Experience of Time

Forward

A transcript from the YouTube video; https://www.youtube.com/watch?v=N1xyZjJtp64 Why Does Time Only Move Forward?|The Answer Will DESTROY Your Understanding of Reality''

(Parenthetical and italicized text are my annotations.)

I submit the following for your consideration in your modern understanding of the knowledge that Shakyamuni Buddha was trying to convey some almost 3000 years ago to a largely illiterate people as well as the intellectual caste of India.

Sifu, Bodhisattva Sylvain Chamberlain

Love and respect, NaMuMyohoRenGeKyo

Transcript

Every second without your permission, time is moving. Not because you chose it, not because something is pushing it, just moving. The way morning becomes afternoon becomes night without anyone deciding the sequence. The way your childhood is behind you and your death is ahead of you. And you have never once experienced it the other way. Not even for a fraction of a second. Not even in a dream. Forward. Always forward. Only forward. And you have never asked why.

(This is the often discussed "momentum" of the Engine of Life.)

Physics has spent three centuries writing the laws of the universe. Newton wrote them. Maxwell wrote them. Einstein rewrote them. Schrodinger dissolved them into probability and rebuilt them as waves. Every version, every revision, every equation sitting in every textbook on every physics shelf on every continent describes a universe with no preferred direction of time. Run the equations forward, the universe works. Run the equations backward; the universe works identically. Gravity does not care. Electromagnetism does not care. Quantum mechanics does not care. The laws of reality are perfectly, completely, mathematically reversible.

And yet the glass falls and shatters, never reassembles, the candle burns down, never grows. Your mother aged, never returned to 30. The equations permitted both directions. Reality has chosen one. And nobody, not Newton, not Einstein, not Hawking lying in that chair with the whole architecture of spacetime mapped inside his mind has ever fully explained why that gap between what physics allows and what you actually live inside every breathing second of your existence is not a small gap. It is the strangest unsolved mystery in all of science. And it is about to dismantle everything. Let us start at the beginning. Not the beginning of your life, not the beginning of human civilization, the beginning of everything. Approximately

13.8 billion years ago, everything that exists, every atom in your body, every star you have ever seen, every galaxy spinning in every direction across the observable universe was compressed into a single point smaller than a proton. A point of infinite density, infinite temperature, infinite curvature of spacetime.

> *(I'm jumping in here simply to point out that I have discussed the well known fallacy of infinities in the mathematics. We follow the way of the "Inversion" of the cosmos in the Conformal Cyclical Cosmological (CCC by Dr. Roger Penrose) transition from the death of one instantiation into a new rebirth of the Potential energy expressed anew. We continue in this transcription with clear eyes and attention to the points of scientific discovery without distraction of collateral information.)*

And then something happened. Physicists call it the big bang, not because it was an explosion the way a bomb explodes, sending shrapnel outward through existing space, but because space itself began expanding. The universe did not explode into space. Space exploded into existence and **time** began. Or did it?

This is already where things become strange. Because asking what happened before the big bang assumes that time existed before the big bang. And current physics strongly suggests it did not. Time according to the best understanding we have did not preexist the universe and then get switched on. Time is a property of the universe itself. It emerged with the universe. It is woven into the fabric of spacetime the way length and width are woven into the surface of a piece of paper. You cannot ask what is north of the north pole. You cannot ask what time it was before time existed. And yet here you are inside time moving through it in one direction at a rate you cannot control toward an ending you cannot avoid. The universe began. Time began with it. And from that very first instant something strange was happening that physicists would not understand for centuries. The universe was becoming more disordered. Not immediately obvious. Not in a way that the earliest humans staring at the night sky would have noticed. But embedded in the structure of physics, written into every interaction between every particle in existence, was a one-way process, a ratchet, something that permitted motion in both directions on paper, but enforce motion in only one direction in practice.

Isaac Newton did not see it. He publishes laws of motion in 1687, and they were astonishing in their power. F = MA. For every action, an equal and opposite reaction. The law of universal gravitation. With these tools, Newton could calculate the orbit of planets, the trajectory of cannonballs, the motion of the moon. His equations described a universe like a perfect clockwork machine. Wind it up, let it run, every motion precisely determined, every position calculable forward or backward through infinite time. Newton's universe had no arrow. It was symmetric in time the way a perfect sphere is symmetric in space. You could run it forward or backward and it would be equally valid, equally consistent, equally precise.

