Time and Impermanence in Middle Way Buddhism and Modern Physics

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Time is the substance I am made of. Time is a river which sweeps me along, but I am the river; it is a tiger that devours me, but I am the tiger; it is a fire that consumes me, but I am the fire. - Jorge Luis Borges [1]

I. Introduction

In the midst of working on this paper, I learned that a friend of ours, an extraordinarily beautiful woman in all senses of the word, found that her equally beautiful nine-month old boy has a virulent strain of muscular dystrophy. For that bright-eyed and laughing little boy with a genetic time bomb, the future points to progressive wasting, immobility, and death before adulthood.

It is easy to see in this little boy the transformations already affecting his body and to feel the sharp sting of how things will unroll in time. There is a clear sense of inevitability, of time being "a river which sweeps him along." Although just as true for ourselves, we easily see in him that time is a devouring tiger and a consuming fire.

I'll show that understanding something about time in Buddhism and modern physics deepens our sense of how "Time is the substance I am made of." Such understanding also helps us appreciate how we are the devouring tiger and the consuming fire. Beyond its inevitability and destruction, time has other crucial features.

We can reflect on past events and learn from them, but we cannot influence them. The past has a fixity that contrasts sharply with the more malleable future, where we make choices and influence events. Therefore, we experience a directionality to time, expressed by a metaphorical arrow pointing from the past, through the present, and into the indefinite future.

In contrast, the fundamental equations of physics are all time symmetric, meaning that they have no directionality in time. All the fundamental interactions can proceed in the reverse direction without violating any laws of physics. For a simple example, bounce a ball off the floor and take a movie of it. If you run the movie backwards, nothing looks strange because the time-reversed motion violates no laws of physics. Or, take a movie of our solar system from a distant star and play it backwards. All the rotations and revolutions of the sun and planets will be reversed, but no laws of physics are violated and nothing looks strange. The same is true for quantum mechanical examples. Let an excited atom decay and emit a photon. Run the process backwards and you have an atom absorbing light and ending in an excited state.

Yet, many complex processes do display clear temporal directionality. The ruptured balloon, dangling from the tearful child's hand never spontaneously reassembles itself back into its inflated condition. Such irreversible processes like the rotting of food and the decay of teeth are in sharp contrast to the time reversible laws of physics. Our little sick friend's inevitable ride down the river of time, along with our own, is full of irreversible transformations, leading to death, the one we most fear. Therefore, despite the symmetry of the fundamental interactions, nature clearly has many asymmetric and irreversible processes. As we will see below, the physicist's explanation for this asymmetry, within symmetric underlying laws, can help us understand some of the deepest lessons from Middle Way Buddhism.

The two decades that this little boy can look forward to seem criminally short from here, yet time may seem to crawl unendurably in his final days. However, in this digital age most believe that, despite such subjective experiences, time is absolute. Two decades is a well-defined interval that all observers can agree on, despite their subjective biases. Again, appreciating how physics destroys this apparent absoluteness can also deepen our understanding of Middle Way Buddhism.

I hope to show that understanding a little about time in modern physics helps us more deeply appreciate some of the most profound ideas in Buddhism. Furthermore, I will also suggest that

some appreciation of Middle Way Buddhist ideas could aid in the development of physics. Thus a nontrivial synergy between these two very different disciplines is possible, one that results in deeper understanding and more compassionate action. While time may be a devouring tiger, appreciating these ideas might help us attain equanimity and encourage us to act more compassionately toward each other and the planet.

II. Carrots and Emptiness in the Middle Way

I'll review the principle of emptiness within the Middle Way Consequence School (PrasangikaMadhyamika, which I abbreviate by Middle Way) through a little story. Nearly thirty years ago a very holy man gave me some fresh carrot juice to drink. What a tasty elixir! I returned home determined to grow some fresh carrots of my own on our little farm. (Actually, I was determined to get my wife to grow them.) However, the soil in my part of the world is heavy and stony, and the carrots that first year were stubby and misshapen. I thought, "If only I had a garden tiller, I could whip that heavy soil into the most beautiful carrot bed." I could not afford one of those fancy tillers that a delicate ten-year-old girl can operate with one hand. My rototiller is a test of my manhood, a bucking bronco requiring strength and stamina. Of course, time destroys both people and equipment, and my tiller soon suffered from a long list of woes. It requires the patience of an advanced Bodhisattva to start, it only works at the deepest setting, it no longer has a reverse, and it cannot run in place and so bolts ahead . . . when you can manage to start it. However, I only use it a few hours a year, so I suffer with it and consider it a perverse sort of challenge.

