Can we Crack the Mind-Body Problem?

Emmanuel Ransford

PART THREE: Psychism, the Deed, and Beyond

PART ONE: Making Sense of Quantum Randomness

PART TWO: Matter and the Poached Egg

PART THREE: Psychism, the Deed, and Beyond

PART FOUR: When Causation Dithers and Dangles…

ABSTRACT

This Part Three, earlier notified as Part Four, outlines a new concept of panpsychism based on holomatter, with a view to unlock the mind-body problem and to clarify the nature and origin of qualia. I hope to bolster the idea that a nonmaterialist, yet scientifically sound, theory of brain consciousness is possible. My approach is tentative and should be read with a "what if" mindset—what if matter were holomatter?

I'll then freely speculate on the issue of transcendence, as glimpsed through the lens of in-causation. Next, I'll contend that science provides some intriguing clues that our life-bearing universe may have meaning and purpose. Finally, I shall ponder how Gödelian incompleteness and in-causation may relate.

The neologisms I use to avoid ambiguities and confusions are defined in the glossary. Those which are not have already been defined, either in Part One or in Part Two. As for my footnotes, they seldom make essential reading and can easily be skipped.

CONTENTS

Expanding physics with holomatter

A quick reminder of Parts One and Two

Holomatter was introduced in Part Two. This "super-matter" is a bi-dimensional stuff which comprises an out-causal dimension plus an in-causal one. The former comes across as deterministic, and the latter as random. Both are tightly entwined and cannot be wrung apart, any more than the two sides of a coin. The out-causal component of an elementary particle of holomatter, or holoparticle, is its **outdown**. Its in-causal component is its **inup**. Both can, in alternance, be active or resting—or else, latent or dormant. They are never active at the same time because they take turns. When the outdown is active, it drives the (holo)particle in its out-causal fashion, which is deterministic. Then the particle is in the **matter** state of holomatter, where the inup is latent. When, contrariwise, the inup is active, it runs the show in its in-causal way, which is nondeterministic. Now the particle seemingly evolves in a random fashion. It is in the **paral** state of holomatter, where the outdown is latent. We'll then say that the particle undergoes a *paral phase* or a **paralling**.[1]

A (holo)particle is nearly always in the matter state because, most of the time, its inup is latent. Accordingly, the in-causal dimension of holomatter hardly ever makes its presence felt and can very easily be overlooked. However, the active inup is a game-changer, even though it rarely shows and does so in less than a jiffy. It prompts an evolution of the particle that is sudden, random and a-relativistic; as we recall from Part One.[2] Owing to this, holomatter can be *matter* and can also be *paral*, depending on the circumstances, much like liquid water can be solid ice too. It is thus characterized by a matter-paral duality, which underpins the wave-particle duality of quantum mechanics. To recap:[3]

> Holomatter takes on two guises. These alternatives are its *matter* state, which is that of any (holo)particle whose inup is latent, and its *paral* state, which is that of any particle whose inup is active.
>
> *Matter* is thoroughly deterministic. It evolves and propagates in a relativistic space-time. *Paral* is non-deterministic. It steers clear of the determinisms of *matter* and does not belong to its relativistic space-time.[4]

In the current prevailing interpretation, quantum waves are seen as smeared-out clouds of abstract probabilities.[5] Within the holomatter approach, they become "stuff-waves" or waves of substance that do not quite exist in the conventional

---

[1] A paralling, where the genie of in-causation is out of the bottle, manifests itself as a quantum jump, also called a quantum leap and a wave or wavefunction collapse. See in Part One.

[2] This a-relativistic (or non-relativistic) feature refers to Einstein's special and general theories of relativity. It entails that the square peg of (a-relativistic) paral doesn't fit into the round hole of (relativistic) matter. Incidentally, this mismatch between matter and paral raises awkward questions about a would-be theory of quantum gravity. One aspect of the a-relativistic character of paral is its distance-blindness, which plays out spectacularly in supralness—and hence, in quantum entanglement (see Part Two). Let me add in passing that a (holo)particle's inup is kicked out of its latency and into the active state in two major circumstances, namely: (1) (*directly*) under a quantum threat and (2) (*indirectly*) through a shared supralness-borne paralling (that is, through a shared entanglement-borne quantum leap or wave collapse).

[3] This is adapted from my paper 'Panpsychism, the Conscious Brain, and Beyond,' in *Science and the Primacy of Consciousness*, *ed.s* R. Amoroso *et al*., The Noetic Press, 2001. In it, holomatter is called psychomatter and a holoparticle's inup and outdown are named its 'psi' and its 'phi' respectively, on account of their psychic and physical natures (more on this later). Here I must confess that, throughout this Part Three, I'll sin the sin of self-plagiarism, as many passages will be adapted from some of my earlier texts, such as: 'Panpsychism, the Conscious Brain, and Our Mind-body-soul Nature', 'Peeking at the Conscious Brain: New Clues, New Challenges' (published in the ANPA WEST Journal—J. of the Western Chapter of ANPA—Vol. **5**, No 2, Winter 1995), 'Expanding Matter: A New Postmaterialist take on Quantum Consciousness' (in *Expanding Science. Visions of a Postmaterialist Paradigm*, Vol.2, Postmaterialist Sciences Series, *ed.s* M. Beauregard, G. E. Schwartz, N. L. Trent & M. Woollacott, AAPS Press, 2020; AAPS is the acronym of the Academy for the Advancement of Postmaterialist Sciences).

[4] The matter state of holomatter is thoroughly deterministic because it is out-causal. Paral, on the other hand, is non-deterministic and comes across as random because it is in-causal. It breaks free from the rules and constraints of ordinary matter, and it therefore transcends the relativistic space-time of plain (out-causal) matter. This shows in a spectacular way through the distance-blind phenomenon of entanglement—which for holomatter is an effect of supralness (see Part Two).

[5] These abstract and nonphysical waves are nevertheless real and physical enough to behave properly. For instance, they always travel at a relativistically correct speed (never above lightspeed)—strange indeed, isn't it? Intriguingly, the quantum waves might also have something to do with gravitation, as suggested by the following semi-classical exercise. Take two particles. The first one, say (O, m), is a genuine quantum particle which, for simplicity's sake, we'll assume to have a Gaussian wave packet $\varphi(r)$ centred in point O (the time parameter plays no role here). We further suppose that its mass, m, is spread out according to the local density of the wave packet, so that $dm(r) = m|\varphi(r)|^2 d^3r$. The second particle, noted (O', m'), is taken as classical and point-like. It is in O', where its mass m' is concentrated. We now want to calculate the force F = F(r) exerted on (O', m') by the "mass field" generated by the quantum waves of (O, m). The computation yields a rather remarkable result: F varies as mm'/r^2 at large distances (i.e., when $r = OO' \to \infty$). This is the Newtonian law of gravity! This result hints at a possible role that quantum waves may play in gravity. (A few tips to work it out: (a) use the polar coordinates of axis OO', given the symmetry of the problem; (b) F derives from the potential energy of the "mass field", so the formula $F = -\text{grad}M = -\nabla M$ applies;

sense of the term. They belong to a first layer of reality, one where existence is not yet "solid" and straightforward, but is somehow flimsier. The existential game they play is one of "self-begetting" or "bootstrapping" processes (see Part One). Solid existence is a kind of illusion that takes root in them.[6]

As such, quantum waves belong to the worlds of both physics and metaphysics.

Another outstanding feature of holomatter is **supralness**. It has been presented in Part Two. It is a "glue" which operates at the in-causal level and is the root cause of entanglement. Because supralness is grounded in the in-causal dimension of holomatter, it is altogether unseen and distance blind. It weaves untold links in the thick of space. These **supral links** blend or bind the inups of (holo)particles. Accordingly, the inups of such *supralled* or *entangled* particles are non-separable. It entails that their in-causal initiatives, choices, and decisions will be shared and concerted. These decisions will be mutually adjusted. They will be "consensual" if you will. This translates into the *correlated* outcomes of their joint parallings; which hold irrespective of the physical distance between them.[7]

Recall from Part Two that we can distinguish two types of supralness. One is **entanglement-by-supra-conservation**, the other is **entanglement-by-indistt**. They have slightly different characteristics.[8] Overall, supral links are invisible threads that weave a deep and uncanny interconnectedness at the heart of the world, revealing its profound interdependent nature. Because of them, the whole of reality is much more than the sum of its parts.

