

# The Pressure of Light

MALCOLM



# **The Pressure of Light**

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# ***Abstract***

The Pressure of Light argues that knowledge accumulates in the human mind sometimes on the straight and measurable arrow-of-time, and sometimes in a time-state distorted by uncertainty and projection. The first-person, epistemological essay makes the argument by comparing the fundamental structures of memories-of-events internal to the self and memories-of-events external to the self. The evidence for the argument is derived from a period of formal introspection about the nature of remembered-thoughts, and the acknowledgement that no confirming-evidence that a remembered-thought existed as remembered by a conscious mind could possibly exist anywhere in the universe. The result becomes the discovery of a time-state here named mirror-time, from which knowledge built off of remembered-thinking is derived. The implications of the result are considered in terms of archetypes that represent oscillating versions of any conscious mind, namely the artist-technologist and the philosopher-scientist, and then more generally in terms of epistemological philosophy. The investigation concludes by logically disproving the existence of repetition through normal-time in section 5: The Principle of Infinite-Heterogeneity-in-Time, which defines the new principle by reviewing and expanding on the glass-ball and lamp visualization in Albert Einstein's Geometry and Experience. A final point is made about the principle's applications to the philosophical underpinnings of quantum mechanics. The expectation of the reader of this non-academic, self-published proposal is to not only digest the material, but consider creating a response that supports or challenges The Pressure of Light.

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# ***1. The Crystallization of Thought-o-Biographies***

“It is certainly true that Maxwell’s equations for empty space, taken by themselves, do not say anything, that they only represent an intermediary construct; but, as is well known, exactly the same could be said about Newton’s equations of motion, as well as about any theory that needs to be supplemented by other theories in order to yield a picture for a complex of phenomena.”

– Albert Einstein, from his 1909 paper *The Radiation Problem*, describing how a set of remembered-thinking-events, when remembered as contextually connected, can approximate the nature of the universe-external in a useful way, even if that internal-approximation is nevertheless the product of human imagination.

“If the magnet is moved, there exists in space a magnetic field variable with time, which, according to Maxwell, forms closed lines of an electric force...However, no electric field arises if the magnet is at rest and the circuit is moved; instead, the current in the conductor is created because the electricities moving with it due to the (mechanically forced) movement relative to the magnetic field suffer an electromotive force, which Lorentz introduced hypothetically. The idea that these two cases should essentially be different was unbearable to me.”

– Albert Einstein, 1920 paper *Ideas and Methods*, relaying his memory of experiencing unbearableness that he connects with his memories of visualizing himself moving with electric and magnetic fields in Maxwell’s empty space.

“The special theory of relativity has crystallised out from the Maxwell-Lorentz theory of electromagnetic phenomena.”

– Albert Einstein, 1916 book *Special and General Relativity*, describing how the remembered-thinking-events relayed by Maxwell, Lorentz, and then himself have crystalized into a conceptual framework for understanding the universe.

“All problems in the optics of moving bodies can be solved by the method employed here. The essential point is that the electric and magnetic forces of light, which is influenced by a moving body, are transformed to a coordinate system that is at rest relative to that body. This reduces every problem in the optics of moving bodies to a series of problems in the optics of bodies at rest.”

– Albert Einstein remembering, in his 1905 paper that introduced *Special Relativity*, the theory’s crucial thinking-event – imagining himself moving with a magnetic

field in such a way that he sees it simply as an electric field in motion – which subsequently led to the resolution of all conceptual problems related to magnetically and electrically charged bodies in motion.

“The more electromagnetic theory advanced, the more the question of whether electromagnetic processes can be reduced to mechanical ones retreated into the background; one became used to considering the concepts of electric and magnetic field strength, electric space density, etc., as elementary concepts that are not in need of mechanistic interpretation...The pressure of light, which has only recently been established experimentally, and which plays such an important role in the theory of radiation, proved to be a consequence of the theory.”

– Albert Einstein, on James Clark Maxwell’s equations, and the crystallization of knowledge they seeded (1909 presentation, On the Constitution of Radiation)

**W***hat happens in my mind happens in the universe.* I am, after all, just another physical body spinning through the galaxy, riding the expanding wave of the big-bang, comfortably seated on the arrow-of-time. The imagination has a place, and every imagination moves at least a few thousand kilometers a second in this fast spinning Galaxy. My imagination, where I’ve time-warped across the universe, flown kilometers above the earth, and played carelessly with my past and future, is much easier to see as something quite separate from the body that spins around the galaxy for real. It’s as if what I imagine appears in a bubble that pops off my head, a piece of consciousness attached, and drifts away guided by nothing but its own laws of physics. This is perfectly fine to believe, it won’t threaten the true nature of time and space in the universe, because those time and space distorted bubbles are nothing but the very expected outcomes of human-imaginations. What’s far more interesting to the universe about conscious-minds is the evolved structure that patterns the development of knowledge in the brain, the part that’s spinning through the galaxy for real, carrying forth that knowledge-accumulation, crossing paths with other bodies, sometimes colliding and bursting into pieces that form their own little worlds.