One beautiful spring day a few years ago the rototiller was taking me for my annual ride while it bathed me in the blue smoke of burning oil. I was musing on carrots and rototillers and suddenly had a tiny enlightenment. The second of Buddha's Four Noble Truths tells us that suffering is caused by desire. My desire for that delicious carrot juice had chained me to this rototiller for a quarter of a century! A desire for fresh, sweet carrot juice initially seemed innocent and "spiritually correct," in that good health is an aid to practicing *dharma*, but look where it led. Desire does generate suffering. However, those blue clouds bellowing from the burned out muffler along with that shattering noise and vibration urged me to deeper reflection. Upon what is that carrot-desire based?

The Middle Way clearly answers that desires and aversions are based upon the false belief in independent existence, the idea that beyond my personal associations, relationship, and names for carrots, there is a real, substantial, inherently existent entity. This substantially existent object, that entity that "exists from its own side," is the basis upon which we project all our desires and aversions, all our craving for and fleeing from objects.

This innate and unreflective belief in inherent existence divides into two pieces. First, that phenomena exist independent of mind or knowing. That "underneath" or "behind" the psychological associations, names, and linguistic conventions we apply to objects like carrot or rototiller, something objective and substantial exists fully and independently from its own side. Such independent objects appear to provide the objective basis for our shared world. Second, we falsely believe these objects to be self-contained and independent of each other.[2] Each object being fundamentally nonrelational, it exists on its own right without essential dependence upon

other objects or phenomena. In other words, the essential nature of these objects is their nonrelational unity and completeness in themselves.

Since it is so critical to identify inherent existence carefully, let me say it in other words. Consider the carrot stripped of its sense qualities, history, location, and relation to its surroundings. All but an advanced practitioner of the Middle Way believes that this denuded carrot has some unique essence, some concrete existence that provides the foundation for all its other qualities. This core of its being, this independent or inherent existence, is what the Middle Way denies. The carrot surely has conventional existence; it attracts rodents and makes great juice. It functions as a food. However, it totally lacks independent or inherent existence, what we falsely believe is the core of its being. In other words, the object or subject we falsely believe independently exists is not actually "finable upon analysis." When we search diligently for that entity we believe inherently exists, we cannot actually find it. It's independent being does not become clearer and more definite upon searching. Instead, phenomena exist in the middle way because they lack inherent existence, but do have conventional existence.

While reifying carrots, I simultaneously reify the one who desires carrots and consider him as inherently existent too. Out of the seamless flux of experience, I falsely impute or attribute inherent existence to both the subject and its object of desire and thereby spin the wheel of *samsara*. In this way, perception is a double act that simultaneously generates a false belief in inherently existent subjects and objects, gentleman farmers and their carrots. Then our time is occupied with cherishing our personal ego, putting its desires before all else, pushing others aside to satisfy those desires, and running after objects we falsely believe inherently exist. We think those objects will make us happy, but in fact they can never satisfy us. Perhaps time "is a fire that consumes me, but I am the fire." Was not this the point of the Buddha's fire sermon?

According to the Middle Way, we can put out the fire by deeply appreciating the doctrine of emptiness, the lack of inherent existence in all subjects and objects, in all phenomena. This requires not only an intellectual formulation as given here, but a profound transformation of our whole being at many levels—a process that usually takes many life times.

Just so that you will have the whole story, I recently bought a new tractor to replace my 1934 hand-cranking model (also the source of many deep lessons). With the new tractor, I bought a huge rototiller that attaches to it and makes garden preparation a breeze. However, I have given the old rototiller, now called the dharma-tiller, to my son hoping that he will grow good vegetables and a deeper understanding of emptiness.

The description of emptiness given so far is negative, a thoroughgoing denial of what we wrongly believe is the core of existence. Next, let me turn to a more positive description of phenomena, including carrots. If phenomena don't independently exist than how do they exist? The Middle Way tells us that they dependently exist in three fundamental ways. First, phenomena exist dependent upon causes and conditions. For example, carrots depend upon soil, sunlight, moisture, freedom from rodents, and so forth. Second, phenomena depend upon the whole and its parts. Carrots depend upon its greens, stem, root hairs, and so on and the totality of all these parts. Third, and most profoundly, phenomena depend upon mental imputation, attribution, or designation. From the rich panoply of experience, I collect the sense qualities, personal associations, and psychological reactions to carrots together, and name them or designate them as "carrot." The mind's proper functioning is to construct its world, the only world we can know. The error enters because along with naming comes the false attribution of inherent existence, that foundation for desire and aversion.

