Dialectical Prologue:

One can argue that a universe governed by laws that do not allow consciousness is no universe at all. I would even say that all the mathematical descriptions of a universe that have been given so far must fail this criterion. It is only the phenomenon of consciousness that can conjure a putative 'theoretical' universe into actual existence! ...Yet beneath all this technicality is the feeling that it is indeed 'obvious' that the conscious mind cannot work like a computer, even though much of what is actually involved in mental activity might do so. This is the kind of obviousness that a child can see--though that child may, in later life, become browbeaten into believing that the obvious problems are 'non-problems', to be argued into non-existence ... .

— Roger Penrose [1], *The Emperor's New Mind* (1988), pp. 447-448.

Science: on the wrong track

A powerful faction in science and philosophy has been doing it wrong for centuries now (in the specific manner we are addressing here.) The basic point can be stated rather shockingly as "trying to make sense out of reality." Is that a bad thing? No, not simply as such. It made sense to *start out* trying to understand reality in terms of representable, reductionistic, deterministic methods and models. That classic scientific approach brought us much insight and predictive modeling power, and is still mostly useful in a manner meta-analogous to classical physics. Unfortunately, this project just isn't working out. Not because thinkers aren't trying hard enough—indeed, they are trying "too hard" as we'll see—but because Mother Nature is not fully cooperating with the effort.

The failing perspective of traditional science is essentially "Western" in character, essentially thinking of reality as like points in motion on a sort of graph. (How convenient for mathematical modeling of course.) Philosopher and panpsychist Philip Goff [2] calls this attitude "Galileo's Error." Current science being unable to fully grasp the nature of reality suggests the need for more insight (not "instead of"!) from an approach that could be called non-Western, "traditional," and even feminine. The latter more often emphasizes wholeness, relationships, relativity in the broader sense, plurality, and the validity of subjectivity. Of course, this inadequacy of science can only be partial, because there is so much that science as-is has and can accomplish.

Here, we examine this failure as it expressed in two realms of fundamental thought: the nature of consciousness and subjectivity, and the quantum measurement problem. The conclusion is that we must let go of trying to force Mind and Nature into these

procrustean beds. Science must give up realism, reductionism and determinism to be about seeking truth. Letting go is no more "giving up" than to stop looking for a fraction that will square to make the number two. It *is* giving up on candor, to not acknowledge our world's transcendent edge. The following arguments are elaborated and synthesized from across various previous work and in discussions, published and unpublished.

Regarding the Hard Problem of consciousness, here we focus on the question of awareness of sheer existential status, rather than the usual (albeit apt) issues of the nature and place of qualia—our "raw feels." It will be shown that no formal system, no AI type of computational "mind," can know that it exists as a concrete being! If our minds are like computer programs even in the broadest sense, then we cannot know whether abstractive monism, such as Max Tegmark's Mathematical Universe Hypothesis [3], is true or false. We couldn't even understand the difference between MUH and there being a "concretely real material world," despite our experiences, beliefs, and protestations to the contrary.

Regarding the measurement problem, no solution is offered. Instead, we find that attempts to resolve this issue using continued Schrödinger evolution (the "many-worlds" view) are arguable failures. It has long been realized that straightforward consideration of the branching possible "worlds" (alternative quantum outcomes) leads to incorrect predictions of the relevant probabilities, compared to application of the verified Born Rule. Attempts to literally paper-over the contradictions have led to a morass of feuding apologists and approaches, and no clear or convincing resolution. Furthermore, the continued indulgence in the pretense of their viability is harmful to science, and even the quality of debate itself. Nor do alternatives stand out as viable.

A computer program can't know it really exists

Addressing the issue of conscious awareness first, sets up a rationale for why the material world as a whole should be something beyond what formal representation *of any kind* can tell us. Challenging the dominant AI premise of "computational mind" will expose a general challenge to mathematical reductionism as a whole, before looking at Nature's most pertinent physical challenge to the same: the measurement problem in quantum mechanics. It's easy to forget that we are experiencers, not austere rational engines being shown even the surface of "reality" as-is, to straightforwardly form insights and construct models about.

