the relationship between science and religion. The main reason for my confidence in engaging with scientists rested in the Buddha's following statement:

> Monks and scholars, just as you test gold
> by burning, cutting, and polishing it,
> so too well examine my speech.
> Do not accept it merely out of respect.

The Buddha advises his disciples to carefully analyze when they engage with the meaning of his words, just as a goldsmith tests the purity of gold through burning, cutting, and rubbing. Only after we have gained conviction through such inquiry, the Buddha explains, is it appropriate to accept the validity of his words. It is not appropriate to believe something simply because one's teacher has taught it. Even with regard to what he himself taught, the Buddha says, we must test its validity for ourselves through experimentation and the use of reason. The testimony of scriptures alone is not sufficient. This profound advice demonstrates the centrality of sound reasoning when it comes to exploring the question of reality.

In Buddhism in general, and for the Nālandā masters of classical India in particular, when it comes to examining the nature of reality, the evidence of direct perception is accorded greater authority than both reason-based inference and scripture. For if one takes a scripture to be an authority in describing the nature of reality, then that scripture too must first be verified as authoritative by relying on another scriptural testimony, which in turn must be verified by another scripture, and so on, leading to an infinite regress. Furthermore, a scripture-based approach can offer no proof or rebuttals against alternative standpoints proposed by opponents who do not accept the validity of that scripture. Even among scriptures, some can be accepted as literal while some cannot, giving us no reliable standpoints on the nature of reality. It is said that to cite scripture as an authority in the context of inquiring into the nature of reality indicates a misguided intelligence. To do so precludes us from the ranks of those who uphold reason.

In science we find a similar approach. Scientists take experimentation and the

logic of mathematics as arbiters of truth when it comes to evaluating the conclusions of their research; they do not ground validity in the authority of some other person. This method of critical inquiry, one that draws inferences about the unobservable, such as atomic particles, based on observed facts that are evident to our direct perception, is shared by both Buddhism and contemporary science. Once I saw this shared commitment, it greatly increased my confidence in engaging with modern scientists.

With instruments like microscopes and telescopes and with mathematical calculations, scientists have been able to carefully analyze phenomena from atomic particles to distant planets. What can be observed by the senses is enhanced by means of these instruments, allowing scientists to gain new inferences about various facts. Whatever hypothesis science puts forth must be verified by observation-based experiments, and similarly Buddhism asserts that the evidence of direct perception must ultimately underpin critical inquiry. Thus with respect to the way conclusions are drawn from evidence and reasoning, Buddhism and science share an important similarity. In Buddhism, however, empirical observation is not confined to the five senses alone; it has a wider meaning, since it includes observations derived from meditation. This meditation-based empirical observation grounded in study and contemplation is also recognized as part of the means of investigating reality, akin to the role scientific method plays in scientific inquiry.

Since my first visit to the West, a trip to Europe in 1973, I have had the opportunity to engage in conversations with great scientists, including the noted twentieth-century philosopher of science Sir Karl Popper, the quantum physicist Carl Friedrich von Weizsäcker, who was the brother of the last West German president and also a colleague of the famed quantum physicists Werner Heisenberg and David Bohm.[2] Over many years I have had the chance to engage in dialogues with scientists on a range of topics, such as cosmology, neurobiology, evolution, and physics, especially subatomic-particle physics. This latter discipline of particle physics shares methods strikingly similar to those found in Buddhism, such as the Mind Only school's critique of the external material world that reveals that nothing can be found when matter is deconstructed into its constitutive elements, and similarly the statements found in the Middle Way school treatises that nothing can be found when one searches for the real referents behind our concepts and their associated terms. I have also on numerous occasions had dialogues with scientists from the fields of psychology and the science of mind, sharing the perspectives of the Indian tradition in general, which contains techniques of cultivating tranquility and insight, and the Buddhist sources in particular, with its detailed presentations on mind science.

Today we live in an age when the power of science is so pervasive that no culture or society can escape its impact. In a way, there was no choice but for me to learn about science and embrace it with a sense of urgency. I also saw the

potential for an emerging discourse on the science of mind. Recognizing this, and wishing to explore how science and its fruits can become a constructive force in the world and serve the basic human drive for happiness, I have engaged in dialogue with scientists for many years. My sincere hope is that these dialogues across cultures and disciplines will inspire new ways to promote both physical and mental well-being and thus serve humanity through a unique interface of contemporary science and mind science. Thus, when I engage in conversations with scientists, such as in the ongoing Mind and Life dialogues, I have the following two aims.[3]

The first concerns expanding the scope of science. Not only is the breadth of the world's knowledge vast, advances are being made year by year that expand human knowledge. Science, however, right from its inception and especially once it began to develop quickly, has been concerned primarily with the world of matter. Unsurprisingly, then, contemporary science focuses on the physical world. Because of this, not much inquiry in science has been made into the nature of the person—the inquirer—as well as into how memory arises, the nature of happiness and suffering, and the workings of emotion. Science's advances in the domain of the physical world have been truly impressive. From the perspective of human experience, however, there are dimensions of reality that undoubtedly lie outside the current domain of scientific knowledge. It is of vital importance that the science of mind takes its place among the current fields of human investigation. The brain-based explanations in contemporary science about the different classes of sensory experience will be enriched by incorporating a more expanded and detailed understanding of the mind. So my first goal in my dialogues with scientists is to help make the current field of psychology or mind science more complete.

Not only do Buddhism and science have much to learn from each other, but there is also a great need for a way of knowing that encompasses both body and mind. For as human beings we experience happiness and suffering not only physically but mentally as well. If our goal is to promote human happiness, we have a real opportunity to pursue a new kind of science that explores methods to enhance happiness through the interface of contemporary science with contemplative mind science. It is my belief that, while acknowledging the great contribution that science has made in advancing human knowledge, our ultimate aim should always be to help create a comprehensive approach to understanding our world.

This takes us to the second goal behind my dialogues with scientists—how best to ensure that science serves humanity. As humans, we face two kinds of problems, those that are essentially our own creation and those owing to natural forces. Since the first kind is created by we humans ourselves, its solution must also be within our human capacity. In contemporary human society, we do not lack knowledge, but the persistence of problems that are our own creation clearly demonstrates that we lack effective solutions to these problems. The

obstacle to solving these problems is the presence in the human mind of excessive self-centeredness, attachment, anger, greed, discrimination, envy, competitiveness, and so on. Such problems also stem from deficits in our consideration of others, compassion, tolerance, conscientiousness, insight, and so on. Since many of the world's great religions carry extensive teachings on these values, I have no doubt that such teachings can serve humanity through helping to overcome the human-made problems we face.

The primary purpose of science is also to benefit and serve humanity. Discoveries in science have brought concrete benefits in medicine, the environment, commerce, travel, working conditions, and human relationships. There is no doubt that science has brought great benefits when it comes to alleviating suffering at the physical level. However, since mental suffering is connected with our perception and attitude, material progress is not enough. Even in countries where science has flourished greatly, problems like theft and violent disputes persist. As long as the mind remains filled with greed, anger, conceit, envy, and so on, no matter however perfect our material facilities, a life of genuine happiness is not possible. In contrast, if we possess qualities like contentment and loving-kindness, we can enjoy a life of happiness even without great material facilities. Happiness in life is primarily a function of the state of the mind.

If contemporary society were to pay more attention to the science of mind, and more importantly, if science were to engage more with societal concerns, including fundamental human values, I believe that this could lead to great advancement and novel outcomes. Although science has not concerned itself with the enhancement of ethics and the cultivation of basic human values such as kindness, since science has emerged as a means to serve humanity, it should never be completely divorced from the values that are of great importance to the flourishing of human society.

In Indian philosophical traditions in general, and in Buddhism in particular, one finds many techniques for training the mind, such as the cultivation of tranquility (*śamatha*) and insight (*vipaśyanā*). These definitely have the potential to make important contributions to contemporary psychology as well as to the field of education. The mental-training techniques developed in these traditions are uniquely potent for alleviating mental suffering and promoting greater inner peace. So my second goal for my dialogues with contemporary scientists is to see how these techniques, as well as their underlying insights, can be best harnessed to the task of transforming our contemporary education system so that our society does not suffer from a deficit in basic ethics.

Today no aspect of human life is not impacted by science and technology. Science occupies a central place in both our personal and our professional lives. It is critically important that we reflect on the ultimate purpose of science, on what larger consequences and impact science can have in our world. In the early part of the twentieth century, many believed that the spread of science would

erode faith in religion. Yet today, in the beginning of this twenty-first century, there seems to be a renewed interest in ethics in general and, in particular, the insights of those ancient traditions that contain systematic presentations of mind science and philosophy.

Three Domains in the Subject Matter of Buddhist Texts

In our society, all sorts of immoral acts are committed on a regular basis. We observe murder, theft, cheating, violence against others, exploitation of the weak, misuse of public goods, abuse of alcohol and other addictive substances, and disregard for societal responsibility. We also see people suffer from social isolation, from vengefulness, envy, extreme competitiveness, and anxiety. I see all these as consequences primarily of our neglect of ethics and basic human qualities such as kindness. It is essential for us to pay attention to the means that would help promote basic ethics. The profound interdependence of today's world calls us to create a society permeated by kindness.

What kind of foundation is necessary for this? Since religion-based ethical teachings are grounded in the philosophical views of their respective faith traditions, an ethics contingent on religion alone will exclude those who are not religious. If ethics is contingent on religion, it will be ignored by those who adhere to no religious faith. We do not need to be religious to see the value of kindness; we can discern it by observing our everyday life. Even animals survive by relying on the care of others.

Furthermore, impulses for empathy, kindness, helpfulness, and tolerance seem naturally present in small infants, well before the influence of religious faith begins. Looking to these innate qualities and their associated behaviors as a foundation, I have striven to promote an approach to ethics and basic human values that does not rely on the perspectives of a specific religious tradition. My reason is simply this: We can enjoy a life of peace and happiness without religion. In contrast, if we are divorced from human love and kindness, our very survival is at risk; and even if we do survive, our life becomes devoid of joy and trapped in loneliness.

We can promote ethics on the basis of a specific religion, but prioritizing the perspective of one religion over others is problematic in today's deeply interconnected and global society, which is characterized by a multiplicity of religions and cultures. For an approach to the promotion of ethics to be universal, it must appeal to the fundamental values we share as human beings. If we neglect these basic human values, who can we blame for the negative consequences? Thus, when I speak of secular ethics, I am speaking of these fundamental values that are inherent to human nature, and that are in fact the very foundation of the ethical teachings of the world's religious traditions.[4]

Historically, there have been societies where respect was accorded to the perspectives of both believers and nonbelievers. For example, although the

materialist Cārvāka school was the object of vehement critiques from other schools in ancient India, it was a custom to refer to the upholders of that viewpoint in honorific terms. Consonant with this ancient tradition, when India gained its independence in the twentieth century, the country adopted a secular constitution independent of any specific religious faith. This establishment of a secular constitution was not to show disrespect for religion; it was to promote peaceful coexistence among all religious faiths. One of the major forces behind the adoption of this secular constitution was Mahatma Gandhi, himself a deeply religious person. Conscious of this important historical precedent, I feel no apprehension in promoting a secular universal approach to ethics.