For the Middle Way, dependent arising is a complementary way of describing emptiness. We can understand them as two different views of the same truth. Therefore, contrary to our untutored beliefs, the ultimate nature of phenomena is its dependency and relatedness, not isolated existence and independence.

One of the difficulties in understanding emptiness is that we can easily assent to the importance of relatedness, while falling prey to the unconscious assumption that relations are superimposed upon independently existent terms in the relation. In fact, it is the relationships, the interdependencies that are the reality, since objects or subjects are nothing but their connections to other objects and subjects.

We might ask what would phenomena be like if they did in fact inherently or independently exist. The Middle Way explains that inherently existent objects would be immutable, since in their essence they are independent of other phenomena and so uninfluenced by any interactions. Conversely, independently existent objects would also be unable to influence other phenomena, since they are complete and self-contained. In short, independently existent objects would be immutable and impotent. Of course, experience denies this since our world is of continuously interacting phenomena, from the growth of carrots nourished by sun, rain, and soil, to their destruction by rodents. From the subjective side, that we do not independently exist implies that it is possible to transform ourselves into Buddhas, exemplars of infinite wisdom and compassion.

Critics of the Middle Way often say that if objects did not inherently exist, they could not function to produce help and harm. Carrots lacking independent existence could not give sweet juice or make soup. The Middle Way turns this around 180 degrees, and answers that it is precisely because objects and subjects lack independent existence that they are capable of functioning. So the very attribute that we falsely believe is at the core of phenomena would, if present, actually prevent them from functioning.

Now how does all this relate to the Middle Way notion of time? As I mentioned above, if phenomena inherently existed then they would of necessity be immutable and impotent, unable to act on us or we on them. Since, in truth, phenomena are fundamentally a shifting set of dependency relations, impermanence and change are built into them at the most fundamental level. That the carrot exists in dependence upon causes and conditions, its whole and parts, and on our attribution or naming is what makes it edible, allows me to experience it and be nourished by it. More important for impermanence, these defining relations and co-dependencies and their continuously shifting connections with each other guarantee that all objects and subjects are impermanent, ceaselessly evolving, maturing, and decaying. In short, emptiness and impermanence are two sides of the coin of existence and therefore transformation and change are built into the core of all entities, both subjective and objective. In this way, the doctrine of impermanence is a direct expression of emptiness/dependent arising. **Because I lack inherent existence and am most fundamentally a kinetic set of shifting experiences, with no eternal soul, as we normally understand it, then "Time is the substance I am made of**." Borges' compact sentence seems like a Middle Way aphorism. Being substantially of time guarantees my continuous transformation and death. Indeed, time "is a fire that consumes me, but I am the fire." These philosophic truths of emptiness and impermanence are central to Buddhist practice, and I return to them later. Now let us turn to physics and its view of time.

III. Time in Modern Physics

As mentioned in the introduction, we all have a natural belief in the absoluteness of time, meaning that, for example, one minute is the same for all observers. Let me again proceed by way of example.

My carrots take 70 days to harvest time. Our belief in the absoluteness of time or its independent existence appears in the view that this time is something intrinsic to the carrot. As long as the growing conditions are normal, it does not matter how this time is measured or who measures it. It has an independent or absolute nature. However, let an astronaut take the same seeds and grow them in a space ship traveling at 90 percent the speed of light relative to the Earth. Then relativity theory tells us that the days to harvest (as measured by an Earth-based observer) would be 161 days.[3] Figure 1 shows the days to harvest, as observed on Earth, plotted against the velocity of the space ship, relative to Earth, divided by the speed of light, c. So for example when v/c = .9 then we move straight upward from that point on the horizontal axis and intersect the curve at 161 days. Only in a reference frame at rest with respect to the observer (the rest frame) is the days to harvest 70 days.

