Reality and the Depth of Time

Terry Bollinger
2024-02-17.15:20 EST Sat

A Series of Comments on the Variable Minds (YouTube) post:
Roger Penrose's Mind-Bending Theory of Reality (Oct 23, 2023)
https://youtu.be/itLIM38k2r0

2024-02-16.11:50 EST Fri
https://youtu.be/itLIM38k2r0&lc=UgxV0rVVunhhapEFsCB4AaABAg

19:29 RP *"… reality is somehow transmitted backward in time. But it's… quantum reality [since] classical reality doesn't have that form."* A better term might be *retroreality* since, as Sir Penrose carefully notes, information, and thus conventional causality, do not exist in this "deep physics" basis. Is this basis related to consciousness? Probably.

I was an early (late 2005) and possibly the original proposer of precisely this version of no-causality retroactive reality updates [1][2]. I would now describe the dynamics differently, however. Instead of going back in time — a meaningless statement in both classical and deep physics — I would instead say that it is possible, with care, to isolate a system from the locally dominant definition of xyzt sufficiently to make full answers to questions such as "what path did it take through space" impossible.

For example, a complex molecule that undergoes a double-slit interference keeps a private internal history and thus never undergoes superposed "dead-and-alive" states. That's just silly. However, it can separate its single-molecule definition of space and time from the experimenter's broader definition just long enough to make an after-the-fact single-path reinterpretation of its deep physics location transformation impossible.

The idea that space and time are constructs rather than fundamentals deeply unsettles most folks. Nonetheless, it is the simplest way to eliminate many seeming paradoxes in relativity and quantum mechanics. Unfortunately, even supposedly mysterious quantum mechanics is no more than a superficial and conspicuously classical-first (wave-and-particle) way of interpreting this deeper reality.

Deep physics is hard to grasp because our classically wired brains tell us that space and time are fundamental despite both relativity and quantum mechanics trying hard to tell us they are not. The xyzt data interpretation is a superb fast-calculation approximation for predicting the future, a bit, in Goldilocks environments composed of just-right sizes, speeds, energies, and times. Light speed limits prevent these concepts from becoming as exact in natural physics as they are assumed to be exact in mathematics.

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[1] T. Bollinger, *On the Impossibility of Keeping Out Eavesdroppers Using Only Classical Physics,* Apabistia References **2006**, 01230000 (2006).
https://sarxiv.org/ref.2006-01-23.0000.pdf

[2] B. Bulyubash, *Encrypted by noise,* Around the World: Journal of the Russian Geographical Society, [Oct 1] (2008). https://sarxiv.org/ref.2008-10-01.0000.pdf

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2024-02-17.07:49 EST Sat
https://youtu.be/itLIM38k2r0&lc=UgxhSIfBgRUQ_q8ii6B4AaABAg

Andréa Morris, I must compliment you on your incredible care and effort in creating this video. Much of your work is subtle since the goal of a good editor is to make the flow of thoughts as seamless as possible, but that goal requires much work. Your efforts have captured Sir Penrose's always-deep insights beautifully. Well done!

2024-02-17.12:05 EST Sat
https://youtu.be/itLIM38k2r0&lc=UgxD2hvLvzIoQSXCfqJ4AaABAg

40:43 The Hemmingway Paradox: Fascinating... I've never heard this one before... which probably has something to do with the fact that Sir Penrose came up with it only a few months ago :) [37:19]. Also, [35:36] "Whether it makes sense to locate [quantum reality] in spacetime is not quite so clear." Roger Penrose, the answer to that one is easy: no. This idea of "spacetime" as "real" in *any* context beyond what an individual observer has set up is hampering your theory. The concept of individualized spacetime is nothing more than good old special relativity but interpreted with the same fanatical strictness that Einstein used in his 1911 Prague lecture: You only get to assign time meaningfully to the set of clocks that the *individual observer adjusts and controls.*

There's no "superposition," no "collapse," because it's all the other way around: You are *creating* a flow of time locally by building up a set of rigid orthogonalities that enforce such definitions and simultaneously create persistent information. These are all part of the same process and are always, to some degree, local: Create xyzt, create information, create history. GR is so powerful because it's part of the deeper physics that links these dribs and drabs of personal spacetimes together to form an overall flow of persistent information: A cosmic history, but not one easily described using local definitions of space and time.

So again, no "superposition," just potential. No "collapse," just your idea of "quantum retroreality" (I'm starting to like that phrase). These limiting concepts stem from placing too much faith in spacetime as a first-order concept.