James Clerk Maxwell did not see it either. In the 1860s, he unified electricity and magnetism into four elegant equations that described how electromagnetic fields propagate through space. His equations predicted the existence of electromagnetic waves, light, radio waves, x-rays, all the same phenomenon at different frequencies. His equations are reversible. A light wave traveling forward in time is mathematically

identical to a light wave traveling backward in time. The equations do not distinguish.

Even Einstein rewriting the entire foundation of physics in 1905 and 1915 did not build a directional arrow into his equations. Special relativity showed that time is not absolute. It stretches and compresses depending on your velocity and your position in a gravitational field. General relativity showed that mass curves spacetime itself. That gravity is not a force but the geometry of the universe bending around mass. These ideas shattered everything Newton had built and replaced it with something stranger and more accurate and more beautiful. But Einstein's equations like Newton's like Maxwell's are time symmetric. They work equally well in both directions. The universe described by our greatest physics, the most tested most verified most precisely confirmed theories in human history, is a universe with no preferred direction of time.

And yet the glass shatters and does not reassemble. The smoke rises and does not descend back into the wood. You grow old and do not grow young. Something is enforcing a direction that the equations do not require. That something has a name. Its name is entropy. And before you decide you already know what entropy is, I want you to consider the possibility that you do not. Not fully, not in the way that reveals why time moves forward. Because entropy is one of those words that people use confidently and understand shallowly. Disorder, randomness, chaos, messiness. You have heard these definitions. They are not wrong, but they are incomplete in a way that matters enormously. Let us start with what entropy actually measures. Imagine you have a box divided into two equal halves by a removable partition. On the left side, you place a thousand gas molecules nitrogen. Say the kind filling your lungs right now. On the right side, nothing. A perfect vacuum. Now you remove the partition. What happens? You already know what happens. The gas expands to fill the entire box instantly. Automatically without any energy input, the molecules spread from the left half into both halves, distributing themselves throughout the available space. Now the question why? The naive answer is that the gas moves from high pressure to low pressure, from concentration to emptiness. True, but not deep enough. The real answer is combinatorial probabilistic. It is about the mathematics of how many ways a given situation can be arranged. When all 1,000 molecules are on the left side, there is essentially one way that can happen. All one thousand molecules must be on the left.

Every single one. If you took a snapshot of the box and recorded which side each molecule occupied, you would find them all on one side. There is almost no freedom in that arrangement, almost no variation, almost no choice in where the molecules are. When the partition is removed and the molecules are free to occupy either side, the number of possible arrangements explodes. Any molecule can be on either side. The number of combinations is astronomical. incomprehensibly large and the vast overwhelming almost infinite majority of those combinations look roughly like 500 on each side. Approximately equal distribution roughly uniform density.

The gas expands not because it is pushed, not because physics demands it move from left to right, but because there are so many more ways for the gas to be spread out than concentrated. If you randomly reassign the position of every molecule at

random, the probability that they would all end up on the left side again is so small it is effectively zero. Not technically zero, just so improbable that in the entire remaining lifetime of the universe, it would almost certainly never happen. This is entropy. Not disorder in the aesthetic sense, not messiness the way a teenager's bedroom is messy. Entropy is a count, a mathematical measure of the number of ways a system can be arranged while looking the same from the outside. High entropy means many possible arrangements. Low entropy means few. And the second law of thermodynamics states simply and brutally that entropy in a closed system always increases or stays the same. It never spontaneously decreases. The gas spreads out because spread out has more arrangements than concentrated. The ice melts in your drink because the water molecules dispersed throughout the liquid have more arrangements than locked into a crystal lattice. The smoke rises and dissipates because dispersed smoke molecules have more arrangements than concentrated smoke molecules. Everything moves from low entropy to high entropy because there are simply more ways to be high entropy than low entropy. It is not a law imposed from outside. It is a consequence of mathematics, of probability, of the sheer overwhelming numerical dominance of disordered states over ordered ones.