It will be enlightening to ask and toil a basic and head-turning question: how do you know that you exist? You are tempted to say, "I *think* and see things and I have feelings, there obviously is a world and I exist in it!" No, it is not that simple. Just aside

from questions of epistemic directness versus representation, able thinkers have challenged the intuitive conviction there is any difference between abstractions or "forms" as such, versus "concrete" material worlds made of some kind of "stuff." Sure, there is *something* going on, but what is it really? Science tries to describe our public world in terms of mathematical concepts, to make a model of it. That model, in terms of math, is not itself a substantive thing — it "is an abstraction." People argue about the nature and status of abstractions and whether mathematical Platonism is valid, but one thing for sure: we can know that specific statements about things like perfect icosahedrons and 6-dimensional polytopes are accurate characterizations of *something*.

Hence, some bold and able thinkers argue the astonishing hypothesis that there is no meaningful distinction between "real things" and the *forms* of things. This stance has been called structural realism (not to be conflated with "structuralism" in other contexts) and "the ultimate multiverse." This structural Platonism overlaps but differs from the even more abstract, classic category-Platonism of an essence of "justice," of "chair" common to all chairs, *etc*.

The case in broadest scope (or similar) was notably made in modern philosophy by Robert Nozick [4] as the principle of fecundity, by David Lewis [5] as modal realism, and by various other figures such as physicist Frank Tippler. Currently a similar and more rigorous notion, the mathematical universe hypothesis, is being promoted on behalf of physics by Max Tegmark, here [6] in accessible form. It does not mean simulation by something concrete, nor relative mathematical transformations like the holographic principle. This refinement at its purest is mathematical monism: the idea that structures of math are all that exist. Tegmark's structural realism implies that our universe and anything else literally *consists of* the kind of mathematical model that physicists use to represent and simulate it. (Or, that following the lead of philosopher Marius Cohen: there is no meaningful distinction.) Maybe refer to this purely structural non-substrate as "figurement"? MUH can simply and honestly, rightly or wrongly, explain why there is something instead of nothing: we are but elements of one small part of all that logically *has to* exist, in the one true sense of "exist." Bit happens. All of it.

Is MUH true? Is it meaningful? Can we even *know* whether it is meaningful or true? Now, consider this deep task: design a computer program (in broadest definition) to explicitly recognize and comprehend--in terms of AI protocols--that it operates in a substantive world, such that MUH is false. That means, a way to carry out *formal rules* that can detect their operating as embedded in something transcending abstract structure. Flattering the common presumption of being more astute than the late Dr. Lewis, we'll call this project the concreteness appreciation program. The CAP must fully appreciate (as *we* are so sure we already do) assertions like: "I can imagine, as abstract models, various possible worlds with other laws of physics. How many of those

PWs are materially instantiated ("really exist" as we say) like my world?" It must understand "there are" five Platonic solids or even a fully-detailed model world, to mean and *be* something essentially different. If our minds are like machines, the CAP should be able to sense this if *we* can, right?

You won't see clear direction here. You aren't modeling specific *features* as in artificial vision *etc*. The inputs, outputs and functioning of any program are ultimately abstractions: data, logical operations; pure structure as bits or forms as would be in MUH. Sure, there can be a larger implied structure extrapolated from inputs. But like the abstract "worlds" coded up inside video games as logical spaces, these too are made of math to the system. Purely logical operations cannot truly define a difference between abstract configurations and "real worlds." What the program does as a model is *the same* whether MUH is true, or there is an embodying substance. The model is structurally and functionally equivalent to the system, despite the purported difference in existential status. The program can't bite into the substrate as such, to know that is more. Hence, a formal process cannot detect concreteness, or analyze and conceptualize it. No computer program can realize that it operates through a concrete entity.

The argument continues over whether a Turing machine can represent or manifest subjective redness. Now we can at least say: no Turing machine can represent or demonstrate *realness*. Indeed, nothing conceived in AI can demonstrate appreciation of *any* "substances" beyond the abstract operational framework itself.