The other severe limiter on your excellent approach is thinking that *only* gravity enables this emergence of local space and time. You need to broaden your scope by asking this question of yourself: What, exactly, is the central core of what gravity is, as defined by Einstein's Equivalence Principle? You already know the answer: Acceleration. But acceleration is far more prevalent than just at planetary surfaces! At the particle level, for example, *every* spin is, after all, an acceleration. Spin is self-observation via acceleration, and it's impossible to see that if your *only* focus is on the gravity form of acceleration.

One definition I've used of gravity is that it is the observation force — the most concentrated and, in some ways, purest form of classicality-creating acceleration. But once you start thinking about the acceleration *core* of gravity, you can generalize your ideas sufficiently to understand better how these concepts come together.

Speaking of new ideas, here's my latest and related exploration idea from a few days ago: Why is the linear acceleration side of Einstein's equivalence principle asymptotically impossible, and what does that say about gravity? I mean this: While gravity *never* gives up net energy to the system under acceleration, linear acceleration *always* gives up a bit of energy, no matter how smoothly one accelerates. You can asymptotically approach gravity-like absolute energy conservation under acceleration but never *get* to gravity's level of perfection.

I don't know what this asymmetry means, but it's closely related to the quantum-gravity connection conundrum. Those slight vibrations that transfer energy in linear acceleration approximations of gravity are a form of quantum observation of the systems, tweaking them in ways that give away the outside influences and connect them into a single classical reality. In sharp contrast, gravity is utterly immune to such linkages: It gives up no secrets and creates no new mergers of quantum realities.

Gravity likely behaves this way because it exists only as part of your deeper quantum reality. That is, gravity is, in some sense, "pre-quantum" and not subject to our usual definitions of how the classical world interacts via quantum rules with the deeper physics of what you call quantum reality.

(Incidentally, I'm unsure about the phrase "quantum reality." The problem is that quantum mechanics is just as emergent as classical reality: The two co-emerge, along with relativity, as the creation of information creates odd portals for viewing physical outside of your own little xyzt interpretation and creation bubble. I'd almost rather say "pre-quantum reality" since that phrase more accurately describes where your consciousness-related physics resides.)

2024-02-17.10:30 EST Sat
https://youtu.be/itLIM38k2r0&lc=Ugz9i3-qJPwk3NLGR894AaABAg

52:11 RP: *"[ChatGPT] doesn't understand a word it's saying."* Spot on! Neural-net-based large learning (or language) models are beautiful mimicry, but at the heart of how they work, they are nothing but mindless mimicry combined with extremely fast grabbing of true, human-generated intelligent results from around the globe. (Please note that I'm speaking as someone who, in my day job, supported funding of Yann LeCun back when he was a lab geek whom other researchers would complain to me about his "obsolete 1950s ideas." This turf is deeply familiar to me.)

Here's the critical difference that you, Roger Penrose, might like because it's a profoundly physics-based differentiator: True, conscious intelligence as exhibited by biological entities is mind-bogglingly energy efficient, and so seems to be accessing mechanisms — your (pre) quantum reality, most likely — that are not available to purely time-and-sequencebased information processing, that is, to classical computing. One of the top university leads in one of my favorite university research collaborations on building real AI — not everyone buys this ChatGPT nonsense, which is mostly marketing that leverages how incomplete the Turing definition of intelligence is — is fond of pointing out that if current neural-net AI trends continue, neural net AI will consume the entire energy output of the world 2040 or so to *persuade* you that it's "real" intelligence.

This lack of understanding has practical consequences. No one can build robots that deal well with truly novel situations because neural-net-based learning "intelligence" becomes incredibly fragile incredibly quickly when bumped even slightly out of their training sweet spots. We even had desert-trained robots that would freeze after placing them in the *wrong* desert! The differences were invisible to most humans but not to the training-dependent neural nets.

Massive energy efficiency is scientifically testable, so this is not some wild invocation of non-physical processes. The difference is that we have *absolutely no clue* how brains do this. Sitting with some of the top neural researchers in the world just a few months ago, I was amused but not surprised when the conversation shifted to just how incomplete our understanding of simple memory mechanisms is. We have many theories in textbooks which provide an aura of respectability. But we also have the tech now that allows real-time probing of individual neurons and sending images to *individual* color receptors in real-time. And guess what? The results continue to be baffling in ways that are very hard to model computationally.

So, Roger Penrose, even if we still have no clue how to "see" these processing mechanisms, with simple colors being a good example (is my red your green, e.g.), saying they don't exist is nonsense. They do, and we don't know what they are.

A (pre) quantum reality (PQR?), time-indifferent level of processing makes sense in that context. Just as gravity provides a strangely energy-free form of indefinite acceleration, perhaps this PQR level of physics can explain the insane energy efficiency of human sentience.