In 2020, I thought a lot about thinking. For the first half of the year I ran through a forested trail for an hour every morning, intending the run to be a meditation where, against the backdrop of repetition, I would explore more deeply the act of reflecting on my memories-of-thinking, feeling, and experiences-of-awareness. The typically calming effect of my run instead started fueling a hyperspeed looping through memories-of-remembered-thinking and memories-of-remembered-feelings as they all jumped, erratically, as I flashed, randomly, people and events from life to entice reactions in my mind to analyze. As my cardio-strength increased and allowed for faster charges up and down steep dirt trails, mercifully beneath the shade of old-growth hard-woods, it started to feel like I was turning my internal world into a particle accelerator for neurological activity.

During this exercise I let up a bit on my life-long-pursuit to create stillness in my verbal thinking and associated physical habits. Instead, I allowed the verbage to run, and in the wake of these events I investigated more closely the hypothesis that a verbal thought inevitably has a non-verbal predecessor. I expanded the practice beyond verbal thinking, smashing my memories of all types of thought against each other so that I could attempt a hard, deep look at that wall of nothing just one notch in time past my thoughts. Unlike in CERN, the raw, objective-as-possible images I returned with always came out black and featureless.

I would frequently follow up these runs with some fast typing into my info-diary, my name for a living document where I brainstorm ideas, experiment with creative writing, write about what I'm reading, and write actual diary entries. On one such occasion I surprised myself with the realization that I couldn't answer a fairly simple question: how do I really know that I experienced the thinking event that I remember having? Might the brain simply write in the memory of the thinking event without bothering with the thinking in the first place? In a system that is forever concerned with efficiency, sometimes decommissioning evolved abilities for efficiency's sake, why not? What would be lost? Even if this seems unlikely, what about my memory of how long the thought occurred for, when it happened, and in what order compared to other internal-information-processing-events I can remember? Most importantly, if I can't confirm the timing or even existence of the thinking-events I remember, who can?

These questions are what led me to write this essay. They're all questions I could ask about my memory of real life events as well, but my memories of life-external would not lead me to question the nature of my mind's place in time. Human minds have the benefit of knowing, through collective agreement, that real life events do happen somewhere on the measurable and unidirectional arrow-of-time. In the external world, we believe in the arrow-of-time, that march along the path. Sometimes that path does muddy the mind's perception of the steady walk forward with events that contextually connect to other events, or events that repeat in a series scattered over normal-time's continuous journey, but in all moments the mind can still feel anchored to the arrow-of-time because in all moments normal-time retains some recognizable level of unpredictability.

No matter how much is learned about life in this universe, the path forward through time is still recognizably heterogeneous. If anyone has ever felt the universe has imprisoned them in a time loop, or distorted their normally steady walk forward, if they ever felt that time is not what they thought but more like a house of mirrors, all they had to do was discuss event distribution along the arrow-of-time with others, and so far the strength of truth that comes from mutual agreement has been enough to set the arrow-of-time straight. But while mutual agreement is epistemologically important to knowledge, the knowledge-sets that accumulate in human minds do not come solely from

multi-mind-development. Understanding knowledge in the human mind means understanding how the mind in part develops knowledge in the brain all on its own.

## ***2. As I Walk the Straight and Measurable Arrow of Time***

“An historian may, perhaps, for the more convenient carrying on of his narration, relate an event before another, to which it was in fact posterior; but then he takes notice of this disorder, if he be exact; and by that means replaces the idea in its due position. It is the same case in our recollection of those places and persons, with which we were formerly acquainted. The chief exercise of memory is not to preserve the simple ideas, but their order and position.”

– David Hume, *The Treatise of Human Nature* (1739), whom Einstein acknowledged as the most significant philosophical shoulders on which was built the Theory of Special Relativity.

“But what about the psychological origin of the concept of time? This concept is undoubtedly associated with the fact of ‘calling to mind,’ as well as with the differentiation between sense experiences and the recollection of these. Of itself it is doubtful whether the differentiation between sense experience and recollection (or simple re-presentation) is something psychologically directly given to us. Everyone has experienced that he has been in doubt whether he has actually experienced something with his senses or has simply dreamt about it. Probably the ability to discriminate between these alternatives first comes about as the result of activity of the mind creating order.

“An experience is associated with a ‘recollection,’ and it is considered as being ‘earlier’ in comparison with ‘present experiences’. This is a conceptual ordering principle for recollected experiences, and the possibility of its accomplishment gives rise to the subjective concept of time, i.e. that concept of time which refers to the arrangement of the experiences of the individual.”

– Albert Einstein, from his 1916 book on Special and General Relativity, in which he agrees with David Hume, but expands on the individuality of the experience of time.

***The Pressure of Light argues that knowledge accumulates in the human mind sometimes on the straight and measurable arrow-of-time, and sometimes in a time-state distorted by uncertainty and projection.*** In the case of both remembered-thinking-events and remembered-external-events, the mind carves out a segment of time from what it understands is a much larger time-line of events, so that we end up with memories that have a beginning and an end. On the real arrow-of-time, segmentation is a clumsy measuring tool that is understood to have blurring at the boundaries. The mind could presume an event observed in the universe outside the self stands alone on the arrow-of-time, complete just as it’s seen, but in life on the arrow-of-time the mind quickly learns to presume instead that any event is

connected, either causally or contextually, to a whole cluster of unseen events on either side of those memory-carved boundaries.

