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The Problem with the Time-Travel Fantasy.

A vague and Ill-defined sense pervades the physics of today that something seems to be amiss in the foundations of the science. One the one hand, cosmology is routinely spoken of as being in crisis due data coming from the Webb Space Telescope. As it peers further and further into the most remote regions of space, and hence further and further back in time, galaxies are being observed far larger and more highly evolved than should be possible. At redshifts around z=14, large spiral galaxies ought not to be being observed according to our current understanding of cosmic evolution, something perhaps linked somehow to the Hubble tension which seems to indicate a problem in our estimates of the spatiotemporal dimensions of our universe and of its rate of expansion.

On the other hand, nearby galaxies and even our own display anomalous rotation curves, the outer reaches of the spirals rotating faster than they should if their stellar mass is all there is to their existence, even taking into account estimates for interstellar gasses and extra-stellar masses such as presumed non-tethered planets. As such, physicists now accept an invisible dark matter, gravitationally potent but otherwise inert, much in the way children with overactive imaginations have an imaginary friend – and even more, the imaginary dark-matter friend has an imaginary friend of their own, called dark energy, which is taken to account for the accelerating rate of cosmic expansion. These speculative postulates of invisible matter and undetectable energy dominating the cosmos seem like an echo of psychoanalytic theories which postulate an unconscious mind, of which our conscious selves are but the apparent tip of a largely submerged iceberg.

Scientific optimists look towards the unification of the macroscopic general theory of relativity and its geometrical explanation of the phenomenon of gravitation with the microscopic theory of quantum mechanics, which is yet to discover a fundamental particle or quantum-field explanation of gravitation. These two forefronts of scientific endeavour, the macroscopic and the microscopic, must fit together somehow, and it seems reasonable to assume that the anomalies on both sides are the result of our having been thus far unable to comprehend how these two divergent perspectives are able to cohere into one theoretical perspective such that science can lay claim, Webb supertelescope in one hand and CERN ultramicroscope in the other, to have finally seen the whole, and reconciled the divorce between Einstein and Heisenberg under which we have all grown up.

If the broken family of modern physics is far from happy, there have been no shortage of counsellors and therapists ready to coach young thinkers in the foundations of physics. Herr Doktor Unziker has taught us that we ought to liberate ourselves from the dogma that the speed of light cannot exceed c, for the policeman enforcing this cosmic speed limit is a figment of our imagination, and in reality the speed of light is as variable as everything else in this world of Heraclitian. And Frau Doktor Hossenfelder has warned us not to get lost in

mathematics and mistake it for the real world like workers obsessed with their tools, rather than getting on with the job at hand which it must always be remembered is the comprehension of the real world, for which fables ought not to be substituted.

If Newton was a visionary standing on the immortal shoulders of Galileo and Copernicus, and Einstein a genius perched atop Newton's via Minkowski and Reimann, then I know very well that I myself am but a flea who has somehow found itself hopping about in Albert's famous shock of hair. It has been this flea's fate to bite at Einstein's mighty scalp at just one tiny point, or more accurately the foot resting on Herman Minkowski. And not to put too fine a point on it, the point of my bite is time. Since my physics degree turned into a degree in the history and philosophy of science, and then led into another two degrees in nothing but sheer philosophy, I got lost not in "math," but in phenomenology.

Heidegger's name is more or less mud since his posthumous stunt to troll an appalled world with his own little black book unfolded in 2014. If one thing can be salvaged from the wreckage of Heidegger's broken hegemony, it is his reversal of Minkowski's merger of space and time into the portmanteau "spacetime." This is presented not in any of his books published in his lifetime, but in a work written in 1936-38 but not published until 1989, the *Beiträge zur Philosophie* (translated into English as *Contributions to Philosophy* in 1999). Like Minkowski, who hardly appreciated the philosophical significance of his geometricization of time and annexation of it as a fourth space-like dimension, which for him as for Einstein was a purely mathematical innovation and nothing but a new and powerful way to use the tools of mathematics to unlock a general theory of relativity, Heidegger conversely hardly appreciated the scientific corollaries of his attempt to rethink the relationship of space and time with his reversed neologism, "timespace."

Miners have to dig a mountain of rubble to find a handful of gold. It's a pain, but there simply is no other way to end up with that tiny nugget. Having to read Heidegger was for me a world of pain. But there was a nugget in there, and there was only one way to mine it.