My own personal view is that, in general, people should remain within their own traditional religions. Changing faith can lead to difficulties for oneself, and it can also undermine the basis of interreligious harmony. With this belief I have never harbored any intention to make converts or convince followers of other religions to become Buddhists. What is appropriate for believers is to contribute to the common good by practicing those aspects of the teachings that can serve humanity as a whole. Such teachings are definitely present in all the world's main religions.

Within Buddhism, for example, I see two things with the greatest potential to serve everyone, regardless of their faith. One is the presentation on the nature of reality, or "science," as found in the Buddhist treatises, and the second encompasses the methods or techniques for training the mind to alleviate mental suffering and promote greater inner peace. In this regard it is important to differentiate among three distinct domains within the subject matter of the Buddhist sources: the presentations (1) on the natural world, or science, (2) on philosophy, and (3) on religious beliefs and practice. In general, when one speaks of religion or religious practice, it is linked with faith in a source of refuge. In this religious sense, Buddhism, too, is relevant only to Buddhists and has no particular connection to those who follow other religions and those who have no religious faith. Clearly presentations rooted in religious faith are not universally applicable, especially when we recall that among today's world population, as many as a billion human beings identify themselves nonbelievers.

Buddhist philosophy contains aspects, such as the principle of dependent origination, which can be relevant and beneficial even to those outside the Buddhist faith. This philosophy of dependent origination can of course conflict with standpoints that espouse a belief in a self-arisen absolute being or an eternal soul, but for others, this philosophy can help expand their outlook and enable them to see things in life from multiple angles, which prevents the narrow fixation that blames everything on a single cause or condition. I see great benefit in extracting the scientific and philosophical explorations found in Buddhist texts and presenting them independently of the strictly religious teachings. This allows someone who is not Buddhist to learn about the Buddhist scientific explorations of reality as well as Buddhist philosophical insights. It

also gives many people the opportunity to learn how Buddhist traditions have developed their worldview and their philosophical outlook on the ultimate nature of reality.

Take, for example, the Buddha's first teaching, the four noble truths, which is common to all Buddhist traditions. In this teaching, we can observe a clear differentiation among the "ground" (the nature of reality), the path, and the result. The statements on the nature of the four truths, e.g., "This is the noble truth of suffering," present the ground; the statements on the function of the truths, e.g., "Suffering is to be known," present the path; and the statements pertaining to the agent and the fruits of the path, e.g., "Suffering is to be known, yet there is nothing to be known," explain how the result of the path comes to be actualized. My point is that, whether the presentation is of philosophy or of ethical precepts, the fundamental approach in the Buddhist texts is to ground them in an understanding of the nature of reality.

In what is called the Mahāyāna, or Great Vehicle, too, the presentation on the two truths (conventional and ultimate) is the ground, the presentation of the two aspects (method and wisdom) is the path, and the presentation of the two buddha bodies (the form and truth bodies) is the result. All of these are grounded in an understanding of the nature of reality. Even in the case of the highest aim in Buddhism—the attainment of the two buddha bodies, or the buddhahood that is the embodiment of the four buddha bodies[5]—the potency to actualize these aims can be found in the innate mind of clear light that resides naturally within us. The presentations found in the Buddhist sources are developed on the basis of an understanding of the nature of reality. If we look at the way the words of the Buddha were interpreted in the treatises composed by the great Buddhist thinkers of the past, such as the masters of Nālandā University, there too the subject matter of the entire corpus of Buddhist texts, including those that were translated into Tibetan running into more than three hundred volumes, fall into the threefold classification of the ground, the path, and the result.

As stated, the content of the Buddhist texts can be grouped within the three domains of (1) the nature of reality, or science, (2) philosophical tenets or views, and (3) religious practice, namely the presentation of the path and the way in which the results of the path are actualized. I see great benefits if we engage with the works in the Kangyur (the scriptures) and Tengyur (the treatises) on the basis of critically examining whether their contents present science, philosophy, or religious practice.

Buddhist Presentations of Reality, or Buddhist Science

Philosophical Outlook and Methods of Inquiry

In general, the word *science* refers to a body of knowledge about the world that is

obtained through a particular method and that is verifiable by anyone repeating the same experiment. The term can be applied to both the acquired body of knowledge and to the method by which such knowledge is obtained. More broadly, *science* can refer also to a systematic method of investigation. When a scientist explores a particular question, first he or she develops a hypothesis. Then, through experiments, certain results are found, and these findings are then subjected to the scrutiny of one's colleagues. When the findings of different scientists come to converge, these findings come to be accepted as part of the larger body of scientific knowledge. The means by which these discoveries are made is characterized as scientific. This basic feature of the scientific method seems to accord with the two criteria of existence proposed in Buddhist Madhyamaka texts: for something to exist, (1) it must be known by a conventionally valid cognition, and (2) it must not be contravened by some other conventionally valid cognition.[6]

In the Buddhist tradition, the principle of "four reliances" sets out the basic discernments necessary when inquiring into the nature of reality: (1) When analyzing a particular claim, we must not draw conclusions based on the renown of the person who is making the statement; rather we should draw conclusions on the basis of critically examining what the person has said. (2) With respect to what has been stated, too, we should not deduce the truth or falsity of a statement from its literary merits or the quality of the writing; the content of the statement is more important than its form. (3) With respect to the contents of the statement, too, we should not trust those that may have been stated provisionally for an expedient purpose; rather we should accord greater importance to the definitive meaning that pertains to the actual nature of reality. (4) With respect to the definitive meaning, too, we should accord greater importance to the observations of direct perception and not be content with mere conjectures or word-based understandings. These four conditions should be applied when we engage in analysis, irrespective of the topic.

As for the actual analysis, the texts speak of the "four principles of reason." Not only do these four principles demonstrate the Buddhist outlook on the natural world, if we examine carefully, we can also say that they embody the entire Buddhist presentation about reality. The first, the *principle of nature*, explains how in the Buddhist understanding there is no absolute beginning or end to the universe when viewed from the perspective of its constitutive elements. For example, even though we can speak of a beginning to the macroscopic world, whether the structure of the world or its manifest aspects, we cannot posit an absolute beginning at the level of ultimate constitutive elements. For if there is such a beginning, that first source will have to be either devoid of cause or be created by some transcendent being. Similarly, if one posits an absolute beginning to consciousness, whose essential character is that of subjectivity, this would mean that consciousness emerges from the aggregation of matter, which is contrary to the nature of subjective experience.

Were this the case, how would we explain the subsequent arising, on the basis of that alleged first moment of consciousness, of multiple distinct streams of cognition? So, in the Buddhist sources, the fact that material things maintain their own integrity and propagate their continuity and the fact that consciousness exists as characterized by subjective experience are stated simply as part of the principle of nature. Things give rise to their own continuum—*that is the way it is*.

Śāntideva makes an important distinction with respect to this principle of nature. In his *Engaging in the Bodhisattva's Deeds*, Śāntideva explains how things arise in the world through a natural process of evolution. However, when this process reaches a point where the basis for the experience of happiness and suffering of a sentient being comes into play, at that point the process has gone beyond the simple principle of nature. At that point, he states, the principle of nature is still the basis, but adventitious factors, such as the intentional activity of a person, have also intervened and become part of the causal process.[7]

The second principle, the *principle of dependence*, relates to the way the features an effect displays are contingent on the characteristics of its cause. In other words, all the diverse attributes that exist in an effect are byproducts of the aggregation of the various characteristics present in the cause. To give an easy example, say there is to be an excellent crop with healthy stalks, unaffected by pests, and crops ripening at the right time, and so on. The presence of seeds is not enough; other important conditions must converge as well, such as soil, warmth, moisture, fertilizer, and dedicated human effort. One cannot say excellent crops are due merely to nature.

Within this principle of dependence, we can distinguish three types of dependence: (1) causal dependence, (2) the way the integrity of a whole depends on its constitutive parts—even the perception of a whole is dependent upon the perception of its parts—and (3) dependence in terms of conceptual designation, which is to say that given everything exists as mere conventional designation, their very identity as distinct phenomena is a function of the mind labeling them. This last sense of dependence is extremely profound.

The *principle of function*, the third principle, refers to specific functions individual entities perform because of their distinct natures and the functions they support. For example, the seed is the primary cause of a sprout, but conditions such as moisture and fertilizer each perform their own unique functions, and it is through the combination of these causes and conditions that a specific effect arises. In general, the earth element functions to ground and support, water functions to cohere, fire to mature, and the wind to enhance. It is functions such as these that are referred to when speaking of the principle of function.

The final principle, the *principle of evidence*, refers to what allows us to draw inferences, such as "If such and such is the current condition, then such and such will be the future state," "Given these diverse features of a given effect,

there must have been such and such diverse characteristics in the cause too," and "Such and such is impermanent because it comes into being at certain times but not at others."

The Nature of the Objective World

Briefly, the presentation of the nature of reality in classical Buddhist texts is fourfold: (1) the nature of the objective world, (2) the presentation of the mind, the subject, (3) how the mind engages its object, and (4) the means, such as the science of logical reasoning, by which the mind engages its object. This overarching framework has been adopted for the presentations in *Science and Philosophy in the Indian Buddhist Classics*.

With respect to the first, the objective world, we can distinguish three categories. First is the category of evident observable facts, those things for whose cognition we do not need to rely on either logical reasoning or someone else's verbal testimony. Second are those facts not directly observable that can be known on the basis of logical reasoning. Finally, some facts we simply cannot discern through either direct perception or evidence-based logical reasoning. This last category must be known on the basis of the words of a reliable person.

Take our own health as an example. Symptoms of ill health such as the loss of body luster, shortness of breath, and inflammation belong to the first category of facts, *observable evident facts*. On the basis of these symptoms, we can diagnose the specific illness and perhaps the cause of that illness as well. These facts that are inferred are known as the *slightly concealed facts*, the second level of facts. Some facts in this second category are opaque to humans in general; some are categorized as such contextually in relation to a particular place or time. Among the third level of facts, *extremely concealed facts*, is, for example, our date of birth. This is something we can know only from the testimony of others; we have no other means of knowing it. This third category includes also the truth about the subtle workings of cause and effects, as well as the answers to what are the causes and conditions for the existence of such diversity of species of sentient beings in this world.

When dealing with the third category, it becomes essential in Buddhist inquiry to rely on the authority of scriptures. However, such scriptural testimony must fulfill certain criteria. To begin with, the content of such a scripture must not be undermined by direct perception and valid logical reason; also the words of that scripture must be free of internal contradictions, and the utterer of that scripture must have no exceptional circumstantial reason for teaching that particular scripture. In our everyday life we use this third type of inference relying on others' testimony. For example, we come to believe certain facts about the world based on what we read in the papers, and we accept numerous facts about the past based on historical works. Even in science too, scientists subscribe to the conclusions of other researchers shared through

scientific publications without themselves undertaking the same experiments.