2024-02-17.12:51 EST Sat
https://youtu.be/itLIM38k2r0&lc=UgyorPNBbh2hKPOv9ph4AaABAg

52:34 RP *"If they are computable systems, things you can put on a computer, they are not conscious."* Yes. Sagan's "carbon chauvinism" concept misses Sir Penrose's point: It's not a matter of what material makes up the entity but whether its design is sufficiently subtle to reach back into what we (from a local-only xyzt perspective) would call the past.

Bit computing is ultra-Hamiltonian, energy-maxed, time-narrowed computing. This computing enforces a strict and exceptionally narrow window of the physics of "now," so much so that it actively weeds out any other result by using various carefully engineered and very much intentional fault reduction techniques; parity checking is one of the oldest and simplest. We like our time (causality) region to be very *flat* in computing!

Such exceptionally thin "this is now" time windows are always somewhat artificial constructs. Still, the same physics that gave sufficient rigidity and continuity (information persistence) to allow life to exist in our universe also gives thin time a huge jump-start in just that direction, especially on Goldilocks planetary surfaces where almost every physics scale and dynamic lies on the smoothest, flattest part of its curve.

There is something about the structure of the cerebral cortex, in particular, that manages to back off from this rigidity a bit. One phrase and hypothesis I've used for many years is "classically emulated quantum superposition" — that is, the idea that the extreme parallelization of neural connectivity in the cortex manages somehow to emulate (and, I might these days say, access) "unset past" superposition capabilities of the quantum world. Again, I would now rephrase that more in terms of creating a lagging history function — a bit of the past not yet set in information stone — rather than superpositions, but that's more a terminology issue.

One reason I like the idea of classical emulation of superpositions is the curious way neurons decide how to move an appendage, say, an arm. It is *not* a matter of calculating one result. Instead, hundreds if not thousands of neurons develop their strategies, many of which differ wildly from what emerges at arm activation. Since this process even includes a complex-like inhibitory-excitatory timing phase, the overall process bears a striking and unexpected similarity to Feynman path integrals, only with quite real cells in fully classical states representing the path options.

Something is intriguing about the idea that classical architectures can still access PQR depths. It suggests that the excessive focus on purely quantum-in-classical-context computing, where you go to classical extremes to induce a bit of "pure" quantum access, could be an overly narrow way of looking at the problem of deep physics access. Keeping a maximum number of options alive, with quantum-inspired phase-math reconciliation of the collective set, may instead be the most critical feature for keeping the past open long enough to contribute to extreme-energy-efficiency decision-making processes.

2024-02-17.14:08 EST Sat
https://youtu.be/itLIM38k2r0&lc=UgylDHFnAEi0prK27994AaABAg

57:01 AM *"So when you say you believe in the rules, a mathematical rule would be 4+3 is the same as 3+4, you flip them, it's obviously true. It's not a belief that it's true."* Andréa Morris, please forgive me, but a foolish question: 3 of what? 4 of what? Residing in what kind of space? Flipped in what fashion, by what procedure? If you look at, say, Einstein's 1911 Prague lecture [3], you'll find that the very heart of Einstein's best work was examining and then discarding the same ideas we most vehemently accept as "obvious" because they are obvious *within the world in which we exist and survive every day.*

An example: 3 apples. But what is an apple? When does it stop being an apple and start being a pear? If it's damaged, is it less than 1 apple? How long must the apple persist to be an apple? A nanosecond? A year? Something in between? Who grouped the apples into 3 and 4? Who owns that definition — you or the apples? When you flipped them, did you move them or regroup them in your mind? If you moved them, what kind of space did they exist when you grouped them, and how many rearrangement options were available?

More than once, I've told a philosopher friend, Ron Green, that cognitive science — the science of artificial intelligence and robotics — is the experimental side of philosophy. The statements that philosophers ponder, emphatically including ethics, are those that cognitive scientists must convert into testable code.

The general rule is this: The moment your brain tells you, "That is obvious!" is the moment you should begin enquiring why, exactly, your brain is shouting that at you. In most cases, it's because your brain is trying hard to keep you alive in split-second decision situations where lengthy pondering of an issue would end up with you dead.

Space and time are in these categories more than most "obvious" reality features. You would not believe the trouble your neural architecture goes to, especially with its bizarre and non-intuitive grid cell structures, to convince you that "space" is the best way to interpret the nicely Goldilocks environments where all living things we know of reside. It's a fantastic fast-response computational shortcut for slow neurons *when it works.* But we all know it doesn't work well when the distance becomes large enough that the usually reliable "it's instantaneous" approximation no longer works. Even in human scales, the sound lags behind light, sometimes causing problems in rapid sensory integration and becoming recognizable.