Here is a summary, given at the end of Part Two, of the main ideas seen so far:

1. Two basic kinds of causation may coexist in the world out there. One is out-causation, which is the ordinary deterministic causality. The other is in-causation, which is hidden and somehow "self-willed", usually very faintly so, and comes out as random.
2. Holomatter is plain matter with an in-causal dimension added. This dimension seldom manifests itself. If however it truly exists, then a dash of in-causation lurks, unbeknownst to us, within any speck of matter.
3. Quantum jumps and collapses on the one hand, quantum entanglement on the other, are in-causal features that protect nature's consistency. They arise in some situations where this consistency is in jeopardy.[9]

This simple mnemonic will help us get used to the new concepts and words employed:

out-causation implies determinism — **in-causation** implies randomness

paralling implies quantum jump or collapse — **supralness** implies quantum entanglement

Holomatter and quantum panpsychism

In a press interview, Roger Penrose declared: "*There is a mystery about consciousness itself, and it is profoundly puzzling how it could come about from the seemingly purely calculational, unfeeling and utterly impersonal laws of physics that appears to govern the behavior of all material things*." Author Peter Ells expressed a similar opinion:

> Despite the success [of science], and intensive effort over the past two decades during which there have been enormous strides in developing techniques for monitoring the brain and in understanding the details of the way it functions, science has made no progress in understanding David Chalmers' "hard problem" of consciousness. There is no explanation as to why we, described as strictly physical systems (composed of molecules, cells, organs, and so on), and moving and behaving according to precise mathematical laws, should actually feel pain or emotions, experience

---

(c) use the divergence theorem which equals a triple integral over a volume with a closed surface to a double integral calculated over this surface; (d) perform an integration by parts (whereby $\int u.dv = u.v - \int v.du$), and note that when r grows towards infinity, only one term remains, as the other vanishes.)

[6] It could be argued that "solid" existence is somehow the ('statistical') *envelope* of this first, and "wavy", layer of existence.

[7] The distance-blind non-separateness of the inups does not rub off on the outdowns however, so that two supralled or entangled particles—i.e., two particles sharing a supral link—remain out-causally separate. Their out-causal identities remain clear-cut and unchanged.

[8] For instance, a property named *quantum monogamy* is attached to entanglement-by-supra-conservation but not to entanglement-by-indistt. In the holomatter framework, supralness, and hence entanglement, is due to an in-causal binding. Generally speaking, this in-bindng is partial only. A supral link is affixed to a specific quantum observable. In entanglement-by-supra-conservation, a (holo)particle can share as many supral links as there are different observables, or physical quantities, in what is called its complete set of commuting observables.

[9] I believe, as an aside, that nature's consistency shouldn't be thought of as a given that kindly comes out of the blue and at no cost. It is more fruitful to think, if I may say so, that nature strives hard to get it; and to gather how it is substantially enriched in the process.

> the touch of another's hands, the sight of a flower, or the smell of new-mown grass. Nor is there any explanation as to how we can also have thoughts, reflecting on our experiences. [10]

Given this mystery, we are at least faced with the following three options: (A) Conscious states are produced by the brain and are nothing but neurobiological brain states; (B) The conscious mind is immaterial and doesn't belong to our immanent world; (C) Ordinary brain consciousness is immaterial and, as a content of the natural world and of its animal kngdom, is immanent too. The first option, (A), is the loose consensus of the day amongst mainstream neuroscientists.[11] Many believe that it is the only scientifically correct option and, as David Lorimer points it out, "*A vast majority of scientists don't know that they are making assumptions about consciousness and the brain. They just think it's a fact that consciousness is produced by the brain*." Moreover, as emphasized by Max Velmans, "*reductionist arguments typically confound* correlation, causation, and ontological identity*; or they rely on false analogies; or both*."[12] Indeed, it takes a leap of faith to believe that conscious states are nothing but brain states, given that they are so unalike. The second option, (B), has a long track record and is often tinged with religious undertones. With it, the conscious mind falls squarely outside the remit of science. The third option, (C), is that of panpsychism.[13] It is the one that I shall dwell upon here, under the assumption that plain matter is really holomatter; which would then be the common source of matter and consciousness.[14] As I wrote,

> In a bid to unlock the hard problem of consciousness, I put forward a panpsychic approach based on the holomatter hypothesis. According to it, what we are wont to take for plain matter really enshrouds an oft-latent—and hence hidden and unseen—"psychic" content. This content makes up the inups of elementary (holo)particles, that in turn would be the raw building blocks of higher-level, "macro-psychic" conscious experience.[15]

Let me first share briefly with you what thought process set me on the path of holomatter and panpsychism. The starting point is that I couldn't believe that conscious awareness and psychism are material in nature. Instead, I thought that ordinary brain consciousness may stem from a universal but hidden potentiality of what we (wrongly) perceive as plain matter. This potentiality would be hidden because it would nearly always lurk in a dormant or latent state. Then the conscious brain would *catalyse* this potentiality out of its latency; for reasons that science may uncover. It also seemed to me that a convenient way to approach the conundrum of brain consciousness was to frame it in terms of interaction. Moreover, I felt that the debate on the mind-and-matter issue was stuck in too narrow an alternative. As David Chalmers noted, "*Current debates about the nature of consciousness focus largely on dualism versus reductionism. Either consciousness is some nonmaterial entity or substance, outside of or beyond the material universe, or it is reducible to a state of or function of the brain*."[16]

Schematically speaking, reductionism and materialism take it for granted that consciousness is both material and immanent, while dualism and, say, "spiritualism" take it for granted that consciousness is both immaterial and

---

[10] Excerpt from Peter Ells' book, *Panpsychism, the Philosophy of the Sensuous Cosmos* (O-Books, 2011). David Chalmers' hard problem of consciousness refers to the riddle of why some physical mechanisms in the biological brain (*third-person perspective*) are accompanied by conscious experience (*first-person perspective*). Some, including Chalmers himself, seem open to the possibility that matter and consciousness are complementary aspects of a primordial world-stuff. (*A world-stuff… such as holomatter?*)

[11] I suspect that it has much to do with the fact that the only thing that is visible and readily available is the material "wetware" of the brain. The conscious mind is nowhere to be seen – and seeing is believing! Not seeing breeds scepticism…

[12] From Max Velmans, *Understanding Consciousness*, Routledge, 1990. Science is a method, not a dogma. Scientists would leave no stone unturned and explore *all* the possibilities—not just materialism— if they were doing their job as they ought to!

[13] Panpsychism holds that consciousness arises from a fundamental property of matter and that a "proto-consciousness"—that is to say, a vanishingly faint whiff of psychism—is present in inanimate objects. It doesn't claim that these objects are aware, let alone have thoughts and feelings. Even though it isn't quite identical with traditional animism, it is certainly akin to it.

[14] We'll see that plain matter is built upon the matter state of holomatter whereas consciousness is inherent in supparal, which depends on its paral state (this supparal will soon be defined).

[15] Adapted from my paper 'Panpsychism, the Conscious Brain, and Beyond,' in *Science and the Primacy of Consciousness*, *ed.s* Richard Amoroso *et al*., The Noetic Press, 2001.

[16] The current materialist consensus is that consciousness is an illusion "*arising from neurons doing their thing*." It can then be likened, if you will, to the blue hue of the blue jay's exclusively *brown* feathers. Their blueness is a side-effect of special microstructures on their surface, which only diffract, or reflect away, the blue range of the light spectrum. Likewise, consciousness would be a mere side-effect of some patterns of electrochemical activity in the brain. According to the philosopher Daniel Dennett for instance, materialism is self-evident in claiming the equivalence of mind and brain. Dennett is adamant that "*When we understand the function of the neurons completely, there will be nothing left to explain about consciousness*." As for the astrophysicist Max Tegmark, "*consciousness is simply the way information feels when it's being processed in certain complex ways*." Such claims ring to my ears as either disingenuous or as empty words or wishful thinking. For me, a mind spontaneously popping out of a biological brain without involving any extra ingredient is as convincing as the white rabbit popping out of the black hat of a trickster. However, with the rabbit, there's plainly a clever sleight of hand at work!

transcendent. But these aren't the sole options. Indeed, the holomatter hypothesis stands somewhere in between, in the following sense:

→ with materialism (or reductionism) it shares the idea of an ***immanent*** consciousness

→ with dualism (or spiritualism) it shares the idea of an ***immaterial*** consciousness

For holomatter, our ordinary consciousness—and that of some animals—has an "im-im" nature.[17] This im-im standpoint is rather unusual, but this doesn't make it wrong (**im-im** stands for ***im***material and ***im***manent). With it, the conscious brain becomes some sort of catalyser. Loosely speaking, it would ignite or kindle part of its inner seeds of psychism and consciousness—which are the inups of its (holo)particles—out of their customary latency. This is what would make it the organ of consciousness. At least, this is how I figured it out, hoping that this would be amenable to scientific inquiry.

Henceforth, I'll use the expressions the im-im approach or theory, and the holomatter approach or theory, as equivalent.

Is it possible to come up with a 'holomaterial' explanation as to why "*the water of boring old brain cells and sludgy stuff in the brain is turned into the wine of phenomenological subjective experience*," as Susan Greenfield put it? I'll put forward a tentative answer to this big and challenging question; but before we get there, let me spell out what I mean by ordinary consciousness. Roughly put, it is "*the thing which abandons us when we fall asleep and returns when we wake up*". I take it as a purely mental phenomenon, made up of the states of awareness that we experience in our wakeful workaday life. We share it with some animals—with due differences of course. Now, the im-im approach bears on this ordinary consciousness only. It leaves the soul and the non-ordinary or altered states of consciousness out, and says nothing about fascinating phenomena such as NDEs, OBEs and the like.[18] On the other hand, it encompasses the whole gamut of wakefulness, from full awareness to dreamy conscious states and to near unconscious states. From now on, I'll simply use the word consciousness to mean ordinary consciousness; and I'll take the word **psychism** as an umbrella term that, roughly speaking, will tag any state of this *ordinary* consciousness, whatever its intensity—its dreamlike and almost unconscious states included.