This mode of inquiry into the nature of reality through the use of direct observation, reason-based inference, and scriptural testimony, consonant with the threefold classification of the facts of the world, existed in the Buddhist tradition from its inception. Nonetheless, it is Dignāga—appearing in the fifth century—and his commentator Dharmakīrti in the seventh century who were responsible for developing a comprehensive science of logical reasoning within the Buddhist tradition. The Madhyamaka philosophy based primarily on critical reasoning arose during the time of the Buddha himself and was refined especially around the second century of the Common Era by Nāgārjuna. However, I think the emergence of a distinct and complete system of logic and epistemology (*pramāṇa*) within the Buddhist tradition must be attributed to Dignāga and Dharmakīrti.

In general, the science of logic and epistemology was well established through the treatises of the non-Buddhist Naiyāyika school, well before Dignāga and Dharmakīrti. Dignāga further advanced the science of logic and epistemology through his innovations, such as the invention of the triple criteria of a logical proof as well as his *apoha*, or "differentiation," theory of meaning in the philosophy of language. In his writings on logic and epistemology, Dignāga presented detailed critiques of the standpoints of other Indian schools such as the Naiyāyika, Vaiśeṣika, and Sāṃkhya. In response, the Naiyāyika thinker Uddyotakara and the Mīmāṃsā philosopher Kumārila critiqued Dignāga. And if we analyze how the views of these thinkers were, in turn, chosen as objects of sustained critique by Dharmakīrti, what we find is the development of a highly advanced tradition of logic and epistemology in classical India.

There are other alternative systems of classification of reality presented in the Buddhist sources. For example, there is the fivefold classification of (1) material form, the visible, (2) primary mind, (3) concomitant mental factors, (4) nonassociated conditioning factors, and (5) unconditioned phenomena. There are also the classifications with specific purposes, such as that of twelve bases and eighteen elements.[8] Thus, taking into account their specific natures, characteristics, purposes, and types, there are various ways in which reality is parsed and subsumed within each other in Buddhist sources.

The first category of reality in the fivefold classification is material form. In presenting this category, Buddhist sources examine the nature of matter and differentiate it into eleven material forms, which include both obstructive and nonobstructive forms, mental-object forms, as well as the great elements and their derivatives (see part 2 of this volume). Explorations of material form include also the topic of the formation of the natural world (part 5), as well as the topic of atomic particles, the ultimate constituents of the physical world (part 3). Also addressed is the question of whether the nature of material objects can be explained on the basis of aggregation of atoms or whether, ultimately, what is perceived as external matter is nothing but perceptions of the mind.

Within the theory of atoms, there is also the view of *space particles* that act as the basis for the other natural elements. Even with respect to a single particle, its characteristics can differ vastly depending on the distinct perspectives of two beings interacting with that individual particle at the same locus, differences as great as between the sky and the earth.

When speaking of natural elements, Buddhist sources refer also to a fifth element, known as the *space element*. By "natural elements" we should not understand only composite things; it also encompasses some things that remain in the form of potencies. Furthermore, since atomic particles are said to derive from the great elements, this would indicate that there are natural elements that are the sources of these particles. What we perceive in our everyday experience as earth, water, fire, and air, although labeled as "elements," are in fact quite coarse. Furthermore, in the Buddhist sources, there are detailed presentations of physiology, such as the gross, intermediate, and subtle levels of the body; the primary and secondary wind energies; the 21,600 cycles of breath that flow within the body in a single day, and so on (part 6).

With respect to the origin and evolution of the natural world and its inhabitants (part 5), Asaṅga, for example, explains this on the basis of three conditions—an *absence of prior intelligence*, the condition of *impermanence*, and the condition of *potentiality*. Based on these three conditions, Asaṅga explains how the cosmos and its inhabitants evolve purely through the function of mere conditionedness and how they do not come into being through the design of a creator. This view is the standard Buddhist position on the question. This standpoint is highly compatible with the basic viewpoint of science.

This compatibility aside, there are explanations found in the Buddhist sources, such as in the Abhidharma texts, describing the shape and size of the planets, the passage of sun and moon, how solar and lunar eclipses occur, and so on that are based on the existence of Mount Meru at the center, with earth being flat and the heavenly bodies like the sun, moon, and the stars circling the earth. I believe these cosmological explanations are simply the received views of the time, based on sources such as the ancient Vedas. These specific claims about cosmology are in direct conflict with confirmed findings of contemporary science. I have not held these as part of my worldview for quite a long time.

Buddhist sources also describe how the world first comes to form, then abide, disintegrate, and become empty, and how during the empty stage there remains space or empty particles. It is from these particles that another new world comes to form that abides, disintegrates, and becomes empty. In this way, in a repeated cycle, the universe is said to retain its endless continuity. These space particles, described in the texts of Kālacakra tantra,[9] are not conceived of as something observable with a physical mass. Nevertheless, they persist as the sources for the emergence of the entire material world. Through the forces of these space particles, the four natural elements evolve from the subtle to coarser levels, and these later dissolve from the grosser to the subtler levels,

ultimately reverting back into space particles. Thus these space particles are the foundation for both the emergence and the dissolution of the world systems. The Kālacakra texts explain how and at what stage these space particles act as the basis for the emergence of a particular world system. Before forming, a world system remains empty, since its entire material basis exists in the form of empty space particles. When the potencies of the karma of the sentient beings that will later come to inhabit that particular world ripen and begin to exert influence, the wind particles coalesce and set in motion the formation of that world.

Although contemporary science provides a profound explanation for the emergence of the universe out of a big bang, important questions remain. What existed before the big bang? Where did the big bang come from? What conditions gave rise to this big bang? What led to the process that created the conditions for the emergence of life on Earth? What is the relationship between the natural world and sentient beings that came to evolve within it?

According to the explanations in the Buddhist sources, there is a connection between the way the outer natural world is formed and the formation of the sentient beings that come to inhabit it. Furthermore, there is a connection between the corporeal body we possess and a subtle body at a deeper level that, in turn, evolves through a process traceable finally to the subtlest state, where there exists an indivisible union of wind and mind. So we find in Buddhist sources the view of how the human body represents in a subtle way the entire universe.

In biology, according to the principles of Darwinian theory, and in particular the process of natural selection, questions of how the diversity of species came to evolve and what might be the origin of life are explored. Evolutionary science explains how life came to emerge through increasingly complex aggregations of molecules and how living organisms propagate their own kinds through reproduction and so on. Thus science explains how five characteristics must be present in something that is alive.[10] Since biology's account of the origin of life is based on the notion of cells, it explains how all living things are composed of cells. When asked what are the first cells, the explanation is that they evolved through an extremely long natural process.

Now in evolutionary science's account of how life first came to emerge, we find the idea of how a series of random selections leads to the emergence of distinct species. When examined from the Buddhist perspective, this view resembles those who speak of the emergence of the universe through pure chance or without any cause. I find this particular aspect of evolutionary theory to be problematic.

Speaking of biology, I have asked scientists on a number of occasions the following questions: Why is it that modern evolutionary view does not accept fundamental human qualities such as compassion to be part of basic human nature? And how is it that the impulse for helping and kindness are not

recognized as drivers for human behavior and the basis of flourishing?

In the Buddhist sources, time (part 4) is not identified as something independent of matter and mind. Time is defined as a construct on the basis of matter or consciousness. The past, that which has ceased, functions not only by opening the way for a present arising, it also helps to make that which is yet to be a reality. The shortest moment of time is identified as the time it takes for a single atom to turn. There are also coarser measurements of the shortest moment of time, such as a sixtieth-fifth—or a three hundred and sixty-fifth—of a finger snap. That countless submoments can be differentiated even within such a short moment of time is clear from the citations from the *Flower Ornament Sūtra*. [11] There it is explained through the descriptions of the qualities of bodhisattvas at different levels that even though there is an immense difference between an eon and an instance, the two need not be contradictory if judged from the perspectives of two distinct persons.

The Mind and Reasoning

I explained above that Buddhist science, or its presentation on reality, can be grouped under four main topics: (1) the nature of the objective world, (2) the presentation of the mind, the subject, (3) how the mind engages its object, and (4) the means, such as the science of logical reasoning, by which the mind engages its object. Of these, I have commented on the first topic. The remaining three topics are part of the sciences of mind, and I explain these in my introduction to volume 2 in this series.

Buddhist Philosophy

Philosophy represents the summation of the conclusions about the nature of reality developed through critical inquiry. In *Science and Philosophy in the Indian Buddhist Classics*, philosophy will be treated in volumes 3 and 4, but I will touch on it briefly here. In Buddhism, works explicitly presenting philosophical views evolved early. We see this with the appearance of the *Questions of King Menander* before the Common Era, the Abhidharma treatises starting around the first century CE, the six philosophical treatises of Nāgārjuna shortly thereafter,[12] and so on. There also appeared, in Buddhism's classical era, treatises in which the principal views of both Buddhist and non-Buddhist Indian schools were presented together in a single work and critically examined. For example, Bhāvaviveka composed his *Blaze of Reasoning* in the fifth century, and in the eighth century Śāntarakṣita authored his *Compendium on Reality*.

Buddhism's basic philosophy is encapsulated in what are known as the view of the four seals, or axioms: all conditioned things are impermanent, all contaminated things are characterized by suffering, all phenomena are empty and devoid of selfhood, and nirvāṇa is peace. *Impermanence* refers to the fact that

things, right from their birth, do not remain static even for a single moment. This is because things do not depend on some third condition for their disintegration; the very causes that produce them also make them susceptible to disintegration. We can see this truth of impermanence for ourselves if we contemplate deeply the gross changes we observe in things. The statement that "all contaminated things are characterized by suffering" indicates how our existence is bound to a causal nexus of undisciplined states of mind that keeps it under their power. As for the statement "nirvāṇa is peace," Dharmakīrti identifies this with the possibility of eliminating pollutants from the mind. He establishes the existence of such a state of freedom through reasoning so that we do not need to rely on faith alone to explain it. The teaching on no-self relates principally to the ultimate nature of reality, namely that things do not exist the way they appear to.

All Buddhist schools reject the existence of a self that is eternal, unitary, and autonomous. Yet many Buddhist schools assume that what we call "self " or "person" must nonetheless exist in some form. We find the assertion that the self exists on the basis of the aggregates, with some proposing that all five aggregates constitute that person and others positing the mind alone to be the person. Some, recognizing that the six types of consciousness are unstable like bubbles in water, assert eight classes of consciousness and posit foundational consciousness (*ālayavijñāna*) to be the real person. Others, seeing faults in identifying the person with the aggregates, assert a self (or person) that is neither identical to nor different from the aggregates.