The Pressure of Light argues that knowledge accumulates in the human mind sometimes on the straight and measurable arrow-of-time, and sometimes in a time-state distorted by uncertainty and projection. In the case of both remembered-thinking-events and remembered-external-events, the mind carves out a segment of time from what it understands is a much larger time-line of events, so that we end up with memories that have a beginning and an end. On the real arrow-of-time, segmentation is a clumsy measuring tool that is understood to have blurring at the boundaries. The mind could presume an event observed in the universe outside the self stands alone on the arrow-of-time, complete just as it's seen, but in life on the arrow-of-time the mind quickly learns to presume instead that any event is connected, either causally or contextually, to a whole cluster of unseen events on either side of those memory-carved boundaries.

When I talk about events in the universe, I can concretely know and mutually agree with others that events do happen, that they all exist somewhere on the arrow-of-time, that they often seem to repeat with varying degrees of similarity, and that each of us has very legitimate reason to hypothesize about the possibility of any particular event happening again, having already happened, and what we should all do about that. This conversation, this part of knowledge development, sits firmly on the arrow-of-time, where the unpredictable, but dependably heterogeneous path keeps a reality check on every hypothesized connection discussed. No such check exists in the mind.

Events repeat along the arrow-of-time, but not precisely. Even the sun rising is an event that happens at a relatively different spot in the galaxy everytime it happens. Nevertheless, the perceived repetition of events is what gives my mind the capacity to understand events, to design a reaction to them for next time, to deduce knowledge based on the relatibility of one event to other events, which helps even when the relatibility is only sort-of there. While the connections help me develop knowledge about the world, real-time heterogeneity keeps my hypothesizing in check by constantly reminding me that while such and such has worked every time so far, every so often I'll have to contend with a black-swan.

In the universe, on the arrow-of-time, even if I can't see what happened earlier on the arrow, I can at least feel certain something happened before and after any particular event I observe, likely something relatable, and possibly something I could, to some degree, deduce from my observations. Deduce as I may, I also know there are rules in this universe which can both confirm and disprove my deductions, and all the other minds in this time-dimension know the same thing, and will think about that when they hear the results of my deductions. Knowledge that accumulates in my mind through life lived fully on the arrow-of-time is knowledge that understands the true nature of time. I argue that half of knowledge does not.

### ***3. Thinking, Remembering Thinking, Thinking about a Memory of Thinking, and how that Messes with Time***

“Dear mommy!

“Your lovely present gives me a welcome excuse to write to you again, the holiday’s silence, the cozy quietude, to have a good chat with you, as if we were sitting together in the red room while the potatoes are getting brown with jealousy and the dear sun and some other dear thing peep into the room. When I think of that room, my head starts ringing in a delightfully mad way, and a thousand memories, some old, some young, some gay and others sad, embrace each other in a child-like fashion, as if they belonged together.”

– Letter from Albert Einstein, 1897, to his surrogate mother and recent board-and-study-hostess, Pauline Winteler, in which he first writes, emphatically, about his time at the Winteler household (“...to have a good chat with you, as if we were sitting together in the red room”) and speaks so enthusiastically and without verbal check (“...the dear sun and some other dear thing”) that it can be deduced that he is speaking direct from memory, recalling information about the external universe without forming a memory of that remembering-in-action, and in which he goes on, in stark contrast to the first sentence, to write about memories of remembering the room, and memories of feelings (“...my head starts ringing in a delightfully mad way”) that he associates with those memories-of-remembering, and in which he then goes on to write about the relationship between a certain set of memories-of-remembering (“...some old, some young, some gay and others sad”) that he remembers deducing from his analysis of the internal experiences: “...embrace each other in a child-like fashion, as if they belonged together”.

**C**ompared to events in the universe that are agreed upon to exist by multiple thinkers, remembered-thinking-events exist far outside the boundaries of agreed-upon-reality. Unless neurologists learn how to observe and decipher the brain processing information, to observe the brain creating a memory of that same information-processing in-action and to decipher the content contained in that memory, and to observe and decipher the crystallization of memories-of-analysis-of-memories-of-thinking-remembered, conscious minds will never ever be able to confirm that a remembered-thinking-event actually happened the way it’s reported. The Pressure of Light asserts that this is impossible, regardless of how far neurology or any other science evolves, and therefore that the uncertainty of remembered-thinking is representative of its fundamental structure in this universe.

My inability to know for certain that the thinking-events in my mind actually happened means I'm even less able to know if I'm correct in presuming any particular thinking-event has connections with any other thinking-event. Any remembered thought I have is shrouded in even less confirmable deductions of what context, or past and future iterations, these events are embedded in. Thus I achieve the capacity to see, without any intuitive doubt, thinking-events that perfectly replicate previous and future events, and thinking-events that connect seamlessly with other thoughts and feelings through the context I've deduced and confirmed without challenge. It's almost as if the mind is enticing me to imagine fantastical explanations for the occurrence of my remembered-thinking.