The eerie mind-stuff that can't be seen

To address the issue of consciousness, we need to posit what follows:

(a) The matter state of holomatter is always non-conscious.

(b) Psychism is grounded in the paral state of holomatter.

Karl Popper acknowledged that "*Dead matter seems to have more potentialities than merely to produce dead matter*."[19] My assumption is that this is due to paral. Somehow or other, the paral state is aware or sentient, ranging from a near-absent degree of sentience to a "glowing" state of conscious awareness. This is my insight and my working hypothesis. It raises the question of how nature manages to move up and down the scale of the psychic states, from unconscious to fully conscious ones. It does so through a dimmer switch effect, to use a phrase of Susan Greenfield. Let me explain. According to the im-im suggestion above, the *latent* inup (in the matter state) is stark nonconscious, whereas the *active* inup (in the paral state) is like a gleam of awareness—one that is so dim and so fleeting a psychic spark that it is nigh-on non-existent. Such a psi-spark taken in isolation, for a lone particle, is the faintest possible infra-psychic state. (In the present context, an active inup or a paralling is also be dubbed a **psi-spark**; similarly, a supral link is also a **psi-thread**.) Yet, under the appropriate circumstances, a psi-spark may join force with other sparks to form bunches of paral of various sizes. These

[17] The im-im or holomatter approach makes for a dual aspect monism or an oxymoronic 'dualist monism' (*monism*, because there's one stuff only, and *dualist*, because every speck of holomatter, or (holo)particle, is two-sided, with an inup and an outdown inextricably bound up together). Note that holomatter's two-sided nature is itself twofold, comprising both an inup-outdown duality and a matter-paral duality.

[18] Chris Nunn, in his book *de la Mettrie's Ghost* (Macmillan, 2005), underlines that "*As Peter and Elizabeth Fenwick (…) argue, it is hard to reconcile [the] explanations [of NDEs by temporal lobe epilepsy, by brain anoxia or lack of oxygen, etc.] with the enhancement of consciousness and clarity of memory that many NDErs claim. When people are dying, or having a fit, or are anoxic, the usual result is that they get confused and forgetful, not extra lucid with super-normal recall on their past. (…) Intensity and clarity are found where confusion and clouding would be expected*." The intersubjective phenomenon of shared near-death experiences is fairly intriguing too. Raymond Moody wrote a book about them (*Glimpses of Eternity*, Rider, 2010). As for the soul, it may have something to do with ur-causation, introduced later on.

[19] For ancient Greeks, ordinary matter wasn't seen as dead or utterly passive. They saw matter as inherently dynamic, living matter being only slightly more so. The difference between dead and alive was only a question of degrees, as regards matter.

will bring forth psychic states of various intensities, including fully conscious ones, depending on their size. Such is my proposed understanding of the dimmer switch effect.[20]

To create these paral bunches of psi-sparks, nature needs a glue. This is where supralness and its supral links come in handy. The idea here is that paral bunches are formed when many psi-sparks are bound together by supral links or psi-threads that, in a way, are *telepathic* bonds since they bring unity and harmony to various in-causal and psychic inups. They create a substance that deserves to be named **supralled paral** because of its two components: the paral state on the one hand, supralness on the other. The paral state goes with psi-sparks and supralness goes with psi-threads. Psi-threads and successive psi-sparks can form large streams of supralled paral when they consistently join forces.[21] From now on, I'll shorten supralled paral into **supparal**—it is the eerie stuff that can't be seen. In short, my proposal is that: (I) when zillion psi-sparks are bound together by a dense network of psi-threads, they form broad chunks of supparal; (II) these chunks give rise to psychic states; (III) broader chunks yield more intense psychic states so that, with enough breadth, they become fully conscious. Obviously enough, supparal stands on the two quantum legs, if I may say so, of holomatter. One is the paralling or paral phase (a.k.a. the psi-spark). The other is supralness or the supral link (a.k.a. the psi-thread).[22] These "legs," by the im-im assumption, are psychic in essence. They may occasionally create *telepathic* events. Quite importantly, they can yield and encode, as we'll see, a brand-new type of subjective and psychic information. Furthermore, the overall fabric woven by psi-threads in the outer space—I dub it the Great Supral Web (GSW) or the Great Cosmic Web (GCW)—may give rise to rare and strange phenomena like synchronicities and psychokinesis.[23]

To conclude, if the im-im insight holds water, then supparal is the eerie stuff of ordinary consciousness or the eerie mind-stuff, as I like to say. It underpins psychism and consciousness; but it will never be seen, whether in a conscious brain or elsewhere.[24] This supparal may explain why some neurobiological processes in the brain relate to conscious awareness. In short, it may hold the key to the riddle of the conscious brain. This is what we see now.

Shining new light on the conscious brain

Cracking the mind-body problem

The mind-body problem is about the relations between consciousness and the brain and body. This tough nut has bedevilled thinkers and scientists alike for centuries. How do mind and brain manage to interact? This remains a huge mystery. As Peter Ells puts it, "*One of the most intractable problems of consciousness is that of mental causation. How do my feelings of thirst and tiredness and my resulting train of thought and imagination lead to the physical behaviour of matter: I engage in the physical acts of making myself a cup of coffee and drinking it.*"[25] To this day, no conclusive and

---

[20] We now gather that the 'holomaterial' strain of panpsychism is both an emergentist panpsychism and a limited panpsychism. The former, according to the philosopher William Seager, is "*a type of panpsychism in which the complex mental states of higher-level entities emerge from a system, or organization, of fundamental entities which possess extremely simple forms of mentality*." The latter posits that there exists (limited) infra-psychic or nascent conscious properties in all matter—even elementary particles possess rudimentary sentient properties; that Thomas Nagel calls proto-mental properties. When suitably combined in complex systems, they become conscious.

[21] The two ingredients that make supparal—psi sparks or parallings on the one hand, psi threads or supral links on the other—are core quantum features. This implies, if the im-im insight is not wide of the mark, that classical physics was unfit to crack the enigma of the conscious brain. The hard problem of consciousness couldn't be sorted out within its conceptual framework. It also explains why these two quantum features (wave collapse and entanglement respectively) raise tough and awkward *interpretational* problems ever since they were discovered. They smack of quantum weirdness. Really, this is just because the conventional materialist framework cannot handle them if they're truly in-causal and psychic as I surmise. This weirdness, like beauty, is only in the eye of the beholder!

[22] We recall from Parts One and Two that a paralling manifests itself as a quantum jump or collapse, and that supralness shows as quantum entanglement.

[23] C. G. Jung defined synchronicity as "*the simultaneous occurrence of two meaningfully but not causally connected events*". Seen from the holomatter perspective, it is the simultaneous occurrence of two *in-causally* but not *out-causally* connected events. Causation is at work here, but stealthily so, in its wonted in-causal way, which resonates with *meaning*.

[24] From the very notion of supparal we can infer some outstanding features of the mind, including these: (A) the invisibility of our mental states, which is a straightforward consequence of the invisibility of the paral state of holomatter—it is little wonder, then, that no one has ever seen a mind inside a skull and in a living biological brain; (B) the non-locality of consciousness: there's no place in the brain where ordinary consciousness dwells and, say, where mental images are seen—the mind, by the magic of the supralled side of supparal (or of supralled paral), spreads out well beyond the physical brain; (C) "*Consciousness is not a thing but a process*," as William James said, since ordinary consciousness is the (nonmaterial) outcome of the brain processes that produce large flows of supparal.