As we can see, there is a divergence of interpretations and subtleties among the various Buddhist schools with respect to the meaning of no-self. The Tibetan tradition relies chiefly on the interpretation of the Perfection of Wisdom sūtras by Nāgārjuna and his disciples. In this view, the meaning of no-self is understood by way of dependent origination. Two types of selflessness are differentiated from the perspective of their bases (persons and phenomena), but there is no difference in subtlety in what is negated; in both contexts, it is independent existence.[13] The very fact that things are dependently originated establishes that they are devoid of self-existence. When we think, for example, in terms of the designator and the designated, the knower and the known, the agent and the act, and so on, we can see the utter mutuality and contingency of these things. If the table in front of us, for example, were to exist objectively without depending on conceptual designation, the table itself could provide the criteria of what constitutes a table from its own side. This is not the case. We have no choice but to accept that what we call "table" is posited by the mind.

What we see is a mutual dependence. The objective world exerts constraints on the mind, and the mind in turn exerts constraints on the objective world. Take the simple example of a handwritten letter *a*. So many factors converge that are part of its dependent reality. There is, for example, the shape of the letter, the pen that wrote it, the ink used to write it, the paper on which it is

written, the person who wrote it, the intention of the writer, the convention that established this letter, those who accept this as a letter, and the cultural environment in which this letter has a meaningful usage. Without these, its existence as a letter is simply impossible. The nature of all things is exactly like this. Therefore things are explained as having a nature of dependence requiring so many other factors for their existence. This is why Madhyamaka thinkers such as Candrakīrti[14] speak of how things are unfindable when subjected to ultimate analysis and of how their existence can only be posited as designated by the mind. This view is strikingly similar to explanations found in contemporary physics about how nothing can be found to possess reality when analyzed at the subatomic level.

Another important philosophical view in Buddhist texts is that of the two truths. We find the language of "two truths" in the non-Buddhist Indian philosophical schools as well. In Buddhism, all four schools of thought equally accept the notion of two truths, but what constitutes these two varies from school to school.[15] Between the two Mahāyāna schools, for example, there is not much difference in the way the Cittamātra (Mind Only) and Madhyamaka (Middle Way) schools define the two truths. Nonetheless there is a substantial difference in the specific examples they give for those two truths.

In brief, *ultimate truth* pertains to the ultimate nature of things while *conventional truth* relates to perspectives rooted in the apparent world. Both the Madhyamaka and Cittamātra schools explain ultimate truth in terms of emptiness. Cittamātra speaks of the emptiness of external reality or the emptiness of subject-object duality, while Madhyamaka speaks of the emptiness of real existence of everything, even the minutest particles of matter. Conventional truth encompasses the entirety of the everyday reality we perceive —the natural world, the beings who inhabit it, arising and disintegration, progress and decline, cause and effect, happiness and suffering, good and bad, and so on. In short, the clay pot of flowers we see in front of us is conventional truth, while its absence of objective existence—that this pot cannot be found when sought through ultimate analysis—is its ultimate truth.

That pot is empty at the very moment it is perceived, and it can be perceived while simultaneously being empty. Madhyamaka thinkers explain this by saying that the two truths have the same nature but are conceptually distinct. When the Buddhists speak of the way things exist, they maintain that we need to transcend both extremes—the extreme of reification and the extreme of denial—and view things simply as they are.

Buddhist Religion

Generally speaking, although aspects of the Buddhist tradition that fall under religion are connected with faith, the basic framework of Buddhist religious practice is grounded in the principle of causality, which is part of the laws of

nature. For example, the impulse to shun pain is part of our natural disposition, and our existence as conditioned beings is the basis for the arising of suffering. Therefore, Buddha taught the *reality of suffering* as the first truth of our existence. Since suffering necessarily arises from a cause, he identified the second truth as the *origin of suffering*. These two truths pertain to the cause and effect of suffering. What is the cause of suffering? Its ultimate source is explained as ignorance, and since this ignorance can be brought to an end, the Buddha taught the third truth, the *cessation* of suffering and its origin. Since such a cessation must also have a cause, the Buddha taught the truth of *the path*, the means of attaining such a cessation. There is thus a cause-and-effect pair of truths pertaining to the attainment of freedom. Clearly the foundation of Buddhist practice described in the four noble truths is the natural law of cause and effect.

When Dharmakīrti introduces the truth of cessation, he demonstrates the possibility of bringing an end to ignorance, the cause of suffering. Nowhere does he speak of the need to demonstrate the truth of cessation by relying on scriptural authority. Furthermore, Dharmakīrti offers a profound explanation of suffering and its origin in terms of the sequence of the twelve links of dependent origination, and cessation and the path in terms of the reverse order of the twelve links.[16] Since happiness and suffering are characteristics of sentient experience, no account of them can be divorced from sentient experience. Therefore Dharmakīrti also offers an extensive account of cause and effect as it relates to the inner world of experience. Furthermore, when one speaks of Dharma (religion) in Buddhism, its true meaning must be understood in terms of the attainment of nirvāṇa. The term Dharma refers to the means and the path that lead to nirvāṇa as well as the scriptures taught by the teacher, the Buddha, that present this path.

Having now distinguished three domains of subject matter in the Buddhist sources—(1) scientific presentations about the natural world, (2) philosophy, and (3) religious practice—we might ask from what sources the presentations in this series on the first two dimensions, science and philosophy, are developed. Among the Buddhist classics available in Tibetan, we have the two canonical collections introduced above. The precious collection of the Kangyur contains translations of the Buddha's words as embodied in the "three baskets" (Tripiṭaka), containing both sūtra and tantra teachings. The precious collection of the Tengyur contains the treatises of great masters such as the seventeen Nālandā masters that include Nāgārjuna and Asaṅga, the two trailblazers prophesized by the Buddha.[17]

The Tibetan translations that comprise the Kangyur and the Tengyur are the largest body of Indian Buddhist texts extant today anywhere. Today modern scholars who engage in objective studies of Indian Buddhist sources state that these Tibetan collections not only contain the largest number of texts, they

represent the best translations and most comprehensive Buddhist canon. Many of these works composed in classical Indian languages, especially Sanskrit, were entirely lost in their original language through changes of history and environmental conditions. Only a few of the great works remain in original Sanskrit. In the Pali canon, we find scriptures associated with the Theravāda tradition but not of other Buddhist schools, such as the Mahāyāna sūtras and tantras. Although a great number of Buddhist texts were translated into Chinese, modern researchers say that because of the character of the Chinese language, those translations tend to be looser and do not match the rigorous correspondence, both in terms and meaning, found in the Tibetan translations. Today, therefore, the Tibetan language is the storehouse for the Buddha's scriptural teachings in their entirety. By offering access to the complete system of the Indian Buddhist tradition encompassing all three vehicles—the shared teachings, the Mahāyāna, and the Vajrayāna—there is simply no alternative to the literary heritage of the Tibetan language.

The Three Buddhist Councils

It might be helpful for the readers of this series to have some understanding of the ultimate sources of the classical texts in the Tibetan canon. I offer below a brief account.

According to both the Mahāyāna and non-Mahāyāna traditions, from his first public sermon on the four noble truths in Vārāṇasī seven days after his enlightenment until his final nirvāṇa at Kuśinagara, the Buddha traveled for forty years across central India and taught in numerous places to countless disciples in accordance with their needs and dispositions. These discourses were later compiled within the Tripiṭaka. For example, in the summer of the Buddha's final nirvāṇa, convened by senior monk Mahākāśyapa, the first Buddhist council took place at Rājagṛha (modern-day Rajgir) in the Saptaparṇa cave. At this council, each of the three compilers opened with the phrase "Thus I once heard" and ended with the statement "Everyone gathered praised what the Blessed One had taught." Mahākāśyapa recited and compiled the Abhidharma basket, the arhat Upāli compiled the Vinaya (discipline) basket, and the arhat Ānanda compiled the Sūtra basket. Thus began the process of upholding the scriptural baskets that are part of the common teachings of the Buddha.

About a hundred years later, a second Buddhist council took place. Buddhist schools generally concur on how this second council took place, and an account of it is found in the Vinaya texts.

As for the third Buddhist council and any additional councils, the scriptures do not explicitly mention them, and there is some divergence of opinion among the Buddhist schools on this question. According to the Sarvāstivāda school, for example, a Buddhist council took place during the reign of King Kaniṣka in Kashmir at the monastery of Kuṇḍalavana. This council was said to have been

attended by five hundred arhats including the elder Pūrṇika, five hundred bodhisattvas including masters Vasumitra and Aśvaghoṣa, and fifteen hundred paṇḍitas of great learning. In this account, formal recognition was accorded at this council to all eighteen schools as presenting authentic teachings of the Buddha, and the disputes among these schools were settled in accordance with the Dharma. Some later scholars do not accept that elders from all eighteen schools gathered at this council. In any case, it is said that at this council the discourses of the Tripiṭaka that had not been committed to writing were written on copper plates.[18] The *Great Treatise on Differentiation* (*Mahāvibhāṣā*) was also said to have been composed or compiled as a result of this council. Some modern scholars suggest that this Kuṇḍalavana Monastery could possibly have been located in the modern-day Kangra district in northern India.

According to the Theravāda tradition, the third Buddhist council took place 218 years following the Buddha's final nirvāṇa during the seventeenth year of the reign of Aśoka (circa 250 BCE). It took place in Pāṭaliputra (Patna) under the leadership of Tissa Moggaliputta and was attended by one thousand elders. It is stated that over a period of nine months, the discourses of the Tripiṭaka were compiled. Their account seems to indicate it was only the scriptures of the Theravāda school that were compiled at this council. The Theravāda tradition also holds the view that the Pali Tripiṭaka as well as their commentaries were first written down in 27 BCE during the reign of the Sinhalese king Vaṭṭagāmani.

As for the scriptures that are unique to the Mahāyāna tradition, they were not compiled at the above-mentioned Buddhist councils. They are understood to have been compiled by Mañjuśrī, Avalokiteśvara, Vajrapāṇi, and so on in various locations perceptible only to the minds of disciples with pure vision. On how the tantric scriptures were compiled, the tantras themselves contain diverse explanations. The non-Mahāyāna Śrāvaka schools accept the Buddha's sermon on the four noble truths to be the only turning of the wheel of Dharma and recognize all other discourses of the Buddha to be further elaborations of this sermon. Mahāyāna schools, on the other hand, accept three turnings of the wheel of Dharma. The second turning pertaining to the absence of characteristics occurred on Vulture Peak at Rājagṛha, while the third, pertaining to clear differentiation, took place in Vaiśālī. After the Buddha's death, for around four hundred years before the appearance of the glorious Nāgārjuna, the Mahāyāna sūtras remained mostly outside the purview of common human perception. Nāgārjuna made many of these Mahāyāna sūtras flourish widely and, in this way, blazed the trail of the Mahāyāna tradition and the Madhyamaka school of philosophy. Composing numerous treatises, Nāgārjuna elucidated the stages of the truth of emptiness, which is the explicit subject matter of the Perfection of Wisdom sūtras.