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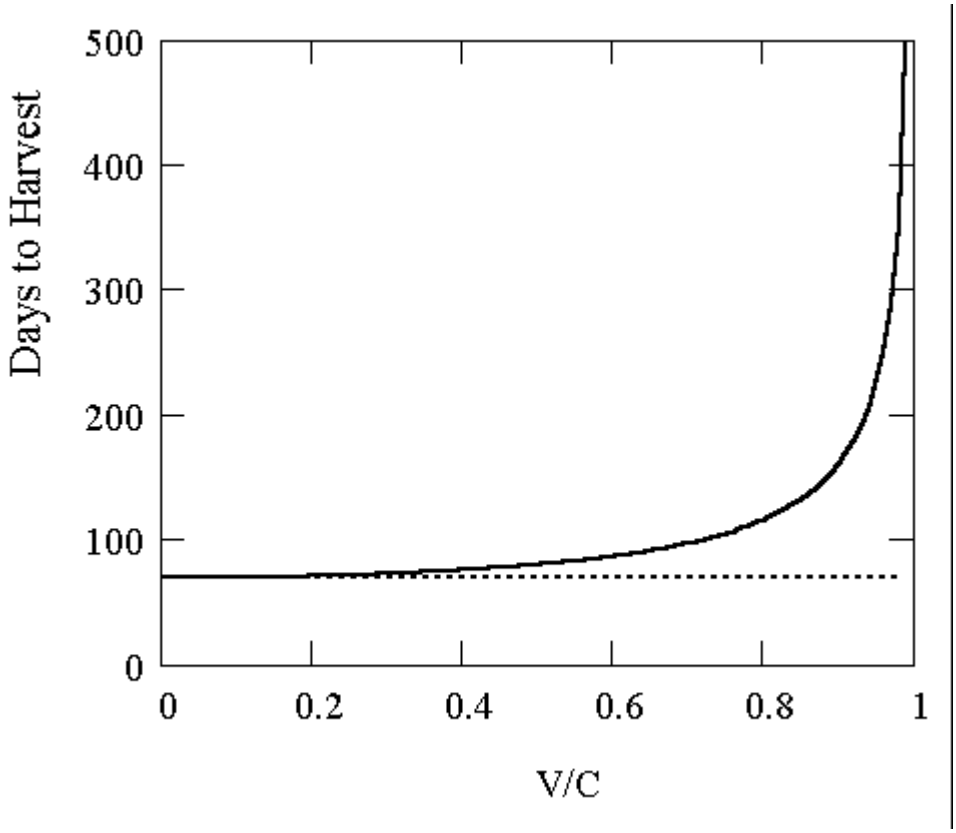


Relativity emphatically states that no value of the days to harvest time is any more real or intrinsic than any other. For example, if the astronaut looked back at my garden she would correctly measure my time to harvest as 161 days. Since time intervals depend directly upon the relationship between the object and the observer, they are essentially relational. *We cannot consider time independent of a particular reference frame*. In Middle Way language, it lacks independent existence. If the seed manufacturers were devotees of relativity they would state on the package, "The time to harvest is 70 day only in the rest frame. For other reference frames consult the graph on the back." That graph would be Figure 1. We can attempt to evade this relational nature of time by saying that humans never travel at any significant fraction of the speed of light, and so this is just an academic consideration. This move denies the conceptual import of relativity's view of time and the thousands of experiments done all over the planet every day that rely on it.

If we clarify the idea of the present moment, the essentially relational nature of time intervals, whether decades or microseconds, is complemented by a thoroughgoing relativity of the present.

Take the reasonable definition that all the simultaneous events that take place for an observer at one time defines the present moment. Let's say I plant my carrots at exactly 9:00 AM on a given day and at that moment a friend in New Deli boards a plane, while my son enters a classroom in a distant city. Relativity teaches that those simultaneous events defining the moment of carrot planting are only simultaneous in my garden's reference frame. If our farmer-astronaut, moving at 90 percent the speed of light, passes directly over my garden at 9:00 AM he observers a different set of simultaneous events and thus his present moment differs from mine. While a second astronaut, traveling at a different speed over my garden at 9:00 AM, finds yet a third set of simultaneous events and thus a different present from mine or the first astronaut.

Therefore, relativity makes both time intervals and individual moments relative to a given reference frame, leaving our old absolute view of time far behind. There are similar things to say about other primary qualities of objects, but these points about time are enough for the present. A more interesting and profound quality of time comes from understanding how it has an arrow.