[25] Quoted from Peter Ells' book, *Panpsychism, the Philosophy of the Sensuous Cosmos* (O-Books, 2011).

falsifiable explanation has been put forward.[26] The mind-body dialogue can be seen as a two-way road made up of a motor lane and of a sensory lane. The former refers to our intentional motor acts and initiatives, and the latter, to our sensory inner life. Roughly speaking, the former is in-causal while the latter is out-causal. In the motor lane, psychism and the conscious mind call the shots and force mental causation upon the physical world. In the sensory lane, the physical body is in the driver's seat and informs the mind about environmental cues. Together, these "lanes" pull the strings of the biological sensory-motor function, through which we both perceive our surroundings and act deliberately, by wilful acts.[27]

Can the im-im approach cast new light on the mind-body relationship? My answer is positive, and rests on the deed. This **deed**, as I call it, is the mind-body interaction at its simplest and barest. It is the alleged low-level building block of the mind-matter interplay. The deed would relate to the individual (holo)particle, whose inup is psychic and whose outdown is physical as we know. It would have much to do with the particle's inup-outdown interactions. As a matter of fact,

> To pin down the deed, look no further than inside any elementary particle and find out whether and how its inup and its outdown twitch and jolt each other. Recall that the inup and the outdown are active in turns, so that one of them is always off and resting. This implies that they can only interact *indirectly*, if at all. The core mind-body interplay—and hence the inup-outdown interplay—could tentatively be understood as follows:
>
> - A paralling, and hence a quantum jump, is how the in-causal and psychic part of a (holo)particle tweaks its out-causal and matter part. It does so by picking a sharp end-state out of a range of possible ones.[28]
> - Conversely, a quantum threat is how matter affects the psychic part of a particle. It does so by arousing it out of its latency. The active psychic part then triggers a paralling.
>
> When the paralling or the jump is over, matter comes back and bears the physical footprint of the in-causal and psychic dimension. This footprint relates to the in-causal choice of a given sharp end-state, that shrunk the particle.
>
> The deed and its two components, quantum threats and jumps, are clearly not incompatible with the laws of physics—instead, they are written into them. Incidentally, threats and jumps have more to do with the sensory side and the motor side of the mind-body dialogue respectively.[29]

As a rule, a quantum threat isn't meted out by the sole outdown of the particle. It usually involves the larger physical neighbourhood of the particle, so that a more accurate account of the deed reads:

> (a) The physical dimension of holomatter acts first. It affects the psychic dimension of a particle by creating a quantum threat that, sooner or later, will stir its inup out of its latency. This is how it turns the particle into an ephemeral psi-spark, which is the tiniest possible speck of paral.
>
> (b) When a paralling occurs, the psychic dimension of the particle at stake, now active, impinges on its out-causal and material dimension by selecting a sharp end-state out of various possible ones. This is how it leaves its mark on the physical dimension.[30]
>
> (c) These two rudimentary components of the deed, threats and parallings, play key roles in the sensory and motor lanes; yet there's another major player. This one is supralness and its supral links. By coordinating the joint and simultaneous actions of various deeds, these links open the possibility of a rich variety of complex gestures and sensory perceptions.

Overall, the deed is a simple choreography where the two partners—one out-causal and material, the other in-causal and psychic—dance in alternance. The out-causal dimension modifies the in-causal dimension by generating quantum threats

---

[26] Well, this is not quite so: really, the conundrum has been solved, once for all—but "on the cheap" and in crude ways, by simply asserting that the mind and the brain are one and the same. Or that the mind is what the brain does. Or that the mind is nothing but an illusion.

[27] The concepts of wilful or volitional act touch on the controversial notion of free will. I'll come back to it later.

[28] Recall from Part One and Part Two that these possible end-states are various component of the initial fuzzy state. (I call sharp and fuzzy states the eigen and superposed states of quantum physics respectively. I also call inup the in-causal part of a holoparticle and outdown its out-causal part.)

[29] This text is adapted from my contributing paper, entitled 'Expanding Matter: A New Postmaterialist Take on Quantum Consciousness', in *Expanding Science* (AAPS Press, 2020), already cited. Note that when a paralling happens, the (holo)particle may then be destroyed, often by being absorbed. This is but another way in which the inup can alter the particle's outdown.

[30] We saw in Part One that the (post-paralling) sharp end-state is threat-free, unlike the particle's (pre-paralling) fuzzy state, which was under a quantum threat. Also, a paralling is a shapeshifting event that shrinks the (holo)particle, from fuzzy to sharp. It is driven by an in-causal choice and leaves a physical mark or footprint when the particle goes back to its matter state, which is wave-like (sometimes, though, the particle is absorbed and destroyed right away). The physical dimension is that of the outdown. It is where the quantum waves are found.

that lift the inups of the particles out of their latency. In short, they **enparal** them.[31] Then the in-causal dimension, now active, modifies the out-causal dimension by dint of parallings. These change the quantum states of the particles when the matter waves reappear. That's not all: the rich and subtle mind-body dialogue that we experience benefits hugely from supralness. The supral links of supralness take it to other levels of complexity.

Such, in a nutshell, is the im-im proposal to crack the mid-body problem.

Supralness, or in-binding, is a bag full of amazing tricks. Here are three of them: (I) it turns the in-causal dimension into a highly non-local and universe-wide psi field; (II) it blends and mingles psi-sparks into chunks of supparal which are psychic wholes that, given the right size and a minimal stability, may become conscious; (III) with its supral links, it weaves patterns that bring structure, and hence information, to the in-causal dimension of nature (assumed to be holomaterial).

Let me explain this idea of information-encoding supral patterns or structures:

> Supralness creates a new type of information. This **supral information**, as I name it, is easy to grasp. Take a handful of beads, and threads to bind them. With these, (…) make objects shaped into stars, pears, flowers, butterflies—whatever you wish. These shapes or patterns bring structure, *and hence information*, to your beads-and-threads treasure trove. They encode and store data: one shape encodes the information "star," another the information "pear," the next one the information "flower," and so on. (…) If we take particles instead of beads and supral links instead of threads, we likewise conclude that the in-causal dimension can encode and store information. (…) Storing data means *memorizing* data, and the storage capacity of this "supral memory" is truly amazing.[32]

Supralness gives rise to information-laden patterns and shapes at the in-causal and psychic level. This supral information belongs to the in-causal dimension and is therefore hidden, nonlocal and psychic. Furthermore, its complexity and diversity are virtually limitless. Think of all the patterns that can be wrought by linking a basketful of beads with a load of threads!

Before we carry on, recall these two "staples" of the im-im vocabulary:

(a) a **psi-spark** is a paralling and shows as quantum leap or collapse

(b) a **psi-thread** is a supral link and shows as quantum entanglement

The lamp metaphor

The biological brain, this three-pound blob between our ears, is the undisputed organ of consciousness. It is the acknowledged concrete anchor of our mind. However, why it is so remains as big a mystery as ever. As neurosurgeon Eben Alexander writes, "*Make no mistake: consciousness is a total mystery. As total a mystery as it was 10, 100, or 1,000 years ago. We simply do not know what it is. But consciousness is so familiar to all of us, that we have learned to overlook this most obvious of facts*."[33] In the same vein, neuroscientist Henning Beck points out that "*When you look at the brain from the outside, you just see a wet mass full of densely packed nerve cells. How can this be the origin of game-changing ideas, great symphonies, language, love, and art? We have no idea. Is there a greater enigma on Earth*?" Why should physical matter give rise to an inner life at all? This raises the hard problem of consciousness.[34]

---

[31] A particle is said to be *enparalled* when it switches to paral, through a paralling or paral phase. Such a paral phase has an exceedingly small—yet a non-vanishing—duration. The continuity and the very existence of our states of consciousness rests on this wee spread in time.

[32] Excerpt from my already cited paper 'Expanding Matter: A New Postmaterialist Take on Quantum Consciousness', in *Expanding Science*. This "supral memory", which belongs to the in-causal dimension and is therefore psychic, is in the same league as our so-called declarative or explicit memory, which deals with our mental recollections, the ones that we can talk or "declare" about. It is different from our procedural or implicit memory, which deals with our acquired motor skills and habits, such as piano playing and bike riding.

[33] Eben Alexander experienced a NDE which completely changed his views on consciousness—and his outlook in life. He shares what he went through in his best-seller *Proof of Heaven* (Simon & Schuster, 2012).

[34] The conscious brain, to paraphrase what Winston Churchill said about Russia, is a riddle wrapped in a mystery inside an enigma. For the philosopher Colin McGinn, "*Mind may just not be big enough to understand mind*." Is the true nature of the human mind forever beyond human ken? No matter what, at least three incontrovertible facts already hinted at—points (a), (b) and (c) hereafter—seem to stand out about consciousness. Point (a): neuroscience demonstrates that ordinary consciousness has physicality (it somehow *correlates* to brain activity). Point (b): the conscious mind is nonlocal and stark invisible. Point (c) "*consciousness is not a thing but a process*" (William James), it is always on the run and never at rest. (The im-im approach has possible explanations: *point* (a): this physicality relates to something called *paralgen* that we'll soon discover; *point* (b): the conscious mind is invisible and nonlocal because it is made out of supparal, itself invisible by its paral side and nonlocal by its supral side (i.e., by its many supral links); *point* (c): ordinary brain consciousness allegedly depends on some brain processes that produce large flows of supparal, making it stream-like or sequential, and never at rest.)

Can the holomatter approach bring fresh ideas to bear on this conundrum? What's new with holomatter is in-causation and its related concepts, to wit: the inup and the outdown, the paralling or psi-spark, the supral link or psi-thread, and finally, the supralled paral or supparal. All these become simple and easy once we are conversant with the core notions of paralling and supralness. With them, we can liken the brain to, er, a big lemon. This lemon has a twist—that of being able, on its own, to squeeze out part of its juice. This "juice," you guessed it, is this odd substance that I called supparal. A better metaphor, though, is that of a lamp or a lightbulb. It rests on the idea that

> Any piece of matter can give off light. Yet this ability, or property, usually doesn't show. It remains potential only; and it takes a lamp—or a firefly, or whatever is fitting—to make it actual. This is so because a lamp is a sort of catalyser of light. By the same token, we can think of the brain as a catalyser of sentience that would actualize the universal, but normally hidden because dormant, property of psychism and consciousness.[35]

My assumption is that

> (a) the ability to yield consciousness is universal and inherent in physical objects, on a par with the ability to release light or photons; yet
>
> (b) special—or "catalytic"—conditions must be met in both cases, for light to come into view and for psychism to show (as conscious psychism, from the overwhelmingly dormant psychic dimension of holomatter).