At that time, most Śrāvaka schools had not accepted the Mahāyāna sūtras to be authentic scriptures taught by the Buddha, and so these sūtras remained an

eighth and ninth centuries. These included not only Śāntarakṣita and Padmasambhava but other great Indian paṇḍitas like Vimalamitra and nearly a hundred Tibetan translators, such as the "seven who are awake,"[21] Kawa Peltsek, and Chokro Lui Gyaltsen. During this long period of translation activity, an important need was felt for a timely reform of the Tibetan language, especially with respect to a specific set of Tibetan terms. Thus, during the reign of Emperor Tridé Songtsen, Indian masters, including Surendrabodhi, Śrīlendrabodhi, Dhānaśīla, and Bodhimitra, as well as Tibetan translators such as Ratṇarakṣita, Dharmaśīla, Jñānasena, Jayarakṣita, Mañjuśrīvarma, Ratendraśīla, and so on, convened a meeting. They established the norms for translating key Dharma terms from Sanskrit into Tibetan and compiled the bilingual glossaries the *Mahāyutpatti* and the *Nighaṇṭu*, the latter known also as the middle-length *Vyutpatti*. [22] Composing these glossaries, the Indian paṇḍitas and the Tibetan translators undertook a reform of the Tibetan written language and established a sound tradition of translation from Sanskrit sources into Tibetan. Since then, thanks to this standardization, there remained a unified consistent system of translation from Sanskrit and other Indian languages into Tibetan. This kind of systematic approach and standardization of translation rarely occurred elsewhere in history, and it is another unique achievement of the Tibetan people. It unquestionably constitutes a great contribution to the discipline of translation as well.

Consonant with the advances being achieved in the work of translation, all the translations of sūtras and treatises that were housed at the Denkar Palace were cataloged in the *Denkarma Catalog* under the supervision of great translators like Kawa Peltsek and Lui Wangpo. In this catalog, the scriptures and treatises were organized into twenty-seven categories with 725 individual entries. This catalog was the first attempt to create a classificatory and cataloging system for Buddhist scripture in Tibet. This too shows the remarkable intellect of the ancient Tibetans. We also read about how, again in the ninth century, the translators Kawa Peltsek and Chökyi Nyingpo and others cataloged all the scriptures and treatises found at the Chimphu Palace and compiled the *Chimphu Catalog*. This work is no longer available. Not long afterward, what is today known as the *Phangthangma Catalog* was created, cataloging the scriptures and treatises found at the pillarless Phangthang Palace. In these two catalogs, the titles of the individual texts as well as their size in *bampo*[23] and page numbers were recorded. As for classification, it appears that the texts that have closely related themes were grouped together. Somewhere around the mid-ninth century, beginning with Emperor Langdarma's activities of suppression, Buddhism in the Tibetan kingdom became splintered, and with it the discipline of formal translation too came undone, and the scholars from India and Nepal were scattered. Though even during this long period, it appears that isolated translation activities persisted in border regions such as in Ngari in the west.

In the tenth century, the Ngari rulers Lha Lama Yeshe Ö and his nephew Jangchup Ö sent many young Tibetans to Kashmir to study Buddhism. Among these, the most accomplished ones, like the great translator Rinchen Sangpo (958–1055) and Ngok Lekpai Sherap, returned to Tibet, having mastered Sanskrit and become learned in the sūtras and the tantras. Inviting Indian paṇḍitas like Śraddhākaravarma to participate, they translated numerous sūtras and tantras. Especially following the arrival in Tibet of the glorious incomparable Atiśa (982–1054), many treatises, including Haribhadra's *Light on Ornament of Clear Realizations* (*Abhisamayālaṃkārāloka*) and Bhāvaviveka's *Blaze of Reasoning*, were translated into Tibetan. During the period of the degeneration of Buddhism in Tibet translations had appeared, some accurate and others less so. Questions were raised about the authenticity of some of these texts. One remarkable contribution the great translator Rinchen Sangpo is said to have made was to search for the Indian originals of all existing Tibetan translations and separating out those for which no Indian equivalents were found. It is from the time of Rinchen Sangpo that the demarcation is made between the old translations and new translations.

Famous translators that appeared in the eleventh and twelfth centuries after Rinchen Sangpo include Drokmi Śākya Yeshé, Taktsang Shönu Tsöndrü, Khyungpo Naljor, Naktso Tsultrim Gyalwa, Rongzom Chösang, Gö Khukpa Lhetsé, Lha Lama Shiwa Ö, Lokya Sherap Tsek, Patsap Nyima Drak, and so on. Around sixty well-known translators flourished during this period, as is evident from the historical sources. Most importantly, the great translator Ngok Loden Sherap (1059–1109) undertook new translations of many important philosophical works, especially the works associated with Maitreya as well as the treatises on logic and epistemology. He undertook new translation work, revised and edited existing translations, and wrote summary introductions to the important Indian Buddhist treatises. In these ways, Loden Sherap made it possible for the scholastic study of these Indian Buddhist texts to become firmly established in Tibet. Well-known Indian paṇḍitas who came to Tibet during this period include, in addition to most importantly Atiśa, the paṇḍita Gayadhara, the paṇḍita Smṛtijñānakīrti, and others.

From the thirteenth to the seventeenth centuries, still numerous Tibetan translators appeared who rendered into Tibetan texts on sūtra and tantra, as well as Sanskrit grammar, medical science, and poetics. These include, among others, Pang Lotsāwa Lodrö Tenpa, Shongtön Dorjé Gyaltsen, Butön Rinchen Drup, Dratsepa Rinchen Namgyal, Gö Shönu Pal, Taktsang Lotsāwa Sherap Rinchen, Shalu Lotsāwa Chökyong Sangpo, and Jonang Tarānātha. Thus, over a period of more than a thousand years, Tibetan translators rendered into Tibetan most of the important works of the Indian Buddhist tradition—scriptures representing the teachings of all three vehicles and the four classes of tantra, most of the treatises that expound the meanings of these scriptures, as well as those that are part of the common fields of knowledge, such as Sanskrit

Part 1

OVERVIEW AND METHODOLOGY

Science in What Sense?

Approaching a volume such as this one, the first question a contemporary reader might ask is: Can the presentation of the empirical world in this special compilation be justifiably characterized as science? Today we think of science primarily in terms of its unique method involving testing hypotheses with experiments and control of variables, but this is a fairly recent development. "Science" in its original sense refers to knowledge about the natural world and the laws or principles that govern their behavior. What distinguished this type of knowledge from other forms, even in this classical sense, is its grounding in empirical observations and its intersubjective nature—such knowledge must be findable by others so long as they engage in the same method of inquiry.

With this definition, the views in this series about the facts of our empirical world can be characterized as scientific in a broad sense. Classical Buddhist thinkers were not content simply to make claims about our physical and mental world; they also strove to understand the natural laws governing life. They were interested in the building blocks of reality, such as the atomic constituents of the physical world, how the macroscopic world is formed through aggregation of smaller units, how the cosmos evolved, what defines life and how it emerged, and so on. It's no wonder archeological evidence demonstrates that at the ancient Buddhist university of Nālandā, in northern India, there once existed even an astronomical observatory, which was used by the fourth-century astronomer Āryabhaṭa. This said, just as in the history of science in the West, Buddhist explorations about our natural world were not uniform; they were characterized by a multiplicity of views, arguments, debates, and revisions.

The Abhidharma Background

It is a truism to say that the ultimate source of Buddhist thought must lie in the teachings of the Buddha Gautama, the founder of Buddhism who appeared in India sometime between the sixth and fifth centuries BCE. Although decisively determining which of the scriptures attributed to the Buddha—and there are many—were actually taught by him during his teaching career of some forty years is difficult, most early sources agree that what the Buddha taught is captured within the framework of the four noble truths: *suffering exists*, *there is a cause to suffering*, *suffering can be extinguished*, and *there is a path that leads to such freedom*. A central message of the Buddha was that since the source of much suffering lies within our own mind, rooted especially in a false belief in an enduring self, it's through transforming our mind that we can alleviate our suffering. The insight into "no self" (*anātman*) came to be closely associated with the Buddha, with its classic analysis of the person in terms of five constituents that make up its existence. Referred to as the *five aggregates*, they are form,

feelings, discrimination, formation, and consciousness. Over time this schema of five aggregates evolved into a sophisticated framework within which the entire world of conditioned phenomena came to be subsumed and analyzed.

Evidence suggests, however, that a systematic approach to organizing the Buddha's discourses and drawing out their larger philosophical implications, such as the development of a comprehensive worldview, began sometime in the second or first century BCE. Contemporary scholars refer to this time as the dawn of the Abhidharma period. Literally "highest Dharma (teaching)" or "directed toward the Dharma," the term *abhidharma* contrasts with the word *sūtra*, the latter referring to the discourses given by the Buddha. While the sūtras are narrative accounts of the Buddha's sermons as he traversed the Indian subcontinent, the treatises on Abhidharma are far more scholastic, with almost no narrative elements. They mine the expressions of doctrine in the sūtras and try to distill them in a comprehensive and systematic fashion. What was anecdotal in the sūtras becomes in the Abhidharma a complete system of thought. The influential fourth-century Indian thinker Vasubandhu defines *abhidharma* as "immaculate wisdom together with its attendant factors." As a body of thought and its associated texts, however, Abhidharma is a system of knowledge that enables one to discriminate and analyze existents according to their generic or particular characteristics, establish the true meaning of the Buddha's discourses, and help eliminate defilements of the mind and progress along the path to enlightenment. Over time there emerged what are known as the Seven Books of Abhidharma, which provided the basis for the composition of the *Great Treatise on Differentiation* (*Mahāvibhāṣā*), where what were deemed to be the received positions of the influential Abhidharma school the Sarvāstivāda came to be codified. The Theravāda Abhidharma, which developed parallel to the Sarvāstivāda, also canonized its own seven Abhidharma treatises.

A characteristic feature of Abhidharma texts is their tendency toward taxonomic organization. Matrices group factors of existence together based on shared attributes. The texts also present discursive explanations aimed at clarifying complex points. At the heart of Abhidharma thought is the notion of a *dharma*, a "factor of existence." This use of the word *dharma* is distinct from the same word when it is used to refer to the Buddha's teachings. A *dharma* here is an irreducible unit of reality with its own intrinsic nature, and the view of the world as being comprised of irreducible dharmas came to be referred to as the "dharma theory." The Abhidharma project thus entails a reductive analysis of the composite objects of our everyday experience into their constitutive elements, so that we come to know our own existence and the world as "they really are," not as they appear to our naïve perspective.