In a devilish twist on Sartre's play *No Exit*, I like to imagine Heidegger, Minkowski and Sartre in their own private post-mortem prison, condemned for all eternity to the hell of trying to explain to each other the difference between spacetime and timespace, all the while Jean-Paul jumping up and down, saying "See, hell really is other people," but in French, which neither Martin nor Hermann understand. This fantasy of revenge upon these three thinkers which between them have wasted decades of my precious time is one of my last temptations, and as I try to rise above such ressentiment and see what clarity emerges from the morass of the thousands upon thousands of pages of their works, one insight alone rings out like a bell.

The one insight is this: a fundamental confusion in our concept of time is all-pervasive, and for that very reason difficult for us to perceive. But the confusion is simple, and obvious enough once pointed out.

The confusion is that time goes forward, and thus at least possibly backwards. In other words, the confused assumption is that time is a dimension. A dimension is a possibility of measure with two directions (i.e. literally, a di-mension). In our experience, to state the obvious, space has three dimensions: up-down, back-forward, left-right, as specified by Cartesian co-ordinates x, y & z. The assumption introduced by Minkowski and adopted by Einstein is that time too should be treated as a fourth space-like dimension, because we have a concept of "forwards-backwards" with respect to time. But this assumption is based upon an illusion rooted in a deep conceptual confusion.

The image of time going backwards is usually represented as a movie being played in reverse. This experience is actually still an experience of time going forward, but seeing things happen in the reverse order to the usual one. Something which is contained, say, by a screen, or by a certain region of space (i.e something not including me, the viewer) is going backwards, and I experience that thing moving backwards as I continue to go forwards in experience. ***At first*** I saw it one way, *then next* I saw it move, (but in the opposite way you would expect, eg cup pieces jump together out of fragments on the floor), ***then next*** I see the opposite again, (pieces assemble on the table), ***then next*** I think, wow, I just saw something happen in reverse to the usual order which I expected." But the experience itself is always a sequence moving forwards, whether in that experience I am experiencing things happening in the usual order, or whether instead I am having the weird experience of events occurring in the reverse order. In either case the situation as whole still goes forward in time.

In short, we do not actually have any experience of "time going backwards," nor do we even actually have a concept of what such an experience would be. *Time itself* has no backwards, and we don't actually have a concept of "going backwards in time" at all. We only imagine we do, because we are trapped in a confused way of thinking about reality. In his book *Being and Time* Heidegger makes this point by saying that time is really only the phenomenon of projection, and that what we call the past, the present, and the future are actually three different modifications of this one more basic phenomenon of projection. Because of the metaphysical confusion in which we are trapped, we think that only the future is a projection, and that the past is something else called a retrojection, and that the present is something else again called presence. But retrojection and presence, he maintains, are both actually also kinds of projection.

But surely, we have the fiction of the time traveller to show us that "going backwards in time" is at least a coherent concept, even if we have not yet invented the technology to make it an actual possibility? The fact that we can at least imagine this happening demonstrates its possibility, right?

Wrong. We only pretend to imagine it, whereas in fact, we can do no such thing. There is actually only a kind of time travel fantasy, which is not really a coherent fiction at all.

Think about the so-called time travel fiction. ***First***, the time traveller gets into the time machine in the present; ***then next*** the time traveller arrives in the past, another place in which time is going forward like the present, in short, another present. ***Then next*** the time traveller gets back into the time machine and returns to our present, and tells us about the

dinosaurs he saw etc. The fiction coheres only because the traveller is always actually going forward in time, and experiencing other presents, all of which actually also go forward in time.

During the actual time-travelling part of the fiction, when the machine is doing the transporting of the traveller from the present present to a past present or to a future present, the traveller is still actually represented in his own present inside the travelling machine, inside of which time is still going forward. If the time machine has window and the traveller looks outside, he sees nothing but a blur, or some squiggly lines. In fact nowhere at all in the fiction can we point to any representation of the experience of "going backward in time."

This is because there simply is no such experience, imagined or actual. "Experience" just *means* going forward in time in the way we call "presence," which Heidegger says is a relatively confused way of saying that wherever we go, there is the projection we call experience. For we don't actually have an opposite concept to experience, like say "unexperience," for the very good reason that there simply is no such thing. Even to forget is still to go forward in forgetting. As a concept, experience is an ultimate without opposite, as Reiner Schurmann was fond of saying.