If so, the brain can be thought of as catalysing the conscious potentiality of matter in much the same way as a lamp can be thought of as catalysing its light-emitting potentiality.[36] These potentialities are everywhere but remain hidden because they're usually latent. It takes special conditions—brought about by a catalytic machinery: *a lamp here, a brain there*—to unveil them by having them to become actual. Furthermore,

> A few photons do not a light make, and to give off enough light, a lamp or a lightbulb must produce squillions of them. As with photons, so with (active) inups: there is a threshold below which awareness, like light, is just too dim to be worth the name. Full consciousness is obtained when vast quantities of simultaneous psi-sparks are mingled together. What makes it possible is supralness.[37]

Or else,

> If a lightbulb emits only a few photons at a time, it hardly generates any light since this light is much too dim to be seen. When, on the contrary, it yields huge quantities of photons (as it normally does), it produces a visible light. This is obvious. Now think "brain" instead of "lightbulb" and "consciousness" instead of "light." A lightbulb that gives off few photons at a time becomes a brain where not so many psi-sparks (or parallings) occur at a time. Too few psi-sparks won't add up to a full-blown conscious state. Expect this state to be hardly above non-consciousness, perhaps even lower than some of our dream-like states of awareness. It would take vast and consistent streams of entangled jumps to achieve true consciousness, much like a visible light arises from huge flows of photons.[38]

The brain's ultimate secret would thus lie in its capacity to produce large flows of supparal. It would give rise to *conscious* chunks of supparal by producing vast quantities of paral woven together by umpteen supral links or psi-threads. This is how the brain would pull off the trick of consciousness. Now, to turn out vast quantities of paral is no mean feat, and as far as we know the nose, feet, stones, and clouds cannot do it. My hunch is that to do so, the brain is equipped with very special micro-biological structures that I call paralgens. A **paralgen** enparals particles, ions, atoms and even molecules found in the brain's biochemical bath, when they bind or come close to it. Its job is to yield paral:[39]

> A paralgen—so named because it generates paral—is an alleged microdevice that kindles matter into paral. Crudely put, a paralgen rouses the inups of holoparticles out of their latency. Think of it as a "psi-switch" or as a nano-trap of sorts. Expect it, in the brain, to be some biological microstructure tucked in some neurons within some areas of its grey

---

[35] Adapted from my 'Panpsychism, the Conscious Brain, and Beyond' paper, already quoted. It is worth emphasizing that the light emitted by the lamp is *not* identical with it. Similarly, consciousness may be catalysed by the biological brain *without* this implying that it is material in nature.

[36] William James distinguished three possible conceptions of the brain and consciousness relationship. These are: the brain *produces* consciousness, it *permits* consciousness, and it *transmits* consciousness, with a 'filtering' function. My insight that the brain catalyses consciousness is akin to the claim that it permits consciousness.

[37] Adapted from my contributing paper, already cited, to the book *Science and the Primacy of Consciousness*. Recall that psi-sparks are parallings seen in the im-im perspective (taken individually, these are exceedingly dim and fleeting sparks of psychism, but they can grow to full consciousness when mingled in wide chunks of supparal).

[38] Adapted from my paper 'Expanding Matter…', quoted earlier.

[39] What follows is adapted from the already cited 'Panpsychism, the Conscious Brain, and Beyond' paper.

matter. If so, the presence of myriads of paralgens in some brain areas would hold the key to the puzzling fact that mental events arise in certain neural systems. Thus,

> *The brain is the organ of awareness because it can yield, on wide enough a scale, an ongoing stream of supparal. It owes this stunning ability to its paralgens*.

Or else,

> We can think of the paralgen as a sort of biological device – e.g., *an allosteric protein molecule?* – that would be akin to a channel endowed with a snare; into which, say, ions and molecules are sent by the relevant assemblies of neurons (…) whence they undergo a paral phase before being released and 'unparalled' again…[40]

In seeking out some paralgens in the brain, I followed a suggestion by Francis Crick, who wrote: "*The most likely types [of* neurons *that can express consciousness] are some of the large "bursty" pyramidal cells in layer 5 [of the cortex], such as those that project right out of the cortical system*."[41] To find paralgens, which open the possibility of putting holomatter to the test, we ought to dig further however, at least down to the level of synapses.[42] Incidentally, though, the biological brain is a warm, messy and macroscopic object that some would deem unfit for quantum effects.[43] However, life had more than three billions of years to learn how to deal with quantum effects and how to benefit from them, and really, one should expect that "*the brain uses quantum mechanics*," as Matthew Fisher contends.[44] Besides, as Roger Penrose noticed:

> Chemical actions are the result of quantum effects, and strictly speaking one has left the arena of classical physics when considering processes that are dependent upon chemistry. (...) The chemical forces that control the interactions of atoms and molecules are indeed quantum mechanical in origin, and it is largely chemical action that governs the behaviour of the neurotransmitter substances that transfer signals from one neuron to another (…). The action potentials that physically control nerve-signal transmission itself have an admittedly quantum-mechanical origin.[45]

Obviously, then, the brain uses quantum effects. Besides, the budding science of quantum biology seems poised to confirm that living organisms routinely use quantum effects, even though they too are warm, messy and big. Indeed,

> The warm and messy wetware of the brain, with its throngs of jiggling atoms and particles, with its swarms of ions and droves of molecules, make [long-lasting macroscopic quantum states] highly unlikely. However, there is still a glimmer of hope for the quantum brain. There are strong hints that the alleged impossibility of macroscopic quantum states is far from watertight, and there is mounting evidence that some biological processes—photosynthesis, olfaction, and enzyme action, to name but a few—involve long-lived quantum states [and effects] at the macro-level.[46]

Indeed, as we learn from neuroscience, conscious awareness is not a feature of all parts of the human brain and most brain activities are unconscious. As Chris Nunn writes, "*Only a small subset of unique neural states [is] associated with unique conscious states, since most neural activity is unconscious. It takes uniqueness of neural activity plus some other, unknown, ingredient to either* be*, or be immediately linked with, a unique conscious state*."[47] What is this mysterious ingredient? At present, no one has the faintest idea. However, the im-im approach comes up with a suggestion—that psychism and sentience arise from the paral state of holomatter. This entails that the brain processes which feed our conscious states

---

[40] From my article 'Peeking at the Conscious Brain: New Clues, New Challenges', *J. of the Western Chapter of the Alternative Natural Philos. Assoc*. (ANPA), **5**(2), 6-26, 1995.

[41] From Francis Crick's book *An Astonishing Hypothesis* (Simon & Schuster, 1994). The pyramidal cells are the most common type of neurons in the cortex, which has six layers. These neurons are so named because they have a pyramid-shaped cell body, or soma.

[42] A synapse is a tiny gap between neurons, across which brain signals travel through the release of charged ions and neurotransmitters. Synapses are essential to neuronal function. They permit to transmit and to collectively process brain signals in organized patterns. Most of them are random and probabilistic. (I wonder: *Are some of them in-causal*?) The average neuron in the brain receives 5,000 synapses from other cells. Of these, about 4,500 are excitatory and 500 are inhibitory.

[43] Quantum fuzzy (or superposed) states can easily be destroyed by the environment, which may prompt all manner of parallings. These parallings are supralicide, which means that they routinely shatter supral links. We saw this in part Two.

[44] Matthew Fisher presented some of his ideas on the quantum brain in the *Annals of Physics*, vol. 362, p.593 ff, 2015. His approach has nothing to do with the im-im thesis.

[45] Quoted from Roger Penrose's book *Shadows of the Mind* (Oxford University Press, 1994). When a neuron fires, an electrical impulse, called an action potential, travels along its threadlike axon towards neighbouring neurons. When this impulse reaches a synapse, it opens tiny ion channels through which calcium ions enter and release chemicals called neurotransmitters which then travel across the small synaptic gap, or cleft, transmitting the signal to the next neuron. The neurotransmitters bind to specific receptors in this postsynaptic neuron, where they make either an excitatory or an inhibitory contribution to its firing.

[46] Excerpt from my paper 'Expanding Matter…', quoted already.

[47] From Chris Nunn's book *de la Mettrie's Ghost* (Macmillan, 2005).

are those which involve paralgens—oodles of them. Then, the so-called neural correlates of consciousness are those brain processes that unfold in paralgen-studded areas, where zillions of paralgens pull off their enparalling trick; in such a way that large flows or streams of collective paral, structured and bound together by supralness, result. This dynamically creates supparal, and hence our psychic and conscious states—really, our streams of consciousness.[48]

There is solid empirical evidence that when the brain processes information consciously, it recruits large neural assemblies in several brain regions at once; and there are sudden bursts of simultaneous activity in widespread areas of the brain. These neuronal flare-ups are often linked to incoming sensory information.[49] This dovetails with the idea that consciousness correlates with broad chunks of supparal (smaller chunks would correlate, say, with dreaming rather than with true wakefulness).