My mind is littered with presumptions of cause-and-effect relationships between different thinking and feeling events I routinely experience, and the correctness of my presumptions depends on those events having a place on the arrow-of-time that I have at least a decent view of. The implications of the uncertainty that surrounds remembered-thinking leads to a very disruptive truth, that knowledge developed from reflections on thinking is

## 4. Archetypes of Inertia

“Incidentally, I believe I have made the acquaintance of this man in Prague. He apparently belongs to a small philosophically and zionistically infested circle, which was loosely associated with the university philosophers, a small troop of unrealistic people, harking back to the Middle Ages, with whom you have become familiar on reading the book.”

– Letter from Albert Einstein to Hedwig Born, 1916, about members of the Fanta Salon in Prague, in which Einstein makes apparent his irreligiousness and distaste for Zionism

“The news about the bitter experience that you had to live through affected me very much. I know what it means to see one’s mother in death throes, without being able to help. There is no consolation. We all must bear such tribulations, for they are inseparably bound with life. One thing does exist, though: loyal friendship and mutual support in carrying the burden. We do share so many beautiful things together that we do not need to succumb to numb brooding. Dead elders do live on in the young. Don’t you sense it now when you, in mourning, look at your children?– ”

– Letter from Hedwig Born to Albert Einstein, 1920, which followed the challenging years of WWI, Einstein’s difficult divorce, his sudden rise to world-fame, and then the loss of his mother to cancer, and which was sent only a few months before the Bad Nauheim debate.

“Now let us have another look at those who have found favor with the angel. Most of them are somewhat odd, uncommunicative, solitary fellows, really less like each other, in spite of these common characteristics, than the hosts of the rejected. What has brought them to the temple? That is a difficult question and no single answer will cover it. To begin with, I believe with Schopenhauer that one of the strongest motives that leads men to art and science is escape from everyday life with its painful crudity and hopeless dreariness, from the fetters of one’s own ever shifting desires. A finely tempered nature longs to escape from personal life into the world of objective perception and thought; this desire may be compared with the townsman’s irresistible longing to escape from his noisy, cramped surroundings into the silence of high mountains, where the eye ranges freely through the still, pure air and fondly traces out the restful contours apparently built for eternity.

“With this negative motive there goes a positive one. Man tries to make for himself in the fashion that suits him best a simplified and intelligible picture of the world; he then tries to some extent to substitute this cosmos of his for the world of experience, and

thus to overcome it. This is what the painter, the poet, and speculative philosopher, and the natural scientist do, each in his own fashion. Each makes this cosmos and its construction the pivot of his emotional life, in order to find in this way the peace and security which he cannot find in the narrow whirlpool of personal experience.”

– Albert Einstein, *Motives for Research*, a lecture given in honor of Max Planck, 1918, in which he makes apparent the emotional and intellectual fortitude that allowed him to be so successful in just about any scientific community.

“Meanwhile, though, you are the old Diogenes again, I hope, and are laughing at the beasts driveling into your tub! It absolutely does not fit the image I have of you, which I have placed, among other venerated holy men, within the shrine of my heart, that people could still disappoint it or provoke it out of its tranquillity. You would not have withdrawn from the wild bustle of life into the still temple of science (see your Planck speech) if you could have found in that bustle, in your fellow men, exactly those illusions, that happiness, and that peace as is in your temple. If the world’s scummy floods are now lapping at your temple’s steps, then just close the door and laugh! And say: it was not without reason that I went into the temple. Don’t be angry! Stay the holy man in the temple and—stay in Germany! Scum exists everywhere, but not such enthusiastic smart[-ass] preachers as your quite pretentious

Hedi Born.”

– Hedwig Born, 1920, in a letter following the Bad Nauheim debate, in which Albert Einstein succumbed to respond to a surprise attack against general relativity that descended into antisemitism, and after which he was bruised and embarrassed, for the first time ever for this famously emotionally-impennetrable man, and after which, he relinquished his pacifism, and anti-nationalism, to become a most important zionist.

**T***There are two types of time that your mind travels.* Do not see this as it pertains to the present moment, because what matters is that you are simply a body passing through the universe, miraculously accumulating knowledge as you go. You will behave, decide, and perform in bizarre ways based on an eclectic accumulation. The *Pressure of Light* investigates the possibility that two types of time are responsible for that accumulation. In mirror-time you are inundated with your drive to establish purpose, cause, context or intention behind the existence of a thought. You are an artist. Or you are inundated with a drive to establish rules every time such and such thought happens, to establish prescription. You are a technologist. In normal-time the self has no interest in perceiving any event as just another example of this or that, instead the self walks the path of time with nothing but curiosity for what lies ahead. In normal-time, you are a philosopher-scientist, meaning above all you develop knowledge that is intrinsically good and useful in real-events, regardless of whether it illuminates

connections or has practical applications. In the form of philosopher-scientist, you are concerned most with knowledge that is developed from observations of events that were at first unexplainable, knowledge which is most useful in navigating events that are unpredictable, and knowledge that survives above all by continually proving its value through unexpected challenges faced along the dependably heterogeneous path of normal-time.