So: our programming task is doomed to fail for foundational reasons. Incredibly: AI is incompatible with comprehension of physicalism! Furthermore, the basis of the argument includes *any kind of math at all*, as a formal structure, not just the maths which are typical in the fields of computation and information science! So finally, here is something a robot can't "do": know that it exists as a concrete thing. This is no mere argument from conceivability, demands or postulated incapacities. Nor is this ultimately stance-sensitive. It's a solid "can't," based on deep basics.

Important point: this argument does not prove we are not machines. Instead, it shows that *if* we are machines, then we cannot know or even understand that abstractionism is wrong. Equally important: this limitation on insight stands firm, regardless of arguments for and against MUH itself. But if the mind asking the question is fully bound by math in even the broadest sense, then that mind cannot understand or know the difference anyway.

A stunning dilemma faces us: any "mind" fully modeled by math in principle, cannot appreciate what most people consider the ultimate distinction *to* math. Nor is it clear, what kind of entity could do so, or how. A mathematicized "mind" is like the *content* of a drawing, like a plat: it can't understand what "paper" or ink is. Analogous to a popular

dilemma, I call this "the brain in a plat" (from the term for a map showing the divisions of a piece of land, which word tellingly can also refer to the land.) This insight is aimed to forcefully join other rages against the machine such as the Chinese Room, Mary discovering red, p-zombies, and the like.

Consequently, thinkers cannot fairly profess framing in terms of AI or even other kinds of abstraction, saying that our brains effectively parallel some kind of math; yet claim to understand "material." If we can't even tell the difference, what difference does it make? If you truly feel and know the world is more than math, then so is your mind. If you agree with Tegmark and believe that neither minds nor seeming-matter transcend math: then congratulations on being consistent. If you try to cling to the orthodox inconsistency, you failed.

MUH still deserves credit for being a boldly contrarian total world-view with a surprisingly solid (so to speak) argument. Still, let's accept our common "intuition" that the existence of "the material world" and our own bodies and minds, is indeed something specially "more real" than the Platonic objects of math (whatever kind of existence *they* have.) If we insist that view is true, we *must* conclude that the universe cannot be fully modeled by math—because our minds are part of that world! There is something "more" to all this, even if we can't be sure what it is.

Bohr was right

If the universe is indeed "magical" and beyond math in some sense, could that trait still at least manifest itself beyond our subjective sense of realness? And if so, could this transcendence be manifested in outwardly physical ways that science could at least *notice*—even if it might fail to explain? Furthermore: since brain processes are presumably responsible for our realizing that "we really exist" in some substantive, trans-abstract sense; that special physical character would logically be an important aspect of neural functioning. It literally so happens that there is an aspect of our world that expresses those features: quantum mechanics and the measurement problem. Despite enormous effort—and sadly, misleading and wasteful sophistry—we still do not understand how the supposed wave functions (if taken literally as in realism) end up manifesting the specific outcomes we experience all around us.

Most pertinent: quantum mechanics crucially offers various clues that our world is not cleanly abstractable. Our quantum reality might help our brains *meaningfully* transcend determinism and existential hollowness. This is true regardless of whether specific theories of quantum neurology, like Orchestrated Objective Reduction [7], are valid. The objection to such theories that "we can describe and explain neural behavior classically" is just *couching* what happens in general macro terms, like "transmitter

molecules cross the synapse and stimulate the neuron to fire" *etc*. Yet I don't need a specific quantum theory of neurobiology to appreciate that such a non-classical substrate is not fully representable, deterministic, nor need be causally-isolated in presumptive ways. Those features can support kinds of holism and independence. (Note that strong correlations don't need path coherence anyway. We can set the detectors at various distances from the point of pair emission.)

Currently, many thinkers attempt to elide quantum indeterminacy and the mysterious and realism-challenging "collapse" (aka "reduction") of wave superpositions into definite outcomes, by using concepts like decoherence and the many-worlds "interpretation." Yet theories and interpretations have specific or potential consequences, admitted or not, based on the particular ways they model things. Otherwise, defenders of MWI wouldn't need to fix that their theory straightforwardly predicts the wrong quantum probabilities! Hence one can't assume that *e.g.* the density matrix or Gleason's Theorem would be accurate anymore.