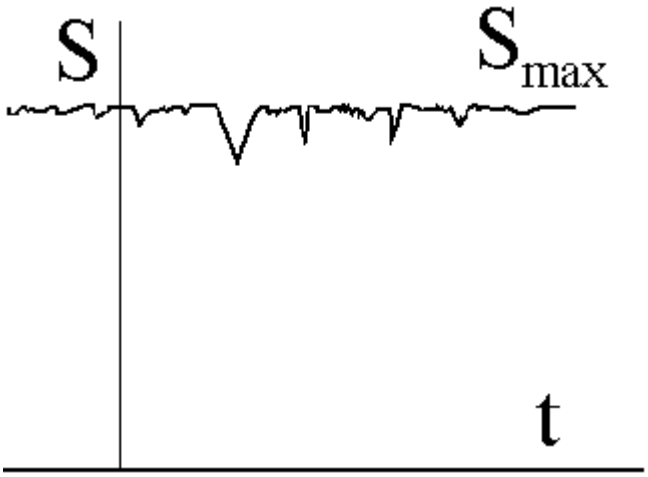
We store our carrots in the cellar where there is a cool, even temperature. However, even there, they rot after four to six months. We have never seen rotten food return to its fresh state. Rotting, whether of vegetables, teeth, or our entire bodies, is an irreversible process. Given that the quantum mechanical laws, which govern the chemical changes of rotting, are time symmetric, this is mysterious. The great Austrian physicist, Ludwig Boltzmann, made the first significant progress in understanding this mystery. He realized that irreversibility comes from reversible underlying laws only when you have large numbers of particles in the system.

Boltzmann started by considering a simple box containing many gas particles governed by Newton's laws. In analyzing this system, he assumed that it was totally isolated from the rest of the universe. There were no influences of the universe on the box and its contents or vice versa. Now this should give anybody influenced by the Middle Way philosophy some real discomfort, since he is assuming that the system independently exists. More about that later.

Boltzmann then imagined a partition in the middle of the box with all the particles in just one half of the box. The other half is totally empty. To proceed further we need to understand the concept of entropy, or measure of disorder. The more disorder, the less knowledge we have about the details of the system, the higher the entropy. When the partition is removed, the overwhelmingly most probable configurations of the new equilibrium condition involve the gas spreading evenly throughout the box. In principle, it is possible for the gas to bunch up in only one quarter of the box. However, it is overwhelmingly more probable that it will attain a new equilibrium configuration diffused throughout the box. Such equilibrium states have maximum entropy. Through this reasoning, Boltzmann proved the famous Second Law of Thermodynamics, which says that any isolated system's entropy must either stay the same or increase. Therefore, when the egg hits the floor it is overwhelmingly likely to go to a state of greater entropy. What is more, the increase in entropy defines the direction of the arrow of time. Time advances in the same direction in which entropy increases—what we call the future. This does not deny that there are local decreases in entropy, like the growth of a child, but the global entropy relentlessly increases with time.

For several years, I taught our junior-senior level course on statistical physics. We used the standard textbook and followed Boltzmann's derivation of the Second Law of Thermodynamics, with the appropriate level of mathematical sophistication. In the last few years, I found that there were arguments as far back as 1877 that showed Boltzmann was deeply wrong. I review some of these problems elsewhere in nontechnical language..[4] Here, I take a different approach and follow an elegant and simple argument by P.C.W. Davies.[5] As we will shortly see, entropy increases, but not the way Boltzmann thought. Why several revisions of this famous text persist in

the error is a mystery.



---------- **Figure 2** ----------

The basic difficulty, which can be seen in several independent ways, is that completely isolated systems, like the box of gas, can generate no directionality to time because of the time-symmetric laws governing the system. Figure 2 displays the entropy, S, of an isolated box of gas plotted versus time, t. We see that the random gas motions give occasional deviations below the maximum. Although it is unlikely, the random motions spontaneously generate states of greater order or lower entropy, which are then brought back to maximum disorder by the same randomization. This is like the shuffling of playing cards that, on rare occasions, puts them into states of greater order, with continued shuffling returning them to disorder.

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Now imagine the following experiment illustrated in Figure 3. We just patiently monitor the system until its entropy spontaneously drops to the value S_1 or below at a time t_1. If we choose S_1 low enough, this could take a long time. The virtue of choosing a small value of S_1 is that once it occurs, we know we are very likely to be near the bottom of a dip in the entropy curve, rather then part way down a larger dip. This is simply because the even larger dips are so much less likely. At t_1, when the low entropy, S_1, occurs, since we are very likely at the minimum of a dip, an increase in entropy with time happens in either direction. At time $t_1 + e$, where e is some small time interval, the entropy increases. We consider this the future. However, the entropy also increases in the past at $t_1 - e$. Therefore, the symmetry of the underlying laws of physics gives no directionality to entropy increase or time.

Even before I began getting instruction from my rototiller 25 years ago, the problem of the arrow of time had largely been resolved, although there are still technical subtleties. Much to the delight of the Middle Way, the main problem lies in assuming we have a totally isolated system independent of interaction with its environment.