There are so many known types of selves that fit the form of the philosopher-scientist: the artist or athlete in-the-zone, the rescue-worker acting on impulse, the worker who moves through the day like a zombie; anyone who has reported a time when they were very much applying their mental capacities to life, but without the ability to report on a memory from that time about a thought or a feeling. Being in the zone appears to flavour this experience with enjoyment and a heightened lack of concern for whether the self's internal processing is at risk of failing her task. Memories from these times are memories of life unfiltered by separation into the particulars of each sensory perception. The memory is of content only, the story of the win, the rescue, or the vaguely remembered workday, with the only medium being the act of recounting the memory out loud. If the memory of the win is recounted inwardly, over and over, then that beautiful moment in the zone becomes a memory of remembering being in the zone, along with memories of mental analyses of what that means. At this point a familiar dilemma may emerge, where contemplating and wanting the zone inversely makes the zone harder to reach or even remember experiencing.

In the context of *The Pressure of Light*, this is the dilemma experienced by the artist-technologist when attempting to jump time-states, or even just understand the perspective of the philosopher-scientist. The problem inherent to their view is that they are just another iteration of many iterations of artists-selves and technologists-selves, because seeing the universe as nothing but a collection of parts that are each nothing more than one in a projectable series means you also become nothing but one iteration in an infinite iteration of selves. Artist-technologist-selves that come to believe their self-regulating-cycles-of-thinking-analysis are superior to the philosopher-scientist's immersion-in-action-without-hesitation, run the risk of sinking into a vision of life as nothing but iterating events, like the single life of a video-game character, a life that's only unique in the sense that it's a variation on the iterating lives experienced by other iterations of video-game-selves. He then lives completely in mirror-time, forever looking away from the actual path-of-time to instead stare into the pairs of infinitely-regressing-mirrors, each one holding a smaller and smaller version of himself, as he takes clunky and resistant steps forward through time. Without escape, this time-scape becomes a meaningless and unhappy dimension.

If the universe were to trap her in a time-scape like this, the philosopher-scientist would not like it one bit. She's too committed to seeing every twist and turn in the path as revealing something never before seen, too committed to waiting until the last mo-

ment before deciding what knowledge she'll need at the next challenge. She identifies herself as someone living a truly unique life, as someone living a story, epic in its originality, and with a plot line that nobody will ever predict, least of all her. This doesn't mean she needs fame to help her stand out, she doesn't need recognition at all, if she did that would mean she's only original in the sense that she is a noticeable iteration among fame-seeking iterations. What she needs is to see time as exactly what it is, unpredictable, but dependably heterogeneous, and to see that single path through space-time that only her body travels. On the path of normal-time she gets to do what she does best, reach into her neurology's network-of-knowledge and draw-out a perfect set of information that never would have come together in the face of any other challenge, at any other point in space-time, or for anybody else. That is happiness for the philosopher-scientist.

## ***5. The Principle of Infinite-Heterogeneity-in-Time***

“...It is a wonderful thing that the explanation for the Mercury anomaly emerges so convincingly from such an abstract idea.

As you see, the war is kindly disposed toward me, allowing me, despite fierce gunfire at a decidedly terrestrial distance, to take this walk into this your land of ideas.”

– Letter from Karl Schwarzschild, who, through correspondence sent from the Russian front, 1916, provided Einstein with an elegant and unique solution to a difficult problem in his General Relativity work, the point-mass problem.

“Ultimately, according to my theory, inertia is simply an interaction between masses, not an effect in which ‘space’ of itself were involved, separate from the observed mass. The essence of my theory is precisely that no independent properties are attributed to space on its own.

“It can be put jokingly this way. If I allow all things to vanish from the world, then following Newton, the Galilean inertial space remains; following my interpretation, however, nothing remains.”

– Letter from Albert Einstein to Karl Schwarzschild on the Russian Front, 1916

The Pressure of Light has now crystalized in my mind for two years, and while the experience has been a bit scary in a consciousness-changing-way, I maintain faith that it’s all positive. What it means for you, I think (isn’t it humorously-relevant how ‘I think’ is a phrase that’s meant to indicate uncertainty in a statement made?) is that everything in your mind is a memory. All you have to do to make use of that knowledge is really learn to understand that. Your reaction to your thinking, recognized feeling, or experienced awareness, is a reaction to a memory. Your ambition to think about something, is nothing more than an ambition to remember thinking about something, and it’s exactly the same with a desire to feel a feeling or experience an awareness of something: all a desire to experience a memory, nothing more.

You also have memories of life-external, which you sometimes remember without remembering-remembering. That might have happened in a conversation, or in an application of the memory to work that has you very much in the zone; this is you as the philosopher-scientist, experiencing life without any need for internal confirmation of the experience. But you also sometimes remember-remembering events-external, and probably the most important way to make use of this information is by sorting out memories of the external from memories of the internal. Physical movements have

long connected with my own mental patterns, in ways that are sometimes impossible to control, sometimes embarrassingly so. Slowly, I'm starting to see it all, where the separation is, how little of the sometimes violently disruptive thinking I've experienced is actually internal, and therefore, how beautifully subtle the internal actually is.