By the second century of the Common Era at the latest in the influential Sarvāstivāda school, all existent factors came to be classified within a comprehensive fivefold taxonomy: (1) form or matter, (2) the primary mind, (3) mental concomitants, (4) nonassociated conditioning factors that are neither

thinkers rather than established standpoints of the philosophical schools they are thought to belong to, the reading of these Indian thinkers remains inextricably colored by the received views on the positions of these schools. This differentiation of Buddhist philosophy into the perspectives of four main schools and critical comparison of their views began in India, at the latest by the sixth century, and became a major focus in the Tibetan tradition as well. These four schools are Vaibhāṣika, Sautrāntika, Cittamātra (Mind Only), and Madhyamaka (Middle Way). Broadly defined, the first school includes all the Abhidharma schools, such as the Sarvāstivada and the Theravāda school. Sautrāntikas, literally meaning the "proponents of sūtra" (as opposed to the Abhidharma), reject dharma theory with its monadic taxonomy of reality and propose a simpler, more epistemologically oriented, ontology. The core positions presented in Vasubandhu's autocommentary to his *Treasury of Knowledge* as well as large parts of the views presented in the epistemological works of Dignāga and Dharmakīrti are recognized as standpoints of this school. Key historical figures of the Cittamātra or Mind Only school, known also as Yogācāra, are Asaṅga (fourth century) and his brother Vasubandhu; moreover, the more-evolved standpoints in the writings of Dignāga and Dharmakīrti are understood as representing the Mind Only school, which denies external material reality. The final school, the Madhyamaka, was founded by the influential Buddhist thinker Nāgārjuna. The central tenet of this school is the concept of emptiness, a radical relativistic standpoint that maintains that nothing exists outside the world of dependent origination; nothing, in other words, exists independently or possesses an intrinsic nature. In contemporary parlance, this is a nonreductionist and antirealist school that questions the very project of seeking any metaphysically complete description of reality. Key figures of this school also include Āryadeva, Bhāvaviveka, Buddhapālita, Candrakīrti, and Śāntideva.

Principles and Methods Underlying Buddhist "Scientific" Inquiry

An important topic in part 1 relates to what in contemporary parlance we might call "methodological issues." These include (1) basic philosophical views on regulative principles or laws in nature, (2) epistemological theories pertaining to sources of knowledge and their scopes, and (3) logical principles—the law of identity, the law of contradiction, and so on—essential for gaining knowledge about the world.

Though not found in the Pali sources, some early Sanskrit Buddhist texts exhort the adoption of the principle of "four reliances": rely on the teaching, not on the person; rely on the meaning, not the words; rely on the definitive meaning, not the provisional meaning; and rely on wisdom knowledge, not ordinary intellectual understanding. Similarly, in an early Buddhist scripture, the Buddha admonishes his monk disciples not to take his words at face value, out of faith and reverence to him, but to accept their validity based on one's own

investigation, just as a goldsmith tests gold by burning, cutting, and polishing it. Although for Buddhists, historically, the Buddha's words did carry enormous weight, for the more scientifically and philosophically minded schools, there emerged a hierarchy for evaluating sources of knowledge, with direct perception the most reliable, followed by inference, and finally scriptural testimony, which is valid only within an extremely narrow scope of inquiry, when dealing with topics or facts inaccessible to ordinary cognition.

This prioritization of direct perception over inference, reason over scripture, has an ontological corollary whereby the world, the object of knowledge, is characterized by three distinct types of facts. There is, first and foremost, the world of *evident facts*, which are directly perceptible to our senses; second, there are *slightly obscure facts*, which though not accessible to our senses can be inferred based on observed facts that are logically related to those hidden dimensions. Finally, there are *extremely obscure facts*, such as the specific details of the subtle workings of the law of karma, which for ordinary humans are knowable only by relying on the scriptures.

Now, it is in knowledge about the second domain, slightly obscure facts, as well as interpretation of the first domain, evident facts, where reason comes to play a critical role in Buddhist inquiry. Just as in ancient Greek thought as well as its descendent, contemporary Western scientific thinking, reason in Buddhist thought is premised on acceptance of a basic set of logical principles. These include the laws of identity, contradiction, and the excluded middle, and also the laws connected with logical relationships, such as between universals and their instantiations and between causes and their effects. It's only by taking into account these logical principles that reason can connect what is observed to something unobserved but logically related and use that to gain reliable inferential knowledge. We can see that even for reason-derived knowledge, validity depends upon a process of verifiability traced to empirical knowledge of an observed fact.

Another important methodological principle identified in this section is what is known as the "four principles of reason." These are the principles of nature, function, dependence, and logical evidence. The idea here is that the laws of evidence or proof can only operate on the basis of the preceding three principles. One can use the logical reasoning "if *a* then *b*" because there is a causal relationship between the two that supports the principle of dependence. And this kind of dependence is possible by virtue of the fact that the two relata individually possess distinct natures of their own endowed with specific functions they perform. This entire chain is supported by the fact that things are the way they are in reality, the principle of nature. Essentially, when the line of analysis comes to the principle of nature, the process of inquiry ends, for here the only explanation that can be offered is simply this: "That's the way it is."

Can Buddhism, at least as characterized above, be viewed as a form of empiricism? There is also the related question, raised earlier, of whether what is

"Abhidharma Philosophy," in *The Oxford Handbook of World Philosophy*, edited by William Edelglass and Jay L. Garfield (New York: Oxford University Press, 2011).

For a succinct historical introduction to Abhidharma, see part 1 of Collet Cox, *Disputed Dharmas: Early Buddhist Theories of Existence* (Tokyo: The International Institute of Buddhist Studies, 1995).

For an engaging and personal discussion on the methodological issues related to Buddhist exploration of the nature of reality and their parallels with the scientific method, see chapter 2 of the Dalai Lama, *The Universe in a Single Atom* (New York: Morgan Road Books, 2005).

For a collection of informative essays on the relationship between Buddhism and science, see Alan Wallace, ed., *Buddhism and Science: Breaking New Ground* (New York: Columbia University Press, 2003).

For a detailed yet accessible introduction to the Tibetan system of debate and reason as developed in the Collected Topics, see Daniel Perdue, *The Course in Buddhist Reasoning and Debate* (Boston: Snow Lion Publications, 2014).

corresponds to Negi's description, whereas the color of the sesamum flower appears more whitish. See Negi 1993, 5380.

136. Mental-object form is also known as "form of the phenomena element" or "phenomena-element form" (*chos kyi khams kyi gzugs*) or "form of the phenomena base" or "phenomena-base form" (*chos kyi skye mched gyi gzugs*).
137. *Vyākhyāykti*, chap. 1. Toh 4061, 36a, Pd 77:98.
138. *Abhidharmasamuccaya*, chap. 1. Toh 4049, 47a, Pd 76:122. Walpola Rahula notes that form arising from meditative expertise (*dbang ' byor ba*, *vaibhūtika*) is form produced by the supernatural powers. See Asaṅga 2001, 6.
139. "Pratimokṣa vows" refers to vows of individual liberation, which refers to the eight types of ethical precepts of ordained and lay Buddhist practitioners.
140. "Negative commitments" (*asaṃvara*, *sdom min*) implies both a commitment to engaging in nonvirtuous acts and a lack of restraint in nonvirtuous acts.
141. "Interim precepts" (*bar ma*) imply an intermediate or preliminary stage to generating vows and so on.
142. The point being made here is that such forms emerge primarily through the performance of a rite, but the rite does not exhaust all its conditions.
143. On the meditation on repulsiveness, see Buddhaghosa 1991, 169–85.
144. Jinaputra/Yaśomitra, *Abhidharmasamuccayavyākhyā*, chap. 1. Toh 4054, 123a, Pd 76:1278.
145. The topic of conceptual mind and its relation to its object—concepts—is explored in greater detail in volume 2.
146. Vasubandhu, *Abhidharmakośa*, 1.9ab. Toh 4089, 2a, Pd 79:4. See Pruden 1988, 1:63.
147. Pūrṇavardhana, *Abhidharmakośaṭīkā-lakṣaṇānusāriṇī*, chap. 1. Toh 4093, 26a, Pd 81:63.
148. *Abhidharmakośabhāṣya*, 4.3. Toh 4090, 169a, Pd 79:416. See Pruden 1988, 2:560.
149. *Saṃdhinirmocanasūtraṭīkā*, chap. 36. Toh 4016, 103b, Pd 68:979. For details on the life of Wonch'uk (613–96), see Powers 1992 and Hopkins 1999, 44.
150. *Karmasiddhiprakaraṇa*. Toh 4062, 144b, Pd 77:379. See Anacker 2005, 49.
151. *Madhyamakāvatārabhāṣya*, chap. 6. Toh 3862, 265a, Pd 60:708.
152. Candrakīrti, *Pañcaskandhaprakaraṇa*. Toh 3866, 242b, Pd 60:1543.
153. *Abhidharmasamuccaya*, chap. 1. Toh 4049, 46a, Pd 76:120. See Asaṅga 2001, 4.
154. *Pañcaskandhabhāṣya*. Toh 4065, 35a, Pd 77:758.
155. Pūrṇavardhana, *Abhidharmakośaṭīkā-lakṣaṇānusāriṇī*, chap. 1. Toh 4093, 34a, Pd 81:82.
156. Guṇaprabha, *Pañcaskandhavivaraṇa*. Toh 4067, 4a, Pd 77:675.
157. *Pañcaskandhaprakaraṇavaibhāṣya*. Toh 4066, 197b, Pd 77:528.
158. *Abhidharmakośaṭīkā-spuṭārtha*, chap. 1. Toh 4092, 28b, Pd 80:68.
159. Vasubandhu, *Abhidharmakośabhāṣya*, 1.13abcd. Toh 4090, 32a, Pd 79:79. See Pruden 1988, 69–70.
160. Kātyāyanīputra, *Mahāvibhāṣā*, 127, 935.
161. Pūrṇavardhana, *Abhidharmakośaṭīkā-lakṣaṇānusāriṇī*, chap. 1. Toh 4093, 34b, Pd 81:83.
162. Sthiramati, *Pañcaskandhaprakaraṇavaibhāṣya*, chap. 1. Toh 4066, 197b, Pd 77:529.
163. Pṛthivībandhu, *Pañcaskandhabhāṣya*. Toh 4065, 35b, Pd 77:759. See Asaṅga 2001, 4.
164. *Viniścayasaṃgraha*, chap. 6. Toh 4038, 52b, Pd 74:124.