We now understand that we must account for how Boltzmann's box got into the low entropy state of all particles in just one half. This did not result from just waiting a long time for random motions to throw the gas all to one side, but from Boltzmann evacuating one half and placing gas in the other. Preparing the box in a low entropy state must generate more entropy elsewhere in the universe. For example, Boltzmann consumed calories from lunch and radiated energy from himself and his equipment that eventually went into deep space. In other words, the box had its entropy put into a low condition by processes outside itself, but at the expense of a much greater entropy increase elsewhere in the universe.

Let me give an example closer to the garden. I walk in the garden to check on whether the mice have eaten the carrots. My footprint in the soft soil gives it more order and structure, thus lowering its entropy. However, this lower entropy comes from a much greater generation of entropy from

my metabolic processes, which eventually degrade to heat radiated to the universe.

As we have long known, the energy emitted into deep space from our activities can only radiate into space because the universe is expanding. If the universe were not expanding then it is so large that any line of sight from the Earth, when extended far enough, would land on a star surface. Then the effective temperature of deep space would be that of the surface of stars, which is typically 6000 °K, rather than the 3 °K it actually has. Since entropy can only increase when energy moves from high to low temperature regions, the simple process of radiating our body's energy into space would be blocked in a static universe. Thus, there would be neither a Boltzmann nor the ability to reduce entropy locally in the box by generating more entropy elsewhere in the universe.

All systems organizing themselves or decreasing their entropy, whether the growing of a carrot, a snowflake, or a child, are decreasing entropy in one location that must be accompanied by a greater entropy generation in another. Not only is the energy from Boltzmann's food and his equipment eventually traced back to our sun, but the sun's low entropy is critical. Energy generation processes, whether the digestion of our food or the workings of a nuclear power plant, are totally dependent upon our solar system being in a low entropy condition. What causes the sun and other stars to be in a low entropy condition? This occurs because the expansion of the universe was faster than the nuclear generation rates in the first three minutes of the big bang. Then, when nearly all the helium (about 25% of the total mass of the universe) was formed, the universe expanded so quickly that after three minutes it was too cool for nuclear reactions to occur. If the expansion and associated cooling were much slower, then all the matter in the universe would form into a very stable isotope of iron, an inert and high entropy condition. Then the stars would not shine, there would be no great entropy gradients in the universe, no time asymmetry, and, of course, no life.

Local time-asymmetry, such as the decay of any biological system, from carrots to our own bodies, must be accounted for by connecting it to the expansion of the universe and its earliest evolution. This extraordinary beautiful result has many technical twists and turns, but the central idea is clear: increasing entropy and time-asymmetry owe their existence to the largest and earliest processes in the universe and its continued expansion. This is a long way from the notion of an isolated and noninteracting system, so abhorrent to the Middle Way. In this way, when you put cold milk into your coffee and the mixture comes to the same temperature and a higher entropy than when the fluids were separated, you are profiting from the universe's expanding and cooling before iron-56 could form. Similarly, that we must all face the irreversible process of death, with its massive entropy increase, is traceable to the earliest and largest processes in the universe. In other words, the impermanence and decay found all around us is due to the earliest and most distance process in the universe and its continued expansion.

On a more positive note, irreversible processes are also essential to life. If metabolic processes did not irreversibly transform my lunch, not only would I get indigestion, I would not live. That which sustains me also destroys me. Indeed, time "is a fire that consumes me, but I am the fire."

IV. Comparisons and Connections

As I have said in my recent ruminations[6] about the relationship between physics and Buddhism, it is a mistake to connect any Buddhist principle too closely with any particular phenomena from physics. Physical theories are prime examples of impermanence. What happens if I make an argument that some physical effect verifies some great principle of Buddhism and then the physics is replaced by a new theory? Does that damage Buddhism? Are the foundations of Buddhism to tremble at every scientific revolution?

A more fruitful dialogue between Buddhism and science can occur when comparisons and connections are done at a more philosophic level. For example, here I have tried to focus on emptiness, the philosophic heart of Buddhism, and make connections with questions of comparable philosophic significance in physics. If the connections mutually illuminate both the physics and the Buddhism, without trying to reduce one to the other, then our understanding of both disciplines deepens. In the present example, the erroneous assumption of a thermodynamic system being completely isolated from any form of external interaction was a critical error. This error could have been avoided if the philosophic principle of emptiness were more widely understood and appreciated in the scientific community. Physics is always done in a philosophic context. In the case of classical statistical physics and thermodynamics, it was done within Cartesian dualism. Although Descartes' vision helped both physics and western philosophy, it has also hindered us in more ways than we can count. I suggest that the principle of emptiness, if more fully appreciated within science, could actually further the scientific enterprise.