> *(The interesting corollary here for Buddhist thought is the Skandhas. With reference to the Nidana we can understand the development of the Skandhas as expressions of Potential from Quiescence. The 'pregnant' nature of Potential is a subtle but powerful demand for expression, to be experienced, to exist, to BE. This condition inexorably leads to birth, endurance (increasing entropy) and dissolution. Dissolution into the vast matrix of Potential. This is the engine of 'creation'. But creation for what, who, but only for the experience of the created. This is Tathagata. To create in order to witness, to experience, the created.)*

And here, right here, is where the arrow of time hides. Time moves forward in the direction of increasing entropy. The past is the direction of lower entropy. The future is the direction of higher entropy. The reason you remember the past and not the future is that the past is more ordered and left records physical traces. Memories, photographs, fossils that persist into the higher entropy present.

The reason you cannot unscramble an egg is that the scrambled state has incomprehensibly more arrangements than the unscrambled state. The reason you cannot reassemble the shattered glass is that the shattered state has vastly more arrangements than the whole glass. The arrow of time is the arrow of entropy. Or so the story goes. But this answer, satisfying as it feels, immediately creates a problem so severe it nearly destroyed the entire framework. The problem is this. If entropy always increases because disordered states are more probable than ordered states, then the laws of probability apply equally in both directions of time. If you run the gas in a box experiment backward in time, the mathematics says the same thing. A gas that is currently spread throughout the box should by exactly the same probabilistic reasoning applied in reverse have been more spread out in the past, not concentrated on one side, more evenly distributed. But that is not what happened. In the past, the gas was concentrated on one side. In the past, the egg was unscrambled. In the past, the glass was whole. The past was a state of lower entropy, not higher entropy. And the probabilistic reasoning that explains why entropy increases toward the future also predicts with equal mathematical force that

entropy should increase toward the past. This is called the irreversibility problem or sometimes the Lashmitt paradox named after the Austrian physicist Joseph Lashmitt who pointed it out in 1876 with devastating precision. If the microscopic laws of physics are time reversible, he argued, then the second law of thermodynamics cannot follow from those laws alone because anything those laws predict going forward in time, they predict equally going backward. You cannot derive a one-way law from a two-way foundation. The physics community struggled with this for decades. Boltzmann, the genius who had done more than anyone to establish the statistical foundations of thermodynamics, spent years defending his work against this objection. He eventually proposed an answer, an answer so strange, so cosmologically vast, so philosophically vertiginous that it has never been fully resolved. He proposed that we live in a statistical fluctuation. If you wait long enough, and by long enough I mean incomprehensibly universe dwarfingly, numbers with more digits than atoms in the observable universe long a gas in a box will spontaneously by pure random motion of its molecules fluctuate into a low entropy configuration. All the molecules will randomly end up on one side just by chance. It will take almost forever. But probability does not forbid it only makes it extraordinarily unlikely.

Boltzmann suggested that the entire observable universe with its stars, its galaxies, its structure, its life might be exactly such a fluctuation, a random, temporary, astronomically improbable decrease in entropy in an otherwise maximum entropy eternal universe. We find ourselves inside the fluctuation. We find the path to be lower entropy because we are on the ascending slope of a fluctuation moving from its lowest point, the big bang, toward maximum entropy. This explanation is deeply unsatisfying for reasons that physicists have articulated carefully. If the universe is a random fluctuation, it is overwhelmingly more probable that the fluctuation produced only our solar system or only our galaxy or only our planet or only your brain complete with false memories of a lower entropy past than that it produced the entire observable universe in its ordered early state. The explanation technically works but predicts something even stranger than what we observe. The problem of the arrow of time goes deeper. Then entropy it goes all the way to the beginning. Here is the real question. Not why does entropy increase. We understand that disordered states are more probable. The real question is why was entropy so low at the beginning? Why did the universe start in such an extraordinarily ordered extraordinarily low entropy state? The big bang was not a chaotic explosion. It was from the perspective of entropy a state of almost incomprehensible order. Not order in the sense of everything neatly arranged. Order in the sense of low entropy, in the sense of very few possible arrangements.