165. Pṛthivībandhu, *Pañcaskandhabhāṣya*. Toh 4065, 35b, Pd 77:760.
166. Kātyāyanīputra, *Mahāvibhāṣā*, 131, 196.
167. Jinaputra/Yaśomitra, *Abhidharmakośaṭīkā-spuṭārtha*, chap. 2. Toh 4092, 113b, Pd 80:270.
168. *Bhūmivastu*, chap. 3. Toh 4035–37, 28b, Pd 72:736.
169. Pṛthivībandhu, *Pañcaskandhabhāṣya*. Toh 4065, 36a, Pd 77:760.
170. Pṛthivībandhu, *Pañcaskandhabhāṣya*. Toh 4065, 36a, Pd 77:761.
171. *Abhidharmasamuccaya*, chap. 2. Toh 4049, 77a, Pd 76:195. See Asaṅga 2001, 91.
172. Jinaputra/Yaśomitra, *Abhidharmakośaṭīkā-spuṭārtha*, chap. 2. Toh 4092, 115a, Pd 80:274.
173. *Ratnāvalī*, 1.84–85. Toh 4158, 110a, Pd 96:295. Also see Hopkins 2007, 105.
174. *Catuḥśatakaṭīkā*, chap. 2. Toh 3865, 52a, Pd 60:1058.
175. *Prajñāpāramitāsañcayagāthā*. Toh 11b, Pd 34:26.
176. Jinaputra/Yaśomitra, *Abhidharmakośaṭīkā-spuṭārtha*, chap. 1. Toh 4092, 12b, Pd 80:30.
177. Here the reference is to the ancient materialist schools such as Cārvāka and Lokāyata.
178. *Skhalitapramathanayuktihetusiddhi*. Toh 3847, 20a, 57:827.
179. This topic will be discussed in the final volume in the series.
180. Vasubandhu, *Abhidharmakośa*, 2.35–36a. Toh 4089, 5a, Pd 79:11. See Pruden 1988, 1:206.
181. Vasubandhu, *Abhidharmakośa*, 2.45ab. Toh 4089, 5b, Pd 79:12. See Pruden 1988, 1:233.
182. Vasubandhu, *Abhidharmakośabhāṣya*, 2.45. Toh 4090, 78b, Pd 79:195. See Pruden 1988, 1:233.
183. Kātyāyanīputra, *Mahāvibhāṣā*, 126, 874.
184. *Abhidharmakośabhāṣya*, 2.45. Toh 4090, 78b, Pd 79:195. See Pruden 1988, 1:233.
185. *Abhidharmakośabhāṣya*, 2.45. Toh 4090, 79a, Pd 79:196. See Pruden 1988, 1:234.
186. *Abhidharmakośabhāṣya*, 4.73. Toh 4090, 203b, Pd 79:500. See Pruden 1988, 2:650.
187. *Pramāṇavārttikaṭīkā*, chap. 1. Toh 4220, 18a, Pd 99:42.
188. *Viniścayasaṃgraha*, chap. 3. Toh 4038, 22b, Pd 74:52.
189. *Abhidharmakośabhāṣya*, 2.57. Toh 4090, 84b, Pd 79:210. See Pruden 1988, 1:251.
190. Asaṅga, *Abhidharmasamuccaya*, chap. 1. Toh 4049, 52a, Pd 76:134. See Asaṅga 2001, 19.
191. Asaṅga, *Abhidharmasamuccaya*, chap. 1. Toh 4049, 52a, Pd 76:135. See Asaṅga 2001, 19–21.
192. Vasubandhu, *Pañcaskandhaprakaraṇa*. Toh 4059, 14b, Pd 77:42. See Anacker 2005, 70.
193. *Pramāṇavārttika*, 2.182. Toh 4210, 114b, Pd 97:516. Also see Jackson 1993, 377.
194. *Śālistambakaṭīkā*. Toh 4001, 155a, Pd 67:403.
195. *Pramāṇavārttika*, 2.60. Toh 4210, 109b, Pd 97:505. Also see Jackson 1993: 251–52.
196. *Pramāṇavārttika*, 2.62. Toh 4210, 109b, Pd 97:505. Also see Jackson 1993, 252.
197. Dharmakīrti, *Pramāṇavārttika*, 2.25. Toh 4210, 108b, Pd 97:502. See Jackson 1993, 212.
198. *Aṣṭasāhasrikāprajñāpāramitā-sūtra*, chap. 31. Toh 12, 278b, Pd 33:667. See Conze 1975b, 292.
199. *Pramāṇavārttikapañjikā*, chap. 35. Toh 4217, 266b, Pd 98:647.
200. *Pramāṇavārttika*, 1.37. Toh 4210, 96a, Pd 97:472. See Dunne 2004, 337–38.
201. *Abhidharmakośa*, 1.5–6. Toh 4089, 2a, Pd 79:4. See Pruden 1988, 1:59–60 and 4:1275.
202. *Pañcaskandhaprakaraṇa*. Toh 4059, 16a, Pd 77:45. See Anacker 2005, 72–73.
203. *Abhidharmasamuccaya*, chap. 1. Toh 4049, 53b, Pd 76:138. See Asaṅga 2001, 23–24.
204. *Pramāṇavārttika*, 1.85–86. Toh 4210, 98a, Pd 97:477.

205. For further discussion on the definiens and definiendum, see Purdue 1992, 61–74.
206. *Mahāyānasūtrālaṃkāra*, 12.36. Toh 4020, 14b, Pd 70:834. See Thurman 2004, 130.
207. Here "basis" refers to "instance" (*mtshan gzhi*).
208. For example, Dignaga's definition of "perceptual cognition," as presented in his *Compendium on Epistemology* (*Pramāṇasamuccaya*), in terms of "being free of conception" is primarily aimed at dispelling what is seen as the misconception of the Nyāyāyikas who accept a determinate form of perception as well. For detailed discussion of Dignaga's definition of perception, see Hattori 1968.
209. For further explanation on these eight modes of pervasion plus examples, see Wilson 1992, 390–94.
210. For a more extensive presentation of one and many, see Dreyfus 1997, 173–79. Also see Perdue 1992, 346–50; 463–64.
211. Dharmakīrti, *Pramāṇavārttika*, 1.45. Toh 4210, 96b, Pd 97:473.
212. Dharmakīrti, *Pramāṇavārttika*, 3.47. Toh 4210, 125b, Pd 97:542.
213. Śākyamati, *Pramāṇavārttikaṭīkā*, chap. 3. Toh 4220, 125b, Pd 99:312.
214. *Pramāṇavārttika*, 1.40–42. Toh 4210, 96a, Pd 97:473.
215. For further discussion, see Perdue 1992, 481–98, 525–30.
216. Dharmakīrti, *Pramāṇavārttika*, 1.59. Toh 4210, 97a, Pd 97:475.
217. See Dreyfus 1997, chap. 9, "Universals in the Collected Topics," 171–73. For an introduction to particulars, see Dreyfus, chap. 6, "Introducing Universals," 127–42. Also see Perdue 1992, 621–93.
218. See Perdue 1992, 630.
219. Although a vase and a pillar by themselves are type-universals, the conjunction of the two can only be a particular since there is nothing in the world that can be considered to be an example of it.
220. See Perdue 1992, 695–771.
221. See Perdue 1992, 695–771, where the topic of Chapa's *rdzas ldog* is extensively presented.
222. For more detail on substantial phenomena and abstract phenomena, see Perdue 1992, 695–771.
223. *Madhyamakāloka*. Toh 3887, 135b, Pd 62:1119.
224. *Madhyamakāloka*. Toh 3887, 135b, Pd 62:1119.
225. For a different presentation of this point, see Yoysuya 1999, 24 n54.
226. *Madhyamakāloka*. Toh 3887, 135b, Pd 62:1119.
227. *Nyāyabinduṭīkā*. Toh 4230–31, 76b, Pd 105:204.
228. *Pramāṇaviniścayaṭīkā*, chap. 2. Toh 4227, 205a, Pd 104:1263.
229. *Pramāṇaviniścayaṭīkā*, chap. 2. Toh 4227, 205b, Pd 104:1264.
230. *Pañcaviṃśatisāhasrikāprajñāpāramitā-sūtra*, chap. 8. Toh 9, 184a, Pd 26:406. See Conze 1975b, 119.

231. Dharmakīrti, *Pramāṇavārttika*, 1.39. Toh 4210, 96a, Pd 97:473.
232. *Śālistamba-sūtra*. Toh 210, 116a, Pd 62:315.
233. Dharmakīrti, *Pramāṇavārttika*, 1.38. Toh 4210, 96a, Pd 97:473. See Dunne 2004, 337–38.
234. For an introduction to the theory of *apoha*, see Dreyfus 1997, 205–16.

235. On the nature of *apoha* theory, see Dreyfus 1997, 217–32. For difficult points related to *apoha* theory, see Tillemans 1999, 209–46.
236. *Prajñāpradīpa*, chap. 5. Toh 3853, 94a, Pd 57:1032.
237. *Tattvasaṃgraha*, 20.139. Toh 4226, 37b, Pd 107:92.
238. Bhāvaviveka, *Tarkajvālā*, 3.3. Toh 3856, 59b, Pd 58:150.
239. Bhāvaviveka, *Tarkajvālā*, chap 3. Toh 3856, 59b, Pd 58:149.
240. *Prajñāpradīpaṭīkā*. Toh 3859, 63b, Pd 58:1018.
241. *Piṇḍanivarta*, v. 8. Toh 4293, 252b, Pd 109:1750.
242. Examples of these four implicative negations are respectively: "A mountainless plain," "Fat Devadatta does not eat food at night," "Fat Devadatta who does not eat during the day is not thin," and "Śākyamuni is either a brahman or kṣatriya but not a brahman."
243. *Pratītyasamutpādādivibhaṅganirdeśa*. Toh 3995, 7b, Pd 66:730.
244. Nabidharma, *Piṇḍanivartana*, vv. 4–5. Toh 4293, 251a, Pd 109:1749.
245. Nabidharma, *Piṇḍanivartana*, vv. 6–7. Toh 4293, 251a, Pd 109:1750.
246. In other words, fifteen negations are subsumed in eight negations as follows: (1) nonexistence, (2) another, (3) similarity, (4) inferiority that includes three negations—inferiority, timidity, weakness, (5) subtlety that includes six negations—subtlety, small amount, swift passage, smallness, no extra, from some not all, (6) incompatibility, (7) antidote, and (8) absence.
247. Nabidharma, *Piṇḍanivartana*, v. 7. Toh 4293, 251a, Pd 109:1750.
248. Nabidharma, *Piṇḍanivartana*, v. 7. Toh 4293, 251a, Pd 109:1750.
249. Nabidharma, *Piṇḍanivartana*, v. 8. Toh 4293, 251a, Pd 109:1750.
250. Nabidharma, *Piṇḍanivartana*, v. 9. Toh 4293, 251a, Pd 109:1750.
251. Nabidharma, *Piṇḍanivartana*, vv. 10–11. Toh 4293, 251a, Pd 109:1750.
252. Nabidharma, *Piṇḍanivartana*, v. 11. Toh 4293, 251a, Pd 109:1750.
253. *Saṃdhinirmocana-sūtra*, chap. 10. Toh 106, 51b, Pd 49:120. In this passage a contrast is being drawn between the Buddha's omniscient mind, for whom these facts are evident, and sentient beings, for whom they remain hidden.
254. *Abhidharmakośabhāṣya*, chap. 9. Toh 4090, 82a, Pd 79:876.
255. *Pramāṇavārttika*, 3.63. Toh 4210, 121a, Pd 97:531.
256. *Pramāṇavārttika*, 4.48. Toh 4210, 141a, Pd 97:578. See Tillemans 2000, 78.
257. *Pramāṇavārttika*, 4.51cd. Toh 4210, 141a. Pd 97:578. See Tillemans 2000, 81.
258. Dharmakīrti, *Pramāṇavārttika*, 1.214. Toh 4210, 102b, Pd 97:488.
259. Dharmakīrti, *Pramāṇavārttika*, 1.215. Toh 4210, 102b, Pd 97:488.
260. Dharmakīrti, *Pramāṇavārttika*, 1.214ab. Although, as cited here, these lines are found in the Tibetan version of the *Pramāṇavārttika*, Dharmakīrti is here quoting Dignāga's *Pramāṇasamuccaya.* Toh 4210, 102b, Pd 97:488.
261. *Catuḥśataka*, 12.5. Toh 3846, 13a, Pd 57:809. See Rinchen and Sonam 2008, 241.
262. Dharmakīrti, *Pramāṇavārttika*, 2.145. Toh 4210, 113a, Pd 97:513. See Jackson 1993, 335.
263. For a discussion on traditional Buddhist atomic theory, see Dreyfus 1997, 83–94.
264. *Catuḥśatakaṭīkā*. Toh 3865, 153b, Pd 60:1296.
265. *Tattvasaṃgrahapañjikā*, chap 15. Toh 4267, 257b, Pd 107:669. See Jha 1986, 895.
266. *Tarkajvālā*, chap. 7. Toh 3856, 242b, Pd 58:590.
267. Bhāvaviveka, *Tarkajvālā*, chap. 7. Toh 3856, 243b, Pd 58:593.