Now, what about qualia? Has the im-im approach something new up its sleeve? Let's find out.

Suprels in the brain, qualia in the mind

Recall that supral information is a brand-new type of information which converts signals and sensory data that wend their way through different brain pathways into a language that the mind can readily understand—the language of experience. This subjective information is encoded in supral patterns. Now, a **suprel** is an elementary unit of this supral information. It is a basic data-encoding in-causal pattern that can be thought of as a "pixel of the mind". It results from a few beads (i.e., holoparticles) bound by threads (i.e., supral links) which form a particular pattern that encodes specific data. Often, it is part and parcel of a much broader supral network. This bit of supral information belongs to the in-causal dimension. Therefore, it is altogether invisible, non-local and psychic. Suprels are letters of the language of our subjective experience. They are simple "supral gestalts" that collectively build what we see or feel. Herein lies the connection between suprels and qualia. Qualia are "how it feels" to have a perception, a sensation, a mood, a thought.[50] They are the inner qualitative contents of our life—e.g., the fragrance of a rose, the taste of sugar and the blueness of the sky.

Qualia are not emergent properties of matter. They cry out for an explanation. As we just saw, my take on them is that they stem from supral information and result from structured clusters of suprels, in much the same way as images on a screen are structured clusters of pixels. Qualia would be released and made available to the conscious mind when the brain, with its many paralgens, enparal their matching suprels.[51] Our inner mental lives would thus benefit hugely from supralness and from the global—and universe-wide—tapestry that its many supral links weave. Suprels differ by the type of their supral links, by the nature of the holoparticles they connect, and by their topological structure.[52] They are players in a game which has these two major constraints: (a) parallings (or quantum leaps, or wave collapses) are supralicide, i.e., they break supral links apart; (b) supralness, if it is of the supra-conservation variety, is monogamous[53]

Assuming that suprels do exist, it is crucial to find out where the brain makes or churns out at least some of them. I believe that the cortical columns make inviting candidates for this. As I explained in 'Expanding Matter',

> I thereby suspect that suprels [are] cooked up by neurons working tightly together, particularly in response to specific stimuli. An attractive possibility for the brain's suprel-churning loci is the vertically oriented columns, or cylinders, found in the neocortex. Interestingly, some of these elementary patterns of cells organized and stacked in columns are found in areas where sensory information is processed. Imagine these specialized modules of neurons working together to produce, say, "red colour" suprels here and "high-pitched sound" or "sweet smell" suprels there.[54]

---

[48] If so, it is little wonder that we failed, thus far, to pinpoint what tells the neural correlates of consciousness apart from nonconscious brain processes, since conventional neurobiology doesn't deal with the eerie mind-stuff that supparal is. Eerie, invisible, and nonlocal to boot!

[49] In paralgen-studded areas, more neurons recruited means more paralgens involved—and hence, more paral produced.

[50] Qualia is from Latin. Etymologically, the word is akin to quality. Its singular is quale.

[51] If so, ***suprology***, that is, the study of the mapping or correspondence between suprels and qualia, will be a fiendishly difficult field of investigation; since our current technologies can't detect, let alone observe, any suprel whatsoever...

[52] The study of suprels may draw on topology, on combinatorics and graph theory (with the particles as the nodes and the supral links as their connecting edges or lines), and, of course, on quantum information theory.

[53] We recall from Part Two that the so-called "monogamy of entanglement" means that a supral link, as regards as entanglement-by-supra-conservation, cannot be shared by more than two (holo)particles. However, even in this type of entanglement, a particle can share as many different supral links as there are quantum observables in its complete set of commuting observables. A spin-entangled (holo)electron, for example, will be spin-entangled (or spin-supralled) with one other electron only, but it can be momentum-entangled with a third electron. It is so because a supral link is observable-specific. It bears on a given observable—e.g., spin or polarization—through a supra-conservation law. See Part Two again.

[54] From my 'Expanding Matter…' paper yet anew. That would partially explain the modularity of the brain organisation.

Those vertical cylinders or cortical columns were discovered in 1957 by Vernon B. Mountcastle, upon observing that cortical neurons firing together in response to a specific kind of touch were stacked in columns. These are elementary patterns of organization, made of cells that work together on a single job.[55] After this discovery, as we learn from Jay Ingram, "*brain scientist soon found the same pattern in areas of the neocortex that process vision and other functions: cells working together stacked in columns. The finding confirmed that the brain has specialized modules that divvy up the jobs of parsing sensations, making decisions and acting*."[56] The cortex contains an estimated 150,000 of these vertical columns. They span the six layers of the cortex and have rather similar appearance from a cortical area to another, yet they perform different functions. They work in parallel. For example, some of them will process simultaneously the motions, shapes, colours, tastes and sounds of an evolving visual scene. These columns may look similar, but it seems likely that their finer "wiring layouts" are different and are geared to the type of suprels they turn out.[57]

Neuroscience provides valuable leads as to where some putative suprels are likely to be made. This is especially true with the visual cortex, which has been widely studied. Indeed, "*The visual cortical areas are organized as a mosaic, within which the different submodalities, such as form, motion, and color, undergo separate but parallel processing*."[58] We may speculate that these areas are where the suprels of form, motion, colour, and so on, take shape. For example, there is solid evidence that areas called V4 and V5 process colour and motion respectively. We also know where the suprels of fear and joy, for example, are churned out in the brain. (All these are worthwhille clues for suprology.)

Let's now go back to the issue of paralgens. Assuming that they exist, where are they in the brain? I believe that post-synaptic receptors channels, where flows of particles and ions gush into the nerve cells, are likely paralgenic microsites. This is because paralgens, to carry out their enparalling task efficiently, must stand in the way of such flows, or at least very near.[59] This being so, here is what I propose:

> Of particular interest is the so-called NMDA post-synaptic receptor channel found on the dendritic synapses of large bursty pyramidal cells of the fifth cortical layer. It is ligand-gated and hence selective, it is highly nonlinear, and it is excitatory.[60] Moreover, this post-synaptic NMDA receptor channel is involved in a wide range of neurophysical and pathological processes and may be a prime candidate to explain the synchronous [40 Hz] oscillatory behaviour in the cortex.[61]

---

[55] Cortical columns may have over 100,000 spine synapses—typically belonging to pyramid-shaped cells, which roughly make up half the neurons of the cortex—tightly grouped in dendritic clusters that have been shown to carry out a lot of neural processing. I suspect these columns to cook up specific suprels, which the brain would then send forthwith to the tip of the cognitive iceberg (see below).

[56] Excerpt from Jay Ingram's book *The Theatre of the Mind* (Harper Perennial, 2005). We also learn from this book that Mountcastle "*found, in an area of the brain called the parietal lobe, strong evidence that the discrete columns of cells that did specific jobs talked to other modules, in effect, to coordinate perception, decisions and movement*." These "talks" are likely to help in binding subjective experience (I'll present the binding problem later on).

[57] This would explain why the brain is a massively parallel information processing system largely organized in discrete modules. It would also explain synaesthesia, where senses are combined in unusual ways, like hearing colours or tasting sounds. Synaesthesia would be a matter of "garbled" wiring, whereby the brain would forward some incoming sensory data to cortical columns involved in different modalities and sub-modalities, with the resulting perceptual mismatch.

[58] Quoted from Gordon M. Shepherd's *Neurobiology* (Oxford University Press, *3rd edit.*, 1994).

[59] Since suprels are supral patterns that bind together a few particles, atoms, ions and the like (and especially the ubiquitous calcium cations, Ca^{2+}), a fitting locus for paralgens would be near or inside certain postsynaptic pores and ion channels. These make perfect spots to enparal—i.e., to turn into paral—waves and flows of successive particles and ions, as they dash through.

[60] NMDA stands for N-Methyl-D-Aspartate, which is the agonist drug of the NMDA receptors (receptors are named after the agonist drug that activates them most effectively).

[61] For example, the NMDA system has a well-researched role in mental retardation, in degenerative conditions such as Alzheimer's disease, and in anaesthesiology (a general anaesthetic directly or indirectly affects the function of the NMDA system). Besides, I suspect that the so-called 40 hertz oscillations—in which the NMDA system also plays a part, and which actually vary within the 35-85 Hz range—may contribute in the brain to build and manage the "supral" side of supparal. Furthermore, NMDA channels are calcium channels, which means that they allow calcium ions, Ca^{2+}, to pass through. These Ca^{2+} are key players in nerve signalling, and they are released as a wave following a sensory stimulus. Incidentally, coming back to the lightbulb metaphor, we learn that "*The current flowing through a single ion channel (…) corresponds to the movement of some 0.6–12x10^7 ions per second through the channel*" (from Irwin B. Levitan and Leonard K. Kaczmarek, *The Neuron*, Oxford University Press, *2nd edit.*, 1997). This is to be compared to the fact that "*a sixty-Watt light bulb emits about 10^{20} photons per second*", as we read in Roger Penrose's *The Emperor's New Mind*.