The Pressure of Light's identification of mirror-time provides a means to better investigate life-internal, but it's perhaps more important that it leads to a better understanding of normal-time. The human mind fools itself into believing there has ever existed an iteration, a connection, or a context: these are all the products of distorted-time. This basic understanding is actually what the second law of thermodynamics is saying. Sure, something might be connected to something else now, but in a universe that is forever evolving into states of increasingly complex patterns of interactions between things, that connection will inevitably change in a weakening way. Any cause and effect relationship observed will be less so next time it happens, just as any contextual connection will be less so later-on, and therefore these things don't really exist in the universe, at least not with the permanence of character which defines them in the mind. What is remarkable about my discovery is that it delegitimizes all claims about the occurrence of repetition in the universe-external, because those claims are all based on evidence derived from mirror-time. By removing the false-belief that repetition exists in the universe-external, The Pressure of Light redefines normal-time as absolutely heterogeneous (which doesn't really count as an absolute, unless absolute non-absoluteness can be counted as an absolute). Unpredictable, heterogeneous-time will in fact be best understood in principle, thus: my principal of infinite-heterogeneity-in-time states that anything that exists in this universe must experience heterogeneity-in-time, so that it may experience direction-in-time over its worldline, a direction that flows forward towards infinite heterogeneity.

My principle includes a claim about direction, and to fortify this point, I will build on the last great work of young Einstein, which is his 1921 lecture and subsequent essay, Geometry and Experience. In this lecture he solidifies an epistemological philosophy about Geometry that is described best by this line: "...as far as the propositions of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality." Einstein sees the propositions of mathematics, and their axiomatic bases, as developed freely from the human mind. The axiomatic basis of mathematics is most simply understood as the fact that all mathematics are built off the statement 'between two points there is one and only one straight line'. When Einstein states that mathematics applied to reality are not certain, he says so because he himself delegitimized the very possibility of a straight line in the universe-external, by proving there is no such thing as the requisite perfectly-rigid-line in this universe. There is a quick way to summarize why: imagine holding a metal pole that extends 10 lightyears into the universe. Would moving that pole, thus simultaneously moving the other end, not constitute the transmission of information faster than the speed of light? Yes, it would, which is exactly why no matter how rigid of a material you manufacture, that motion

you began at your end will still have to travel like a wave down the pole. Straight lines do not exist in this universe.

Einstein speaks a lot about ideas freely conceived of by the human mind, but it's important to note that he's never actually talking about thinking as an individual event, as I am in the Pressure of Light, but thinking as something that produces knowledge to be discussed later with a community, and perhaps to be combined with other people's thought-developed-knowledge, to form collaborative ideas that nevertheless retain their developed-purely-from-the-human-mind quality. Einstein's epistemological philosophies, which embody so much of David Hume's Treatise on Human Nature, and which could still provide so much guidance to scientific communities, nevertheless have great value to contemplations about how knowledge accumulates in an individual's mind alone, and, because of the parallels, his words I believe say as much as anyone needs to know about knowledge built from their remembered-thinking versus knowledge built from events-external, so I'll print that first part again: "...as far as the propositions of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality."

You see, beliefs held with certainty are not bad, not wrong, just as mirror-time is actually a real thing; it's just that no one internal framework describes the universe-external perfectly for each and every individual. Love really is all you need, relieving suffering really is the perfect mission to dedicate your life too, eat the rich really is the only motto needed to solve all social problems, and yes, there is a God; the perfection of these internal, axiomatic frameworks come from a real place, mirror-time, and are only imperfect when applied to reality, just like mathematics. This is where my epistemological philosophy diverges from Einstein's, because Einstein still believed that any axiomatic framework, no matter how ancient, was still the product of human imagination (as did Hume), even though basic math is as natural to the human mind as language. I believe that a proper understanding of remembered-thinking, of mirror-time, shows these frameworks owe at least some of their structure to a time-state that is real, although non-existent in the universe-external. Where our philosophies re-converge is in the assertion that it is the responsibility of conscious minds to develop axiomatic principles and frameworks that best approximate the external as understood by direct observation. In his 1916 book on Special and General relativity, Einstein put it very well, "The attempt to become conscious of the empirical sources of these fundamental concepts should show to what extent we are actually bound to these concepts. In this way we become aware of our freedom..."

Normal-time is different, and I think it's time conscious minds really understand how. The principle of infinite-heterogeneity-in-time defines forward movement in time, a movement that exists not because the second law of thermodynamics inevitably leads to some end, but because time is actually infinite, infinitely heterogeneous. My principle suggest this is what the second law really implies.

Geometry and Experience leads up to a visualization that helps the audience understand why the universe, which at the time was not known to be expanding, is both bounded and infinite, an oxymoron to any logical mind. Because it's not always easy to understand exactly what Einstein is conveying, at least on a first, second, or even third read, I will offer my own rewrite, designed to be more gentle on the mind, and while I'm doing it, I might as well advocate this new way of thinking about thinking.