The early universe was hot and dense and smooth to one part in a 100,000. Tiny quantum fluctuations in the density of matter, but overall breathtakingly uniform, breathtakingly low entropy. And from that extraordinarily ordered beginning, the universe has been climbing toward disorder ever since. Stars are entropy machines. They take the ordered potential energy of hydrogen and release it as dispersed heat and light. Life is a local temporary decrease in entropy powered by the enormous entropy increase of the sun. Your body maintains its low entropy ordered structure by consuming low entropy food and releasing high entropy heat and waste.

Everything is running downhill from that extraordinarily ordered beginning. But why was the beginning so ordered? This is called the past hypothesis. The philosopher David Albert named it. The physicist Roger Penrose calculated what it implies. And what it implies is staggering. Penrose calculated the probability that the big bang would produce a universe with entropy as low as ours. The answer expressed as a fraction has a denominator with 10 ^ of 10 ^ of 123 zeros. A number so large it is not just beyond human comprehension but beyond the capacity of any notation system to make intuitively graspable.

The universe we live in with its arrow of time, its low entropy past, it's increasing. Entropy is not the generic outcome of the big bang. It is an outcome of such improbable specificity that even calling it improbable undersells the strangeness. Something chose a beginning of extraordinarily low entropy or something caused it or it was necessary in a way we do not yet understand. Roger Penrose has his own answer to this. He calls it Conformal Cyclic Cosmology, *CCC*. The idea that our universe is one in an infinite sequence of universes. Each big bang the compressed remnant of the maximum entropy heat death of the previous universe with low entropy somehow regenerated at the transition. It is speculative. It is controversial. It is not accepted by most physicists but it is a serious attempt by a serious mathematician to explain why the beginning was so special.

Others look to quantum cosmology to the no boundary proposal of Hawking and Hardle which suggests the universe has no beginning in time at all that asking what happened before the big bang is like asking what is south of the south pole. The question assumes a structure of it does not exist. Time itself emerged gradually from a quantum foam in which the distinction between time and space was not yet sharp. In that framework, the low entropy of the early universe is not something to be explained. It is a boundary condition. It is just how the universe is near the boundary of its existence. None of these answers fully satisfies. All of them leave open the deepest question. Why this beginning? Why this entropy? Why this arrow? And it gets stranger still.

Quantum mechanics is the most precisely tested theory in the history of science. Its predictions have been confirmed to more decimal places than any other theory ever proposed. It describes the behavior of particles at the smallest scales, electrons, photons, quarks, the fundamental constituents of matter, and it is in its equations time symmetric. Run the Schrodinger equation forward or backward. The mathematics does not care. But there is something in quantum mechanics that is not in the equations. Something that happens when you make a measurement. When a quantum system, a particle existing in a super-position of states, a cloud of probability, a wave of possibility interacts with a measuring device, with the outside world, with you, the wave function collapses. The particle that was everywhere at once, that was both spin up and spin down simultaneously. That was a super-position of every possible position and momentum suddenly becomes one thing. a definite position, a definite spin, a definite momentum. The cloud of probability collapses to a point of certainty. And this collapse is not described by the Schrodinger equation. It is something that happens to the equation, not something the equation predicts. It is sudden. It is irreversible. And it happens only in one direction from quantum superposition to classical definiteness. Never the other way.

You never observe a classical definite particle spontaneously. dissolving back into quantum super-position. This is called the measurement problem and it has been argued about since the 1920s. Copenhagen interpretation, many worlds interpretation, pilot wave theory, relational quantum mechanics, quantum bases. Every interpretation of quantum mechanics is at its core an attempt to explain what the collapse of the wave function actually is. Whether it is real or apparent, whether it happens physically or only in our knowledge, but here is the connection to the arrow of time. In some interpretations, particularly the decoherence approach developed in detail by the physicist Waj Shaiish Shark, the apparent collapse of wave function is the result of a quantum system becoming entangled with its environment interacting with billions of surrounding particles leaking its quantum information into the environment. becoming classical not because something magically selects one outcome but because the quantum correlations spread into the environment so thoroughly that they can never in practice be retrieved. This spreading of quantum information is an entropy process. Decoherence is quantum information entropy increasing. The arrow of quantum measurement from super-position to definite outcome is the same arrow as thermodynamic entropy increase.