Selective, nonlinear, and excitatory: these, I believe, are three key criteria that paralgens should satisfy. Let me explain. Selectivity is crucial to achieving a high signal-to-noise ratio in the information that enters conscious awareness.[62] Nonlinearity can also be expected, since linearity is often a rather smooth, deterministic—and hence, out-causal—feature, whereas paralgens spark off in-causal events by enparalling particles, ions and the like in the central nervous system. Being excitatory seems a likely feature too, since the action of paralgens is meant to arouse or enhance conscious states, which should have more to do with excitatory neurotransmitters than with inhibitory ones. It turns out that the post-synaptic NMDA receptors and ion channels of the large bursty pyramidal neurons of the fifth cortical layer meet all these criteria, which makes them attractive and promising candidates for the role of paralgenic sites. They have many additonal interesting features to boot. Here is why:

(1) ***Selectivity***: the NMDA-type receptors, being ligand-gated, display a sharp selectivity.[63]

(2) ***Nonlinearity***: nonlinearity is a common feature of synaptic transmission.[64] However, it is further increased in the NMDA postsynaptic receptor channels by the voltage-dependent magnesium ions that gate (open and close) them.

(3) ***Excitatory type***: NMDA receptors are glutamate receptors, and glutamate is the major excitatory neurotransmitter in the brain.

I conclude from the above that some paralgens are likely to be tucked near or within the postsynaptic NMDA receptor channels found on the dendritic synapses of large bursty pyramid-shaped neurons of the fifth layer of the cortex.[65]

I now present the cognitive iceberg model of sensory or perceptual awareness.[66] This sketchy model gives a rough exploratory idea of how the brain handles its alleged supparal to cope with perception. The notions of suprel and paralgen are its cornerstones. Like any iceberg worth the name, the **cognitive iceberg** has two layers. The lower one is its underwater—or rather, its *underaware*—part. The upper one is its tip. The **underaware layer** is where the bulk of the brain processing takes place. It is where incoming sensory stimuli are encoded, in a profusion of suprels. These suprels are typically made in specialized cortical areas—perhaps in various cortical columns, working simultaneously and in parallel.[67] For want of paralgens, they remain in the unconscious matter state of holomatter. Consequently, the underaware layer is home to the initial, nonconscious, and parallel brain processing. This tallies with what is known about the brain treatment of sensory data.

Once made, the newly minted suprels are sent in droves and in a stream-like manner to the **tip** of the cognitive iceberg, where zillions of paralgens are at the ready to enparal what comes their way. Here the suprels are therefore enparalled successively, as they arrive. They then blend with the wider conscious state, into which they release their multifarious

---

[62] (*This note anticipates on the cognitive iceberg model soon to be presented*.) Owing to this selectivity, the particles and ions, say, enparalled by these paralgens partake in suprels sent from the underaware layer of the cognitive iceberg straight to its tip. It is convenient to label these "meaningful" ions—involved in information-laden suprels that contribute to our qualia when they are enparalled—as *suprel ions*.

[63] This selectivity it achieved by the rather unusual phenomenon of voltage-dependent blockade of the NMDA receptors' ion channels by extracellular magnesium ions. (Magnesium ions, Mg^{2+}, float freely in the saltwater solution that surrounds neurons.) Because of this, as David J. Linden writes in *The Accidental Mind* (Belknap Press, 2007), "*The NMDA-type glutamate receptor can differentiate low-level background activity from high-frequency bursts. (…) The NMDA receptor is a coincidence receptor: it opens and fluxes calcium ions when both glutamate is released and the postsynaptic membrane is depolarized, but neither of these events alone is sufficient*." I surmise that the low-level background activity, as a rule, is mainly noise whereas the high-frequency bursts carry neural (and suprel-based) signals. When the Mg^{2+} plug is expelled from the mouth of the NMDA receptor, it allows Ca^{2+} to flow through the NMDA receptor channel into its pyramidal—or pyramid-shaped—postsynaptic cell (most of the current in the NMDA channels are due to these Ca^{2+}, but sodium (Na^{+}) and potassium (K^{+}) cations also contribute). Gordon M. Shepherd concludes, in *Neurobiology* (Oxford University Press, 3rd edit., 1994): "*The NMDA channel has several critical properties. There is a voltage dependence, due to the voltage sensitivity of the Mg^{2+} block; (…) there is an associated threshold depolarization for activation, which is a highly nonlinear property. There is a prolonged, non-desensitizing activation of the channels. And there is a high permeability for Ca^{2+}; in fact, most of the current in the NMDA channel is carried by Ca^{2+}. This is highly significant, because Ca^{2+} serves many functions in the nervous system*." (A membrane depolarization increases a nerve cell's ability to generate an action potential—i.e., an electric signal—and is therefore excitatory.)

[64] The diffusion of neurotransmitters inside the synaptic cleft, the activation of postsynaptic receptors, and the depolarization of the membrane of the postsynaptic neuron, are random processes. They contribute to this nonlinearity.

[65] It should be noted, however, that different subtypes of NMDA receptor channels are found in the Purkinje cells of the cerebellum, which is known *not* to contribute to conscious states. These receptor channels have specific characteristics that make their function and modulation different from those of NMDA receptors in the cortex.

[66] Alternative models—not considered here—would cater for some other cognitive functions and skills.

[67] In the case of vision, these specialized cortical areas might for instance be areas such as V1 for colour and V5 for motion, themselves comprising many sub-modality-specific cortical columns. If so, some cortical column in V1, say, would turn out colour suprels related to a particular shade of green while other columns nearby would deal with a particular yellow hue.

contents. Now these contents are subjectively felt or experienced. They become bits of broader qualia. Consequently, the tip is home to the final, conscious, and stream-like or serial, brain processing. Again, this agrees with what is known about the brain processing of sensory data. As an aside, recall that suprels are made of "beads" joined by "threads"—or really, of particles joined by supral links—and such beads could typically be the ubiquitous calcium ions (Ca^{2+}) found in the brain. These ions or cations would spurt from the underaware layer in waves and bursts triggered by sensory stimuli. The suprel-bearing ions, or **suprel ions** for short, would rush into some NMDA channels, which are calcium channels and may include paralgens.[68]

We can illustrate this proposed scenario of the iceberg model by our sense of vision.[69] Suppose an apple is in front of us. The brain will deal with the visual data coming from the fruit by breaking them up into various sub-modalities such as colour, shape, orientation, motion, spatial location, depth, and texture. It will then process them separately. Altogether, no less than 30-odd different specialized zones in the brain will treat these sub-modalities, each working simultaneously and in parallel.[70] This is a general feature of the brain:

> Extensive work in neurobiology, psychology, and neuroscience suggests that brain structure and function are organized into discrete modules. Mental life, an apparently unified experience, actually consists of multiple individual components. (…) Sensory processing occurs through multiple, parallel pathways. In vision, for example, color, motion, and depth are analyzed by different pathways that nevertheless result in apparently unified perception.[71]

The cognitive iceberg proposal is that our vivid, "technicolor" mental images result from the following two-stage process:

> (a) First, there is the earlier processing in the large underaware layer, below. Sensory stimuli are its input and suprels are its output; these stay in the unconscious matter state throughout. This early treatment is simultaneously distributed over many areas, each dealing with a sub-modal aspect (e.g., colour, shape, motion, etc.) of the visual scene.[72] At this stage, the apple isn't seen yet.[73] No sooner are they made, most of these suprels are sent to the tip.
>
> (b) Then, there is the later processing in the small tip, above. Underaware suprels (i.e., suprels coming from the underaware layer) are its input. Qualia—and occasionally, conscious recalls—are its output. The tip is awash with paralgens that turn the flows of incoming suprels into streams of qualia, by kindling or enparalling them. This neural processing is therefore conscious and stream-like, or serial.[74]

I suspect that this two-step operation is how the brain translates sensory stimuli into the language of the mind, which is made of qualia. To recap: (a) the underaware layer of the cognitive iceberg turns sensory stimuli into suprels and send most of them to the tip, through different pathways. Then, (b) the many paralgens in the tip collectively turn these suprels into qualia which become available to the broader conscious state. So, the cognitive iceberg model contrasts a non-

---

[68] Of course, all this is wholly speculative and may be entirely mistaken; but at least this is how I try and make sense, as concretely as possible, of the holomatter-based approach to the conscious brain.

[69] Amazingly, nearly half of our cortex is dedicated to processing visual information. No less amazingly, the honeybee possesses a trichromatic colour vision similar to ours in its functional and architectural principles. It can perceive the same visual sub-modalities as we do, with a brain that contains about 850,000 neurons only. This makes it a valuable animal model to study parallel visual processing in the brain. As an aside, let me add that our trichromatic colour vision rests on three cone opsins, one for red, one for green and one for blue—which may seem an odd and "sub-optimal" mix, given that the three primary colours are red, *yellow* and blue (green is a mixture of yellow and blue). Dogs, by the way, have only two opsins, goldfish have four and mantis shrimps are blessed with twelve—*is there any sound reason, any selective advantage, why it should be so?*...