## 6. *Geometry and Experience Remembered*

“A specific inertia-generating envelope is not assumed; rather, all inertia-generating matter will consist of stars, as those in the portion of our universe accessible to our telescopes. This is compatible with the facts only when we imagine that the portion of the universe visible to us must be considered extremely small (with regard to mass) against the universe as a whole. This view played an important role for me psychologically, since it gave me the courage to continue to work at the problem when I absolutely could not find a way of obtaining covariant field equations.”

– Letter from Einstein to William de Sitter, 1916, in which Einstein remembers-remembering failing to obtain covariant field equations, then remembers visualizing the universe as it’s seen from telescopes, then remembers seeing the enormity of a universe where what’s seen from telescopes is minutely small, then remembers an awareness of a feeling of courage, which, through subsequent analysis, he remembered as connected with the immensity of the universe.

“In practice I must, and in theory I can make do with this, and I am not at all unhappy when you reject all questions that delve further. On the other hand, you must not scold me for being curious enough still to ask: Can I imagine a universe or the universe in such a way that inertia stems entirely from the masses and not at all from the boundary conditions? As long as I am clearly aware that this whim does not touch the core of the theory, it is innocent; by no means do I expect you to share this curiosity!”

– Same letter from Albert Einstein to William de Sitter, 1916, in which he reveals, shyly, weakly, his in fact firm belief that the universe is both bounded, and infinite.

**I**want you to remember visualizing a glass sphere hovering above a large white table that is otherwise surrounded by the darkness of an empty universe. Don’t try to put the image in your head, that doesn’t make sense anymore, you can only remember it. Now, it’s been the case that the human mind should add a touch perception to three-dimensional visualizations, ever since artists of ancient times discovered that to create the concept of a three-dimensional object in the mind, like a sphere, it works best to show a sphere held in the hands, so that the mind can feel the curves, or balancing on a rim, so that the mind can see the weight of the sphere teetering from one side to the other, than to simply show the sight of a sphere, which the mind can only imagine, without a concept of touch, in a very low quality way. So, you may want to remember touching the glass sphere, or remember having pushed it, so that it wobbled and bounced in its hover a little, revealing its mass.

Next, remember that there was a lamp over the sphere, directly over top. Then, remember that there was a knitted cup-coaster in your hand, and that you placed it on the side

of the glass sphere, and then left it, because just as the sphere magically hovered, the coasters magically stuck. Where was the coaster's shadow? How big was it? Can you remember? The light from the lamp did in fact reach out to infinity, that's what light does, albeit in the faintest of brightness as it extends to the ends of the universe. This coaster, however, placed on the side of the sphere, cast a shadow much closer than infinity, to a spot on the white table just a little ways to the side of the sphere.

Remember bringing that shadow closer to the sphere without having detached the coaster from the surface of the sphere. How did you do it? You moved the coaster down the sphere towards the point that was closest to the table. As you continued to move the coaster closer and closer to the bottom, you saw the shadow get smaller and smaller. Once the coaster reached the point closest to the table, the shadow shrunk to the exact size of the coaster, and sat directly beneath it. Remember continuing the experiment by moving the coaster up to the top of the sphere. As the coaster approached the equator of the sphere, the shadow as a whole moved away from the sphere. After the coaster passed the equator, the closer edge of the shadow moved closer to the sphere, but the outer edge continued its journey towards infinity. Do you remember what happened when the coaster reached the top of the sphere, directly beneath the lamp so that it had blocked all its light? The shadow's outer edge extended to infinity, creating darkness across the entirety of the white-table universe.

Einstein's visualization is describing an infinite universe, because the coaster can move around the sphere for as long as it wants, for an infinite amount of time, even creating infinitely new path-shapes to trace. As it does, the shadow of the coaster also moves around in an infinite universe. The three-dimensional glass-sphere and its perfect re-representation on a two-dimensional table shows how a universe can be perfectly the same under dramatically different conceptual circumstances.

Remember that there was a stack of coasters in your pocket, and that they were six-sided-polygons, so that you could fit them together around the sphere, and so you did. You put one on the bottom point and started stacking them around it in a connected-circle. Eventually you covered the whole sphere, and therefore all of infinity on the two dimensional table. But how was that possible? First, the coaster roamed forever around an infinite universe, exploring the two-dimensional white-table in a way that seemed very similar to space-exploration in this universe, which often sorts its solar-systems and galaxies out in flat planes like the table. When you started stacking coasters, however, the sphere quite quickly filled up in its very non-infinite capacity, and the two-dimensional plane became enveloped in the shadow of a fully-covered sphere. This was, without a doubt, a universe both bounded and infinite.

With this visualization, Einstein was describing exactly what he felt general-relativity said about this universe. The two-dimensional table is like three-dimensional space, the place that human minds see themselves moving around in, while time ticks by in the

background without any direct influence on any object. A universe where the position of things is described as much by time as by space, is the sphere, and this sphere is the sphere on whose surface Einstein believed we lived, bounded, but infinite. I love this visualization, and before I move onto my projection of the visualization, I just want to make Einstein's point a little clearer with a slightly different tweek.