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[3] A. Einstein, *The Theory of Relativity* [English translation], Naturforschende Gesellschaft, Zürich, Vierteljahresschrift **56**, 1-14 [Jan. 16] (1911). https://sarxiv.org/ref.1911-01-16.engl.pdf

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2024-02-17.14:28 EST Sat
https://youtu.be/itLIM38k2r0&lc=UgzFLqrAwBSMpKtE62Z4AaABAg

1:00:01 RP *"The common mathematician's view is that mathematics is a bit like archeology."* An alternative view: Mathematics is like a Mandelbrot set deep dive. You never know what lovely pattern or repetition of an earlier pattern may eventually emerge. The Platonic question is to ask if the pattern was always there.

To me, this is *entirely the wrong question.*

The right question is this: What is the *cost* of getting to that pattern?

Under this simple question, the original Platonic question takes on a new flavor. In the structure of our universe, we have this delightful property that, for certain issues, such as spatial separation, the *early* cost of getting to, say, that perfect and ideal cube shape or perfect point is almost vanishingly small, allowing *nearly* perfect approximation to emerge easily.

This marvel of the classical approximation and why it is so persuasive! History, information, and life become problematic without these delightfully good and cheap "almost" approximations. The classical approximation is the core of our existence and is why Newton was not wrong to admire it so profoundly.

But all of this comes with a high *cognitive* impact. The illusion is so persuasive and cheap that we forget *it's all a construction* — a confluence of relationships that don't always or necessarily produce historical persistence and information.

Yet the cost is always there, and no truly complete mathematics theory can exist without recognizing this cost. Euclid's definition of a "point" is perhaps the best example since, unlike Euclid, we now know experimentally that the construction of any such point, while incredibly cheap down to the atomic level, then *explodes* into an energy cost that expands to infinity and nominally cannot be satisfied by the mass and energy of the entire universe.

2024-02-17.14:29 EST Sat
https://youtu.be/itLIM38k2r0&lc=Ugw1IL6zSWl5aDSS0cx4AaABAg

Sidenote: Akbar Sayeed, thank you so much for pointing out this interview to me!

2024-02-17.14:56 EST Sat
https://youtu.be/itLIM38k2r0&lc=Ugx2_8dRuM9IyqKOiIh4AaABAg

1:02:54 RP *"The many-worlds interpretation [is] nonsense."* Roger Penrose, thank you — that kind of simple bluntness makes my day! Two items about MWI:

(1) If one switches to xyzt as an interpretation of underlying deep metrics, e.g., using the LxLyLz (Lorentz area) metrics I mentioned earlier, or better, the SR-compliant LAUs, "lidar awareness unit" — the entire superposition issue disappears. You get nothing but well-defined potentials that expand in certain directions under local xyzt expansion. Even QFT and QED become generative, finite-energy-limited applications of some local xyzt observer imposition on local matter and energy, and the entire aether-ridden concept of an infinite vacuum density disappears. (It was never there in the first place; QFT is *always* single-observer. Thinking it's not is just sloppy.)

(2) Multiverse Hilbert spaces have infinite time and energy costs! Everett's indifference to cost is why getting the cost issue in Platonic perfectionism is incredibly important. If you think of orthogonality as a consequence of Fourier transforms of finite-length wave trains, Everett's oh-so-casual assumption of the *existence* of Hilbert formalisms as proof that such universe states exist due to simple events become one of the dumbest math errors in the history of physics. Sure, and even could invoke two states — large-molecular double-slit interference proves that quite well. But Everett completely missed that such states *expand no faster than the speed of light.* Every one of his multiverse splits, even if they stayed quantum (which they don't for more than a few seconds since the universe is full of accelerations, and accelerations *always* redefine pre-quantum reality down a new, more classical path), requires *more time than the entire history of the universe* to form. It's one of the poorest understandings of physics — and overreliance on formalisms for formalism's sake — in the history of physics.

2024-02-17.15:20 EST Sat
https://youtu.be/itLIM38k2r0&lc=UgyorPNBbh2hKPOv9ph4AaABAg

1:12:08 AM “A collapsing quantum computer then is a misnomer because it’s no longer a computational device.” Andréa Morris and Roger Penrose, I would suggest that “collapsing” does not capture the idea well enough. To most folks, it sounds more like the computer is collapsing badly and so doesn’t accomplish anything.

This idea goes a lot deeper. It’s resetting classical reality to some indeterminate depth in causal (information-exchange, GR) time, with the depth depending on what options are still open. Tossing in a final firework just for fun, I would argue that this depth of time is ultimately behind why an electron on the other side of the universe looks *exactly* like one in a telescope. The observation (an acceleration; no need to get Wheeler-level exotic) that induced that reality reset and ensured a critical bit of commonality in classical reality went *so* far back in time that it established the entire Standard Model of particle physics, creating a single shared image of “electron” that works identically across the universe.

So, it’s more of a multiscale reality reset. (Could “muse” come out of that phase? Muses as computation. That is... a-muse-ing? Must go now.)