In MWI (also called Everettian Quantum Mechanics or EQM), all the original states--the possible quantum outcomes--happen and continue to evolve. They are supposedly separated and hidden from each other by phase decoherence of the relevant superpositions, with matching relations of outcomes (being "here" means not also "there") being entangled such as to make globally consistent results. (This entanglement differs from the strong correlations between particles. The latter means each such particle doesn't even *have* an independent pre-measurement state for some properties.) Supposedly, irreversible recording clinches the deal. Yet that happens in each world, and how relevant is "recording" to just *seeing* specific events? (Yes, entire other "worlds"—the expanding consequences of each macroscopically-manifested option make for a whole different history going forward. Note also from conservation of momentum, an emitter must also *already* be in a corresponding suite of superpositions; even before a further interaction.)

Decoherence supposedly hides the co-evolving, alternative outcomes from each other "because they don't interfere," and entanglements herd consistent histories into separate lineages. (Somewhat confusingly: "entanglement" sometimes means the consistency of observations connected to a single particle, other times it refers to the experimentally isolated correlations between multiple particles.) The modest but muddled claim is often made that the measurement problem is not *truly* solved, but we still find how "the appearance of" (whatever that means) a classical world is spun out of that web. This inconclusive mush, typically based on circular arguments using the density matrix, supposedly says why the proverbial dead and alive cat ends up as (or is *seen as*) separate observed outcomes. Arguably decoherence does not even accomplish that much, yet many writers frame its efficacy as a fact.

What goes wrong here? See Herbert [8] for the succinct basic case against the core

decoherence argument, as part of an excellent readable overview of the problem of quantum reality. I sharpen and add some points. In summary: decoherence offers no conceptual or clear physical basis for why disorderly waves *per se* would present originally coherent superposed options as exclusive outcomes, even relative to an observer state; without the action of other effects. Note first that "interference" is a misleading term anyway for the non-interactive adding of wave amplitudes. (Again, we have a failure to avoid "bewitchment" by language.) It isn't "interfering" (or just being able to) that upholds the "quantumness" of states. That way to infer they are (or were) waves, does not imply the converse by its absence. Quantumness arguably remains until something else, we know not what, makes otherwise.

There is this striking but little-remarked muddle about how the "universe splits." Each possible impact spot on a scintilator screen that could be hit anywhere by an electron, counts as a possible emitter of an entire photon: with what that implies per EQM about each spot actually producing, in advance of concerns about decoherence, its own "full" wavefunction; with a total probability of unity *per each* for further absorption *etc*. So how does the combination of all those emitted waves in the total EQM multiverse compare, representationally and physically, to the case where a single photon might be *reflected* from any of many tiny mirror segments. In the latter case, don't we imagine a given wavefunction being partitioned into various possible directions, not as becoming a combination of many "full" photon wavefunctions? Is there an inherent physical difference between "starting over again" versus "redirection"?

Most tellingly: EQM infamously runs into deep problems trying to theoretically justify the known probabilities using continuing quantum states. Unlike for collapse, probability is *not* a free parameter in EQM. The equivalent of (legitimate, how-many) probabilities in EQM should derive from ratios of the numbers of branching states, most clearly in the "simple" case of channeled bifurcations by *e.g.* an asymmetric beamsplitter. Indeed, these pan-actualized possibilities are *more* genuine a relative "how many" than is the shaky "chance of being the right chance" in classical probability! Yet if *e.g.* both outcomes happen each time, how can we (most of "us" in the manyverse?) typically find *e.g.* 29% of one outcome, 71% of the other; as required by certain amplitude ratios? This isn't like the chance a soul will be reborn in one host versus another: the branches are ontically equivalent. Each one incredibly embeds a "you." Problems persist if the branches are subdivided and finessed. (Infinities or slivering of such slabs lead to messes, not credible solutions.) And, even aside from not matching the BR, the scheme is logically *ambiguous* under asymmetric branching.