Why then do we think we have the concept of going backwards in time? Where did this pseudo-concept come from?

It is only since movies were invented around 1890, and it was discovered that the film could also be run backwards through the projector, that the time travel fantasy first arose with H.G. Wells' *The Time Machine* of 1895, a fantasy immediately confused with a fiction. Then in 1908, Minkowski imported this confusion into physics, and soon after it was adopted by Einstein. What is conflated by Minkowski is that event symmetry is not time symmetry, two different things which he failed to distinguish. Events can run forwards or backwards in time, but time itself goes only forward, and backwards events are still running forward in time, just in reverse order. This crucial confusion of time itself with events in time is at the root of Mikowski's mistake of taking time as a dimension, a mistake then built into the foundations of physics by Einstein..

The transcendence of the shackles of time effected by the experience of cinema was nothing but a phantasy, but a phantasy so powerful that it has confused us into thinking we understand that time is a dimension. The mathematical convenience of assigning to time a simple scalar value in the form of a real number "t" is so seductive that we didn't notice that in doing so, we actually take leave of all experience. It is fine to take leave of all experience in mathematics, and mathematicians do that often. This is what makes mathematics different from physics.

But physics can never take leave of experience and should never forget that it is a description of experience of physical reality, lest it get "lost in math." Physics and mathematics obviously overlap, but mathematics is able to leave physics behind at a certain point; precisely the point at which description of the experience of reality ends, and exploration of sheer conceptual possibility begins, unencumbered by a need to correspond

to an experience of a physical reality. The fact that today all physicists are also mathematicians has led to us forgetting the difference between them. And it has been entirely forgotten that “t” is an exploration of mathematical possibility, not a description of physical reality.

If we stick to the description of physical reality, what we must admit that time always goes forwards, or rather that the very concept of time is the concept of going forwards.

But even the word “forwards” harbours an unwarranted assumption not actually qualifying as a description. For “forwards” always remains conceptually one half of a pair “forwards/backwards”, and if there is only *one* way without opposite, then it is neither forwards nor backwards but simply “wards” itself, so to speak, i.e. the very concept of movement itself, or as Heidegger put it, projection.

So even the description of time as moving forward is strictly speaking going too far with our assumptions, at the expense of actual description. It assumes some kind of framework around time, through which time could be said to move. But there is no such framework around time other than another assumed background time, thereby begging the question. The correct description of physical reality is that time itself *is* the framework around reality, namely, the quality of reality that it is on the whole dynamic, and regularly (i.e. measurably) so. Reality can also be relatively static at times and in places, but these regions of stasis are always situated in relation to a larger becoming-in-general.

Becoming-in-general is sometimes regular and sometimes abrupt, sometimes continuous and sometimes discontinuous, sometimes laminar and sometimes chaotic. The most general description would seem to be that everything is always a mixture of the two. On the whole, regularity and discontinuity are balanced into a predictable stability between continuity and discontinuity, which is in fact the general description of the experience of the physical reality of time. Things are in general changing, and the next moment things will be different to the last, but that difference will also be situated in the context of something that hasn’t changed. I can tell that one second has passed on the clock not only because the location of the second hand has changed, but also only because the clock face itself hasn’t changed. It is never that nothing changes, and it is also never that everything changes, but always that we tell the difference between what has changed and what hasn’t changed. The most general description of a clock is a regularity in telling such a difference.

If the description of time as a dimension along which entities can go back and forth is not accurate, how then are we to describe time more accurately? The temporal aspect of the events we experience are more accurately described according to the concept of symmetry, rather than the concept of direction, which is a misleading category under which to try to describe our experience of temporality. It’s not that time can go backwards and forwards. Its that events are distinguished by time-symmetry or the lack thereof. A pendulum swinging is a time-symmetrical event: running a film of this event backwards or forwards looks the same. A cup falling off the bench and breaking is highly time-asymmetric and a film of it looks completely different going backwards or forwards.

Being able to distinguish time-symmetrical events from time-asymmetrical events is closer to the empirical root of a truly descriptive concept of time than the misleading metaphor of a spatial dimension, which confuses the distinction between part and whole, a distinction no less metaphysically basic than the distinction between symmetry and asymmetry. If time is an aspect of the whole and not of the part, then time cannot be said to move forwards or backwards, nor to move at all. The whole cannot move forwards for there is nowhere for it to move to, because it is already there. Nor can it move backwards, because wherever it goes, it was already there (the few people who understand Parmenides will hear something familiar here). The very concept of movement is a concept of changing relations between parts of the whole. But this category cannot be applied to the whole itself. It simply doesn't make sense.