What does Buddhism gain from such connections and comparisons as attempted here? I see at least two benefits. First, understanding such things as the relativity of time (the 70 days to harvest example) and the relativity of the present moment helps us appreciate the closely parallel arguments made in the Middle Way about time's lack of inherent existence. **There is a well-known and difficult section in Nagarjuna's *Mulamadhyamakakarika* that analyzes time and leads to the modern interpretation, "Time is thus merely a dependent set of relations, not an entity in its own right, and certainly not the inherently existent vessel of existence it might appear to be**."[7] Such critical, but difficult, points are illuminated by understanding Einstein's relativity of time. In short, science can help us understand ancient, but pivotal, philosophic aspects of Buddhism.

Second, Buddhism is a portable religion that has wandered far from the home of the original Prince. In each movement, whether to China, Japan, or Cambodia, it takes on the hues of the local culture without losing its original spiritual impulse. Science is clearly a cultural dominant in the West. Therefore, if Buddhism is to come to the West, in the best and fullest sense of the term, then interaction with science is both inevitable and necessary for a real transplant to take place. The present effort at understanding some common ground and even synergy between Buddhism and science can be part of the effort to translate Buddhism into terms that are easier for a Westerner to assimilate.

V. Summary and Conclusions

Reflecting on the relativity of time and how the irreversible nature of my little friend's disease connects to the first few minutes of the universe and its continued expansion gives me little comfort. Yes, intellectually these ideas strongly support the principle of emptiness, that both the mother and the little boy along with the one who writes these words lack independent existence. Yes, we are all a system of interdependent relations and thereby subject to the law of impermanence. Nevertheless, the heartache remains. That little boy will be consumed by the "fire

of time" before he reaches the age of my two sons.

According to the Middle Way, my inveterate projection of that false quality of independent existence is the foundation for my attachment and consequent suffering. It all comes back to my inability to put these ideas fully into practice. This is often the plight of those who can articulate ideas but not fully live them. Or being kinder to myself, perhaps I have assimilated just enough of the principle of emptiness to give me a deep appreciation of the mother's sorrow, but not enough to dispassionately see it all as an embodiment of the First Noble Truth, that all experience is suffused with suffering. What then do we do?

The Middle Way advises us to take refuge in the Three Jewels: the Buddha or fully enlightened One, the Buddha's teaching, and the community of those seeking enlightenment. The Buddha shows that we can do it. We suffering humans, nurtured and destroyed by time, can become full embodiments of wisdom and compassion and break free from the suffering of *samsara*, the endless torment of repeated death and rebirth. The Buddha's teaching, which includes emptiness and much more, is the work at hand among those who support our efforts at realizing these great truths—including the mother and her sick child.

If I could reflect deeply enough on the relativity of the twenty years as the maximum allotted to this child and that the very irreversibility of his condition, and my own, is due to deep cosmological connections, then perhaps my sense of connectedness to others and the cosmos could increase. Could I realize more deeply that my ego and yours are dependent, not inherently existent, but fundamentally co-dependent systems of relationships? Could I profoundly appreciate that there is no speaker without a listener, no griever without a dependently related object of grief? If I could, then the centrality of my own ego and my self-cherishing would surely diminish. Such a realization of my ego's emptiness and our mutual co-dependency must result in compassion, not just for this little boy and his mother, but for all sentient beings. Assimilating these great truths and shifting my ego off center stage is surely not easy, but the promised increase in understanding and compassion keeps me trying.

If I could deeply appreciate that any irreversible process, whether the rotting of carrots or my body, is due to the earliest and largest scale structure of the cosmos, then how much easier it would be to appreciate that my neighbor's loss or gain is not separate from mine. Then the suffering in one cell of the body of humanity is truly the suffering of all. Perhaps, we could even realize that compassion is actually in our own enlightened self-interest and that the survival of our very planet requires a profound understanding of our co-dependence.