The sophistic, exotic kludges plied to overcome difficulties of EQM seem odd for a concept touted as "pure genuine quantum mechanics." This, not the sheer existence of many unobserved realms, is EQM's true parsimony problem. The earliest trick to rescue statistical expectations was probability "weightings," also (arguably mis-)applying a

measure. It is like coloring heads of coins to make more heads. (Valid weightings, like an unfair die, actually *produce* more or fewer of an outcome--instead of declaring some "special.")

Nor are other approaches, such as Bohmian mechanics, objective-collapse *etc*. very convincing or free of difficulties. The quarrels and *apologia* come and go, with much internecine disagreement and little to show for it—especially for EQM, in the important literal sense of *show* diagrammatically how the correct probabilities are *manifested* if all states continue to evolve. The search for a *representable*, "scientific" model of quantum reality continues to flail despite the insistence of some proponents that victory for their favorite interpretation is around the corner, whilst competitors must be mistaken.

If the world is an encompassing mind, our science must rise to meet it

There is no weird trick that solves the measurement problem, and we are left with ... weirdness. One subversive but insistent implication is that the quantum world really just isn't representable, in classic realist—that is, mathematicizable—fashion. And if the world is not, that may give our "non-Galilean" nervous systems the power to reach beyond abstraction and know that all this is something more than just math, and furthermore: something that cannot be fully *modeled by* math. The implications of The Brain in a Plat will be debated, but can we now more seriously consider that this world, and the creatures residing in it, are not machines? Currently, there are many alternative perspectives in circulation, some of them related to various ancient wisdom traditions, including Eastern mysticism. Panpsychism asserts that in some sense the universe itself is a kind of "mind," or expresses conscious mind. We can ask: how is that character consistent with what science finds out about atoms, nervous systems, and the like?

Property dualism is a long-standing but too-neglected answer to having reality both (or more) ways. Being numerically "the same thing" does not have to mean "being the same in kind." Consider Lorentz contraction as a loose analogy. Length was long seen as an absolute, inherent property of an object. But now we know that objects in relative motion literally have (not an optical illusion) different lengths for different observers. PD is perhaps the only way to imagine "neural activity" and "the way red looks" to "be" the same thing at the highest level of identity, although *relatively manifesting* as different in kind.

Realize that instruments provide the results of their interactions with things, which is a relative product. The results are conditioned by how we are doing the "looking." We filter those results in turn through experiences and conceptual constructs. Then, we interpret those results and spin stories from them about the world. These stories can be

useful, but they too are conditioned by the limitations and prejudices of the intellectual and cultural history in which dominant science developed.

What consequences might result—or better put, can we strive to achieve—from appreciating that the universe and its sentient creatures are not machines? We can hope that a better philosophy of science will also enhance ethical concern for Nature and our fellow sentients. (Robots will need to plead cognition-based rights and wrongs.) Possibly: the fall of materialistic reductionism in a context of the centrality of consciousness in the universe, will dissipate the individualistic sense of separated personal existence. One way to harmonize with lived (ordinary!) experience, yet separate the changing mental activity from a deeper self, is the Eastern and wider path or version of imagining we are all the same one "Self" at the core. Erwin Schrödinger wrote of minds: "Their multiplicity is only apparent, in truth there is only one mind." (*Mind and Matter* (1958)) We can call it open individualism, or maybe common individualism. This can be appreciated and experienced as beautiful, and it ultimately resolves identity problems like split-brain ambiguities, but we don't know. The down-to-earth consequences could be more concern for social equity. Perhaps not coincidentally, the self and Big Why are at the frontier: where logic wavers, and belief thrives.

Consider: we don't know what most of our universe is made of. We don't know how elementary interactions come about and then manifest macroscopically. We don't understand why "information processing" would lead to real feelings. We even might have to deal with unusual technologies beyond our current understanding, given recent indications from government sources around the world. We can't afford to cling to old certainties in times like these, even just for pragmatic reasons. Will our modern Pythagoreans accept there is a realm beyond the ratios to which they are accustomed? A revolution in worldview won't happen unless the wider public is taken into confidence by a candid scientific establishment. At present, there is much popularizing of the wow factor in scientific discovery, yet little admission of the continuing failures of reductionism. I can only suggest the contours of what may lie beyond, but it's time for a change.