What does make sense is to say that the whole exhibits two contrasting temporal aspects: symmetry and asymmetry, and events are a mixture of these aspects, some highly time-symmetric, some highly asymmetric, experience always being various mixtures of the two. If time is at root the fact that things change, we can say that they can change in continuity (regularly), or in discontinuity (chaotically); i.e they can bend (linearly) or they can break (fracture). The clock is a nice example of a balanced mix of the two in a regular harmony. An accident by contrast is too much break and not enough bend, so to speak, while on the other hand, a long boring wait is too much bend without enough break.

In thinking that we have a concept of going backwards in time, or that time travel is a conceptual possibility, we are in both cases smuggling in a concept we are not thinking about, but it the concept which is actually doing the heavy lifting. This is the concept of transcendence. The viewer of the thing going backwards transcends that thing (the screen, say, or that region of space *over there*), and his experience goes forward in seeing it as *a thing going backwards*. And the time traveller can only go from this present to a past present or to a future present because they think of themselves as transcending all those presents and can drop into or jump out of one or the other of them. Transcendence is here assumed in the background of our minds among the things we do not realize we are doing, rather than being thought of in the foreground of them, where we realize what we are doing.

Nowhere is the unthought presumption of transcendence more obviously on display than in the big bang diagram. An absolute time scale is held up next to the sideways cone of the expanding universe as an invisible ruler for time, an implicit "God's sensorium" showing the ghost of the Newtonian thinking which still actually pervades our way of representing reality. No matter how objective we try to make our picture of reality, the concept of subjectivity remains ineradicable, although here reduced to its formal conditions of possibility. In the blank black background of nothing which implicitly frames the universe in the foreground, as in the zero point at which the three spatial axes of Cartesian co-ordinates intersect, the observer hovers in the self-contradictory position "outside the whole," while yet trying to think itself inside it as well.

This unacknowledged presumption of transcendence in macro-physics resurfaces in micro-physics as the measurement problem, thus permeating both cosmology and quantum

mechanics. On the one hand we have smuggled transcendence unacknowledged into our way of thinking about time, while on the other, we have not realized its connection to the misleading metaphor of movement for understanding what time is.

In order to get our minds around this impasse, it is worth noting that this language I am currently using to write with, and which you are currently using to read with, bears within its very grammar the fossil of one of that language's previous upheavals in its understanding of temporality. In the Old English of pre-Roman Britian, there were only two tenses, past and present. Exposure to Latin and Greek put pressure on Old English to express the future tense in order to translate these languages and to understand the Roman and the Greek ways of thinking. And so the somewhat *ad hoc* solution was come up with of inserting the auxiliary verb "will" before any verb in order to make the sentence into the future tense. It is worth pausing for a moment to entertain the thought experiment of inhabiting a culture whose language has no future tense, and imagining what shape your experience would thereby take. This thought leads us inevitably to another: could we imagine the need for another upheaval in our concept of temporality?

Is our three-tensed past/present/future grammar adequate to a description of reality? Or are we yet to actually understand the realization Einstein came to in 1905: "We have to take into account that all our judgements in which time plays a part are always judgements of *simultaneous events*" (A. Einstein "On the electrodynamics of moving bodies" 1905)? The big bang diagram purports to show us the perspective (frame of reference) from which everything is simultaneous. But isn't this exactly the perspective which general relativity denies is possible? What would it mean to realize that there is no frame of reference from which all events in the universe are simultaneous? Ernst Mach's theory of gravity and his interpretation of the phenomenon of inertial mass, and David Bohm's concept of an implicate order, are two attempts to 'think the whole' in this way as the foundation of physics. Are these attempts compatible with one other? Do we need a new language, or at least a new grammar to answer this question? Is Heidegger's timespace the key to unlocking this apparently closed door? If Einstein was misled by Minkowski, can we rethink which way he ought to have gone instead? And does Kant have at least part of the answer, as Einstein seemed to think in his work with Kurt Goedel in his final few years at Princeton?

All I can say at this point is: stay tuned.