268. Kātyāyanīputra, *Mahāvibhāṣā*, 136, 354.
269. Pūrṇavardhana, *Abhidharmakośaṭīkā-lakṣaṇānusāriṇī*, chap. 2. Toh 4093, 131a, Pd 81:329.
270. *Abhidharmasamuccaya*, chap. 2. Toh 4049, 77b, Pd 76:196. See Asaṅga 2001, 91.
271. Jinaputra/Yaśomitra, *Abhidharmasamuccayavyākhyā*, chap. 4. Toh 4054, 38b, Pd 76:1048.
272. *Alambanaparīkṣāvṛtti*. Toh 4206, 86b, Pd 97:433.
273. *Alambanaparīkṣāṭīkā*. Toh 4265, 181b, Pd 106:483.
274. *Viniścayasaṃgraha*, chap. 6. Toh 4038, 80a, Pd 74:117.
275. Bhāvaviveka, *Tarkajvālā*, chap. 5. Toh 3856, 209b, Pd 58:510.
276. *Prajñāpradīpaṭīkā*. Toh 3859, 92b, Pd 58:1089.
277. *Catuḥśataka*, 9.19. Toh 3846, 11a, Pd 57:803. See Rinchen and Sonam 2008, 211.
278. *Catuḥśatakaṭīkā*, chap. 9. Toh 3865, 154a, Pd 60:1298.
279. *Bāhyārthasiddhi*, v. 56. Toh 4244, 191b, Pd 106:514.
280. *Abhidharmakośabhāṣya*, 3:85–86. Toh 4090, 154b, Pd 79:381. See Pruden 1988, 2:474.
281. *Lalitavistara-sūtra*. Toh 95, 77a, Pd 46:185.
282. A type of small particle (Skt. *avagaṇa*; Tib. *a ba ga na*) whose meaning is something isolated or separated from its companions.
283. Another term for a small particle (Skt. *vaṭika*; Tib. *ba ti ka*) that also refers to a pawn in chess.
284. *Lokaprajñapti*, chap. 4. Toh 4086, 9b, Pd 78:650.
285. *Vinayavibhaṅga*. Toh 5, 239a, Pd 8:562.
286. Guṇaprabha, *Vinayasūtra*. Toh 4117, 26a, Pd 88:898.
287. *Condensed Kālacakra Tantra*, *Kālacakra-laghutantra*, 1.13. Toh 362, 23b, Pd 77:60. *Abhidharmakośa* presents a slightly different explanation: one *krośa* (*rgyang grags*) equals 500 spans (*dhanu*, *' dom*) or 2,000 cubits (*hasta*, *khru*) or roughly one kilometer, while one yojana (*dpag tshad*) equals eight krośa or roughly eight kilometers.
288. Pūrṇavardhana, *Abhidharmakośaṭīkā-lakṣaṇānusāriṇī*, chap. 2. Toh 4093, 131b, Pd 81:329.
289. Vasubandhu, *Abhidharmakośa*, 2.22. Toh 4089, 4b, Pd 79:10. See Pruden 1988, 1:185.
290. Pūrṇavardhana, *Abhidharmakośaṭīkā-lakṣaṇānusāriṇī*, chap. 2. Toh 4093, 131b, Pd 81:330.
291. *Abhidharmakośabhāṣya*, 2.22. Toh 4090, 64a, Pd 79:159. See Pruden 1988, 1:187.
292. *Abhidharmasamuccaya*, chap. 2. Toh 4049, 77b, Pd 76:196. See Asaṅga 2001, 91.
293. Asaṅga, *Bhūmivastu*, chap. 3. Toh 4035–37, 27a, Pd 72:733.
294. Bhāvaviveka, *Tarkajvālā*, chap 5. Toh 3856, 210a, Pd 58:512.
295. Āryadeva, *Catuḥśataka*, 7.10. Toh 3846, 8b, Pd 58:798. See Rinchen and Sonam 2008, 174.
296. *Catuḥśatakaṭīkā*, chap. 9. Toh 3865, 152b, Pd 60:1294.
297. *Jñānasārasamuccayanibandhana*. Toh 3852, 38b, Pd 57:883.
298. Bhāvaviveka, *Tarkajvālā*, chap. 7. Toh 3856, 242b, Pd 58:590.
299. *Bāhyārthasiddhi*, v. 46. Toh 4244, 191a, Pd 106:513.
300. *Bāhyārthasiddhi*, vv. 47–48. Toh 4244, 191a, Pd 106:514.
301. *Abhidharmakośabhāṣya*, 1.43. Toh 4090, 49b, Pd 79:122. Also see Pruden 1988, 1:121.
302. *Abhidharmakośabhāṣya*, 1.43. Toh 4090, 49b, Pd 79:123. Also see Pruden 1988, 1:121.
303. Kamalaśīla, *Madhyamakālaṃkārapañjikā*, chap. 1. Toh 3886, 92b, Pd 62:1002.
304. Śubhagupta, *Bāhyārthasiddhi*, v. 52. Toh 4244, 191a, Pd 106:514.
305. Vasubandhu, *Viṃśatikā*, v. 12. Toh 4056, 3b, Pd 77:9. See Anacker 2005, 167–68.

364. Dharmakīrti, *Pramāṇaviniścaya*, chap. 1. Toh 4211, 179b, Pd 97:677.
365. The reasons here refer to the three proofs proposed earlier to demonstrate the existence of a prior mind, namely, the creator: (1) things operate in a temporally ordered way, (2) they possess specific shapes, and (3) they are capable of function.
366. Dharmakīrti, *Pramāṇavārttika*, 2.10. Toh 4210, 108a, Pd 97:501. See Jackson 1993, 195.
367. Dharmakīrti, *Pramāṇavārttika*, 2.23. Toh 4210, 108b, Pd 97:502. See Jackson 1993, 210.
368. *Madhyamakahṛdaya*, 9.134. Toh 3855, 36b, Pd 58:85.
369. *Tarkajvālā*, chap. 3. Toh 3856, 110b, Pd 58:269.
370. In Sāṃkhya philosophy "primal nature" (Skt. *prakṛti*; Tib. *spyi gtso bo*) refers to the first principle (*tattva*) or cause of the material universe. It is composed of the three qualities (*guṇa*): *sattva*, *rajas*, and *tamas*, and twenty-three components, such as intellect (*buddhi*), self (*āhaṃkāra*), and mind (*manas*). See Larson and Bhattacharya 1987.
371. This phrase, "merely this conditionedness" (Skt. *idam pratyaya*; Tib. *rkyen nyid ' di pa tsam*), is a crucial aspect of the Buddhist principle of dependent origination and its approach to understanding the origination of everything, including the entire cosmos, purely in terms of cause and effect dynamic. This crucial term is often translated as "conditionality" or "specific conditionality," such as in Ñaṇamoli's translation: "Because there is a condition, or because there is a total of conditions, for these states, beginning with ageing-and-death, . . . it is called *specific conditionality* [*idapaccayatā*]" (Buddhaghosa 1991, 526).
372. Asaṅga, *Abhidharmasamuccaya*, chap. 1. Toh 4049, 64b, Pd 76:167. See Asaṅga 2001, 56.
373. *Pratītyasamutpādādivibhaṅganirdeśa*, chap. 1. Toh 3995, 5a, Pd 66:725.
374. *Śālistamba-sūtra*. Toh 210, 116a, Pd 62:315. Almost identical passages on dependent origination are found in the Pali canon as well, e.g., "When this exists, that comes to be; with the arising of this, that arises. When this does not exist, that does not come to be; with the cessation of this, that ceases. That is, with ignorance as condition, formation comes to be" (Ñāṇamoli 2015, 927).
375. *Abhidharmasamuccaya*, chap. 1. Toh 4049, 66a, Pd 76:169. See Asaṅga 2001, 58.
376. Rain whose drops are like the shafts of a carriage. See Pruden 1988, 2:452.
377. *Abhidharmakośabhāṣya*, 3.46. Toh 4090, 144a, Pd 79:355. See Pruden 1988, 2:452.
378. Vasubandhu, *Abhidharmakośa*, 3.73–74. Toh 4089, 9b, Pd 79:21. See Pruden 1988, 2:468–69.
379. *Lalitavistara-sūtra*, chap. 12. Toh 95, 77a, Pd 46:186.
380. *Vinayavibhaṅga*, chap. 3. Toh 3, 49a, Pd 5:128.
381. *Vinayavibhaṅga*, chap. 3. Toh 3, 49b, Pd 5:130.
382. *Vinayavibhaṅga*, chap. 3. Toh 3, 49b, Pd 5:130.
383. *Vinayavibhaṅga*, chap. 3. Toh 3, 49b, Pd 5:130.
384. *Vinayavibhaṅga*, chap. 3. Toh 3, 50a, Pd 5:131.
385. *Vinayavibhaṅga*, chap. 3. Toh 3, 50b, Pd 5:133.
386. Maudgalyāyana, *Lokaprajñāpti*. Toh 4086, Tengyur, mngon pa, *i*. This is the first of three Abhidharma texts (the other two being *Kāraṇaprajñapti* and *Karmaprajñapti*) belonging to a corpus known collectively as the *Prajñapti Treatise* (*Gdags pa' i bstan bcos*), which is attributed to Maudgalyāyana, one of the two principal disciples of the Buddha. This

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