They are the same phenomenon at different scales. The arrow of time that you experience the direction from past to future, from memory to anticipation, from birth to death, is the arrow of entropy increase, which is the arrow of information spreading, which is the arrow of quantum decoherence all the way down. But this still leaves the deepest question untouched. Why does entropy increase in this direction and not the other? And the answer keeps pointing back to the same place. The extraordinarily low entropy beginning, the big bang, the initial condition that physics cannot yet explain. We need to go deeper because so far we have been talking about time as if it is a river, something that flows, something that passes, something that moves. And this language, so natural, so intuitive, so embedded in every language ever spoken by human beings, is precisely what needs to be dismantled.

Einstein taught us something about time that most people have heard but very few have genuinely absorbed. **Time is not absolute. Time is not the same for everyone. Time is not a universal background against which events occur. Time is a dimension, a direction in spacetime, not fundamentally different from a spatial direction.**

In special relativity, time and space are unified into a four-dimensional continuum. You move through spacetime at a constant rate, the speed of light always. When you are sitting still in space, all of that motion is in the time direction. You age at the maximum rate. When you begin moving through space, some of your space-time motion is redirected into the spatial directions, and less remains in the time direction. You age more slowly at the speed of light, which only mass-less particles like photons can achieve. All space-time motion is in spatial directions. No motion remains in the time direction for a photon. From emission to absorption, no time passes. **The photon does not experience duration**. This is not metaphor. This is not analogy. GPS satellites must correct for relativistic time dilation every single day or their timing errors would accumulate and make the entire system useless within

hours. Time passes at different rates, at different altitudes, different velocities. It has been measured directly with atomic clocks on airplanes, on rockets, on satellites.

Time is physically different for different observers. And in general relativity, time becomes even stranger. Massive objects curve spacetime, not just spacetime. The curvature affects the time direction as well as the spatial directions. Near a black hole, the curvature is extreme.

At the event horizon, the point of no return, the time direction, and the radial spatial direction swap roles.

What was time becomes space and what was space becomes time. Inside a black hole, movement toward the singularity is not movement through space toward a place. It is movement through time toward a moment. The future inescapable the way the future is always inescapable. But even with all of this, even knowing that time bends and stretches and slows and speeds, Einstein's equations still do not explain why time moves in one direction. The curved spacetime of general relativity is still in principle time symmetric. A universe of curved spacetime running backward is still a valid solution to Einstein's field equations. The curvature does not create the arrow. The arrow comes from somewhere else.

Some physicists, Julian Barber most prominently, have argued that time does not flow at all. That the sensation of time passing is an illusion constructed by minds embedded in a static four-dimensional block universe. In this view called the block universe or eternalism, all moments of time exist equally and simultaneously. Your birth and your death are both equally real, equally present in the four-dimensional structure of spacetime. The past is not gone. The future is not yet to come. They all simply are timelessly permanently.

The way all points on a ruler exist simultaneously even though you can only touch one at a time. The experience of time passing in this view is like the experience of moving along a ruler. You are at one point now. You are at another point before. You will be at another point later. But all the points exist. The ruler does not flow. You move along it. This is a coherent mathematically serious position. It is not universally accepted. It has profound and disturbing implications for free will for the reality of change for the meaning of words like past and future and now. But it is taken seriously by serious physicists. And in this view, asking why time moves forward becomes asking why your experience of the static four-dimensional block universe is ordered in the direction of increasing entropy. which points again to the initial condition to the big bang always to the big bang.

There is one more layer deeper than entropy deeper than the big bang deeper than the block universe and it concerns the relationship between information physics and reality itself. In 1961, the physicist Ralph Landau made a discovery that most people have never heard of, but that sits at the foundation of the relationship between information and physics. He showed that erasing a single bit of information, taking a physical system that can be in one of two states and resetting it to a definite state necessarily produces heat. Necessarily increases entropy by a minimum amount calculable from the temperature of the environment. This is called land hours principle and it means that information is physical not metaphorically physical

literally physical. Erasing information requires energy. Creating information, storing it, copying it. These are physical processes with thermodynamic consequences. Information is not an abstract thing imposed on physical reality. Information is woven into the fabric of physical reality. They are the same thing at the deepest level.