Remember that you also had a pocket full of rectangular-knitted-pieces that you could place around the sphere, stacking up rows like a mason. Remember that you did this, leaving the bottom half of the sphere already filled, and the top half still clear, so that a circular shadow cast out to a significant distance from the sphere. Remember that you gave yourself the challenge of moving the shadow towards infinity on the two dimensional white-table one step, equal to the distance of the last step, at a time. It's possible of course, all you had to do was remove some yarn from each new row of knitted pieces, so that the smaller pieces cast a shadow of equal size to the previous row. How did it all play out? Yes, of course you were able to continue to add layers of rectangles, expanding the shadow-sphere by shadow-rows of equal size, but the actual knitted pieces had to shrink in width with each new layer, until they were so small, and progress so slow, that not only did the knitted pieces never reach the top, they never really got that close. I believe this is wonderful way to understand the limits, and also freedoms, of space travel. It is bounded, in our small capacity to cover pathetically small distances in three-dimensional space during any one particular incremental step. But it's also infinite in this limited-region of the universe, at least if its remembered that time is a dimension that the mind moves around in too. This was Einstein's point about the bounded, but infinite universe, described by general relativity.

Now, I would like you to remember how this sphere could have said just as much about infinite heterogeneity-in-time. If you only had remembered one coaster on the sphere moving on its own, like an asteroid, magically exempt from the decay of entropy, moving with inertia through the emptiness of space, it would be hard to have imagined it moving infinitely in infinitely different types of paths, since any change in its motion, without anything to change it, would violate Newton's First Law, the law of Inertia. With Newton in mind, it seems unlikely two coasters would create much heterogeneity either, since the most intuitive dynamics for two objects in a universe is that they fall into orbit with each other, and in this magically entropy-less universe, that orbit would achieve a perfectly time-reversible state. Now with orbits in mind, you can remember a most famous example of infinite heterogeneity, the problem of three bodies in orbit. Three coasters alone in a universe would not only trace infinitely variable paths all around the sphere, but any other object added to this universe would also have to conform to a life of infinite heterogeneity, because of the inevitable intersection with the complex of orbits.

Now, remember a single cup-coaster again, and remember it travelled a cyclical path that went from the bottom, where it cast its smallest shadow, to the top, where it cast a

shadow to infinity. Remember what its shadow looked like when you moved the coaster around the sphere in a homogenous cycle that indicated no direction in time. The shadow moved like a wave, oscillating between infinite reach and smallest possible size. The coaster did not experience heterogeneity in time, because the coaster did not experience anything in its worldline that would indicate forward motion in time, towards infinite heterogeneity or any other directional concept for time. If you had placed a rectangular-knitted-piece in the path of the cup-coaster, the cup-coaster would have experienced heterogeneity-in-time, because the rectangular-knitted-piece got in its way and caused an erratic chain of events that veered the coaster away from its homogenous experience of time. What if the knitted-rectangle wasn't in the path of the coaster, would it still have created heterogeneity? Yes, because while the knitted-cup-coaster would not have run into the knitted-rectangle, its shadow would've, if not simply when the shadow had increased to infinite coverage as the coaster passed beneath the lamp. This is the same thing as saying that two objects, while not intersecting in three-dimensions, nevertheless intersected in two-dimensions, or, in the dimensions of the real universe, that the two objects didn't connect uniformly in space, but did, at some point, in time.

This continuation of Einstein's Geometry and Experience provides some fortification for the principle of infinite-heterogeneity-in-time, because it shows that the principle has application to the philosophical foundations of quantum mechanics. Rather than predicting where the universe might decide to place an electron at a given time, or what might make a wave decide to collapse into a particle in certain experiments, a confusingly non-deterministic perspective that has prevailed since 1927, the principle of infinite-heterogeneity-in-time says the predictions are instead regarding the conditions for which a particle can appear, rather than existing in a form guaranteed to experience heterogeneity-in-time, such as a wave with infinite reach. For example, a single electron emitted so that it may travel a free path to a point of annihilation has no opportunity to experience heterogeneity-in-time, so it must exist as a wave reaching into the universe's infinitely-heterogeneous dimensions-of-space. However, anything that is set up along that path, that in anyway creates a heterogeneous experience of time, no matter how subtly, would allow the wave to collapse into a particle, since it now has the capacity to experience heterogeneity-in-time as a particle.

This is a wonderful way to imagine quantum mechanics, because it immediately leads to the question about what other kinds of particles might waves collapse into given they have the opportunity to experience our world heterogeneously. It's a wonderful principle, derived from a wonderful argument, built into an amazing essay, if I don't say so myself. Of course, it could all be wrong. My expectation of my audience is that they not only read and digest this material, but respond with support, or a challenge, or a successful falsification of a statement made, or an indication that some other theory is better, or similar, but already disproven. I like to think that The Pressure of Light presents proposals that are risky, that could easily be torn down if they are wrong, because

just imagine if it turns out all attempts fail and I'm right. Just imagine if all the chaos the human mind is capable of, all the infiltration the human mind is vulnerable too, the violence it can feel, the darkness, the loneliness, what if all that stress dissipated, leaving nothing but the feeling, of the pressure of light.

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**THE END**