In contrast, we could ask what happens when our philosophic view embraces the false notion of independent existence. The late David Bohm, known for both the depths of his physics and philosophy, said it very directly when he wrote:

It is proposed that the widespread and pervasive distinctions between people (race, nation, family, profession, etc., etc.), which are now preventing mankind from working together for the common good, and indeed, even for survival, have one of the key factors of their origin in a kind of thought that treats things as inherently divided, disconnected, and "broken up" into yet smaller constituent parts. Each part is considered to be essentially independent and self-existent.[8]

According to Bohm, many of the evils of our modern world are traceable to a view where "Each part is considered to be essentially independent and self-existent." In other words, one in which things inherently exist. I tried to show above that, although we commonly assume for simplicity that a system, such as Boltzmann's box, is independent from its surroundings, such a view

misleads us. This is bad enough in physics, but when a race, nation, or person views themselves as fundamentally independent, then the stage is set for calamity—the stuff of our daily headlines.

As we stand on the threshold of ever more powerful theories in science, it is more urgent then ever that we find a coherent world view that can guide our science as well as our moral actions. Consider how the advent of quantum mechanics and relativity brought about the wonders of the information age, along with our horrendous weapons of mass destruction. Then imagine what wonders and horrors might be released by a grand unified theory or "theory of everything" that today occupies some of the best minds in physics. What benefits and horrors can we expect from the revolution already underway to understand the complete genetic code?

I'll conclude with one small example. Despite it not being "spiritually correct," I enjoy watching professional football on TV. I usually hope for a close game with plenty of action. Occasionally, I find myself rooting for one team. I urge them on to victory, and even try to exert mental influence through my TV set. I catch myself and wonder what I am doing. "Hey, these guys are getting millions of dollars to beat each other up, what do I care who wins?" After a little reflection, I realize that "my teams" are those I have some connection with, even it if is only because they are from the State of New York or I go through the Pittsburgh airport on most of my flights. These flimsiest of connections give me affection and concern for those gladiators.

What would happen if I could more deeply appreciate the profound interdependence implied by the Middle Way? What would happen if I could more deeply appreciate, as more than interesting physics, how the irreversible processes that sustain and destroy my life occur because of my connection to the first few minutes of the big bang and the continuing expansion of the universe? Then how much do my loyalties expand? If I could appreciate that the relativity of time is logically extended to all my subjectivity, then how could I rationally support my selfishness and self-cherishing?

It is overwhelming to think about extending my loyalties beyond a small circle of family and friends to the cosmos. Now that we know of more planets outside our solar system than within, does the Bodhisattva vow of working for the liberation of all sentient beings, embrace even those beyond our solar systems? Surely, experiencing the sadness of more parents and their mortally sick children would crush me. How then can I possibly cultivate compassion on a cosmological scale?

Perhaps the ecological activists can offer guidance. In the face of daunting global ecological problems, they advise us to "think globally and act locally." Following their counsel, I try to keep the cosmological picture in mind and simultaneously act in the present with the person in front of me. Then it seems small ripples of compassionate action gradually flood beyond my little circle of family and close friends. The ideal is to extend our concern out in ever widening radii, until it encompasses more and more of the great suffering body of humanity. If in fact, I lack inherent existence then my present limitations are not fixed, in place for eternity, and I can work toward this ideal. Let us begin to widen the circle of concern beyond the narrow confines of "our team" and "our friends." How else can we live with that devouring tiger of time, that inexorably includes our final irreversible process?

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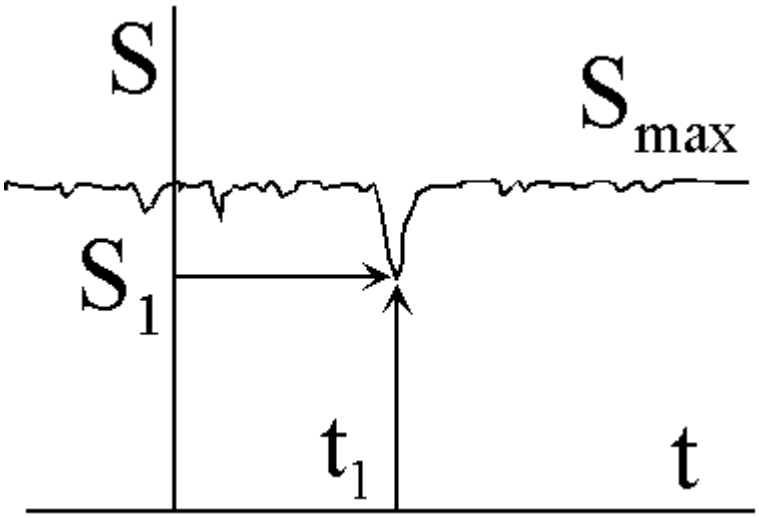
Fonte: www.buddhanet.net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