John Archibald Wheeler, one of the most creative physicists of the 20th century, spent the last decades of his life pursuing an idea he called it from bit. The idea that physical reality, every particle, every field, every force is fundamentally informational. That existence is at its deepest level made of information, not matter, not energy. Information, this sounds like mysticism.

It is not. It is a serious research program and it connects to the arrow of time in a way that is profound. If physical reality is formational, then the arrow of time is the arrow of information processing. The direction from past to future is the direction from less processed to more processed information. From lower information entropy to higher information entropy. From the compressed, ordered, low in information state of the big bang to the expanded, disordered, high information state of the far future. The arrow of time is the arrow of the universe computing itself. Every physical interaction is an information exchange.

Every collision between particles is a computation. Every measurement, every entanglement, every decoherence event is the universe processing information. And it processes that information in one direction from the extraordinarily compressed initial state to the maximally expanded final state because that is the direction of increasing entropy of increasing information of time itself. You are made of information. Your memories are stored information. Your body is an information processing system of almost incomprehensible complexity. 100 trillion cells each containing gigabytes of genetic information. each performing thousands of chemical computations per second. And you are embedded in a universe that is itself an information processing system of incomprehensibly greater scale. And both you and the universe are processing information in the same direction. The direction of time, the direction of entropy, the direction from the extraordinary specialness of the beginning toward the uniform maximum entropy of the far future. This is why time moves forward.

Not because physics requires it, but because the beginning was special. Because the big bang was a state of extraordinarily low entropy. Because from that beginning, probability and mathematics and the sheer combinatorial dominance of disordered states over ordered ones drives everything, every particle, every field, every system, every mind toward greater disorder, greater entropy, greater information dispersal. The arrow of time is the shadow of the Big Bang, stretching across 13.8 billion years of cosmic history. Through every star and every galaxy, through every living thing on every planet, through every thought you have ever had, pointing always in the same direction, from the specialness of the beginning toward the uniformity of the end. Now stop. Come back from the cosmological scale. Come back from the quantum scale. Come back from the formational scale. Come back to yourself. You are sitting somewhere right now. Maybe in a chair, maybe in a bed, maybe on a bus or a train or a plane. You are a collection of approximately 7 billion billion billion atoms

arranged by 4 billion years of evolution into a structure of extraordinary complexity. A structure capable of asking why. And you exist at a specific point on the arrow of time. Not at the beginning. The big bang was 13.8 billion years ago. And you were not there. Not at the end. The heat death of the universe is approximately 10 to the power of 100 years away. And you will not be there either. You are here in the middle at a specific moment moving in one direction. You cannot go back. This is not a poetic statement. It is a physical statement. The entropy of the universe has increased since your birth.

The information has dispersed. The quantum decoherence has occurred. The records have been made. The past is fixed. Not because of some mystical property of past-ness, but because it is the low entropy end of the arrow. To go back would be to decrease entropy. And entropy does not decrease. Not without a cost. Not without producing more entropy somewhere else. Not in a way that returns you to exactly where you were.

Your memories are the records that low entropy events left in your high entropy brain. Your childhood exists in your memory, not because the past is present somehow, but because the low entropy events of your past produce information that was encoded in your neurons. That encoding is itself a physical structure, a pattern of synaptic connections, a configuration of matter that preserves a shadow of the past into the present. And this shadow, this record is why time feels like it flows. You have memories of the past. You have no memories of the future. Not because the future does not exist in the block universe. All moments exist, but because records only form in the direction of entropy increase from low entropy toward high entropy, from ordered past toward disordered future. A record is a low entropy trace of a past event persisting into the higher entropy present. The future leaves no records in the present because the future is the high entropy direction. There is nothing ordered enough in the future to leave a trace in the less ordered present. You experience time as flowing forward because your brain is a record-keeping system and records only form in the direction of entropy increase. This is why precognition is impossible. This is why you remember your first day of school and not your last day of life. This is why cause precedes effect because causes leave records low entropy information that persists into the high entropy future. Effects cannot leave records in the low entropy past. The arrow of time is built into the structure of memory itself. And memory is what makes you a self, a continuous identity, a person with a past and a future and a present. Without the arrow of time, without the directional flow from low entropy to high entropy, there would be no memory, no self, no experience of existing through time, no consciousness as you know it.

You are not just embedded in the arrow of time. You are made of it.