[70] The cortex is divided into primary, associative and tertiary areas. These correspond to different stages of the brain information processing.

[71] Excerpt from the book: Ira B. Black, *Information in the Brain*, Bradford Book / MIT Press, 1994. The visual information is therefore distributed along many different pathways and over many different zones in the brain. This distributed processing comes as a surprise, due to the lack of neurobiological mechanism for later combining all its simultaneous and parallel operations into the coherent representation of what becomes finally a mental image. This conundrum is known as the binding problem (I'll come back to it).

[72] For example, the visual area dubbed V4 processes colour and area V5, in the middle temporal cortex, treats motion. People with a lesion in area V5 cannot perceive motion, despite being able to see unmoving objects normally. This strange cognitive deficit is called akinetopsia.

[73] This unconscious or pre-conscious processing may account for the fact that conscious experience always lags slightly behind. It is estimated that we always live at least one fifth of a second behind the times because it takes at least 200 milliseconds (two tenth of a second) for us to become conscious of a sensory information arriving in the brain.

[74] However, the brain has also the capacity to process information of which we aren't consciously aware. Indeed, most of its cognitive activity is run behind our conscious mind (see the upshot problem below). Note that the brain is also a bath of neurochemicals (neurotransmitter, neuro-hormones…); and, as Chris Nunn writes in *de la Mettrie's Ghost*, (Macmillan, 2005), "*There are physiological underpinnings like dopamine release associated with all [manner of] feelings and experiences. Nevertheless, experience can appear to cause physiology as well as the other way round; though the latter view is the one often favoured by reductionists*." As if to illustrate this last point, Patricia Churchland declared: "*The love I feel for my child is really just neural chemistry*."

conscious and parallel initial processing, in the underaware layer, with a conscious and sequential final processing in the tip. This suggests potential solutions to a few riddles, some of which are age-old conundrums, such as:

A. The ***parallel/serial problem***. It arises from the so far unexplained discrepancy existing between the unconscious brain processing and the conscious one. The former is massively parallel (distributed over many areas) while the latter is stream-like or serial. The im-im solution, as we already know, is that the processing is both unconscious and parallel in the underaware layer of the cognitive iceberg whilst it is both conscious and stream-like in the tip.

B. The ***upshot problem***. This conundrum refers to the fact that what reaches consciousness is not the neural computations of sensory data but the results, or upshots, of their processing in the brain.[75] The cognitive iceberg model explains it because with it, sensory awareness arises only in the tip, which is home to the final or upshot stage.

C. The ***qualia problem***. It is about the conversion of neuronal information into perceptions experienced by the conscious mind. We already know the im-im solution. It is that sensory data are turned into unconscious suprels (in the underaware layer) that become felt qualia (in the tip) when they are enparalled.[76]

D. The ***binding problem***. It raises the issue of the puzzling oneness of our conscious experience, when the bulk of the underlying brain computations—visual and otherwise—is spread over many areas with no neurobiological mechanism for combining their separate and parallel processing into the final coherent, unbroken and seamless experience of what we become aware of.[77] The im-im solution is that supralness is likely to contribute significantly, yet "on the sly", to this binding. Recall that supralness is stark invisible and binds particles and objects, whether near or far. It does so in the in-causal, and hence psychic, dimension of holomatter. This is particularly relevant for the brain.

E. The ***consciousness problem***. This, of course, is by and large the most important problem! It poses the question as to why some brain activities correlate directly to conscious awareness and subjective experience when others, e.g., in the cerebellum, do not.[78] The im-im answer is that our ordinary states of consciousness stem from the simultaneous enparalling actions of squillions of paralgens (in the tip) that are suprally combined to make large flows of supparal. The nonconscious brain activities are paralgen-less, or almost so.

The fraught issue of free will and that of declarative (or mental) memory could also be looked into in relation to the im-im perspective. This cannot be done in a few paragraphs, and I won't develop here.[79]

Hopefully, it will be experimentally possible to put the holomatter hypothesis to the test. Modern technology and its future developments might for instance ascertain whether paralgens exist or not. Or whether qualia depend on suprels. Or whether supral links or psi-threads are psychic—then, they'd occasionally give rise to telepathic events. However, one should not expect any hard and fast conclusive test. The difficulty is obvious: suprels, supparal and the like are outright invisible. What we are after are intangible entities made of psi-sparks bound together by psi-threads. Paralgens are more concrete, but what sets them apart is their paral output—which, again, is outright invisible. This may prove hugely challenging.

---

[75] This, by the way, implies that most of the information processing carried out by the brain is unconscious. Indeed, this "upshot" feature is extremely fortunate. Were it not so, all the stages of the brain visual treatment (or computations) would be consciously felt, so that our vision would be blurred and muddled by a messy clutter of superimposed images. It would be so hazy and foggy that we wouldn't be able to make sense of any visual scene!

[76] We may therefore suppose that an inability to experience some qualia found in some persons can be due either (a) to the lack or loss of the matching suprel-churning ability (caused by a brain lesion for example) or (b) to an impaired pathway that, normally, would bring these suprels to paralgens for them to be enparalled and thus become experienced.

[77] So far, no one has found a brain mechanism capable of transforming the firing of neurons scattered throughout the visual cortex into a unified perception. As we read in Francis Crick's book *The Astonishing Hypothesis* (Simon & Schuster, 1994), "*We can see how the visual part of the brain takes the picture (the visual field) apart, but we do not yet know how the brain puts it all together to provide one highly organized view of the world—that is, what we see*." And, later in the same book: "*There appears to be no single cortical area whose activity corresponds to the global content of our visual awareness*." These remarks still hold today. This binding, however, is limited, imperfect and partial only, as evidenced by split-brain subjects in controlled lab experiments. Broadly speaking, the problem of how various distant neural processes lead together to a unified conscious experience eludes neurological explanations, since this unity is achieved from the outputs of separate and functionally distinct regions *without the use of any assembly area*.

[78] At about 10 percent of the brain's total volume, the cerebellum is compact and contains a whopping 69 billion of the 86 billion nerve cells of the whole human brain. It is home to a superfast wiring system. This notwithstanding, it does not contribute to our conscious states at all. Its main job is to control voluntary movements and balance.

[79] The im-im insight suggests, in a nutshell, that ***Our mental memory is supral in essence***. It means that our declarative memory is recorded by means of suprels, which are therefore *nonlocal* memory engrams. The recall of our recollections would then occur when some of the matching underaware suprels—amongst those not yet sent to the tip—would be enparalled. (Remember that parallings are supralicide.)

The wilder shores of in-causation

From immanence to transcendence

The issue of transcendence is plainly and vastly beyond our ken. Perhaps it is nevertheless possible to catch a limited and tentative, but still interesting and worth its while, glimpse of this mysterious and largely uncharted territory.[80] Here I'll broach it; and what follows is purely speculative. It should be taken *cum grano salis*—with a pinch of salt. My exploration will be strictly conceptual and won't have anything mystical.

The world that surrounds us—assumed to be holomaterial—is dominated by determinism and cannot be stripped of out-causation. This defines it as immanent. But what if this out-causation were to go? What if pure and unmitigated in-causation, one that would be utterly free and totally untethered to out-causation, did exist? These questions plumb the depths of something nearly unfathomable, i.e., ontogenesis.[81] We'll soon gather that full and untethered in-causation possesses novel features that tell it apart from partial in-causation. It therefore deserves to be named differently, and I christen it ur-causation. **Ur-causation** is in-causation shorn of any hint of out-causation.[82] We cannot really figure it out; but perhaps we can still learn a few things about it. Let's try!

Whether partial or total, in-causation is a matter of active self-reflexivity. It is, as it were, a matter of decision-making, a matter of having a say on some of the rules of the game of existence; instead of having them forced upon from outside or elsewhere. Now, when it comes to ur-causation, it is not *some* but *all* these rules that are self-decided (so to speak). Thus, a ur-causal entity is blessed with unlimited freedom. Its active self-reflexivity is unrestricted. A major and far-reaching implication is that a ur-causal entity can modify itself as it wishes (so to speak again), with no impediment and no restraint. It entails that a ur-causal entity—a ur-entity for short—is altogether *self*-begetting and *all*-begetting. This makes for a paradoxical mode of existence where many of our concepts lose their currency. They do not apply and must be re-invented or dismissed altogether. Thinking out of the box is definitely needed here! The great Sufi mystic and poet Rumi said that language is a tailor's shop where nothing fits. This is especially true with ur-causation, because to think about it means to think beyond the limits of thought, which is bound to stretch language beyond what it can attend to.[83]

To give an inkling of how our current concepts are irrelevant, let's briefly consider three notions that we usually take for granted: that of existence, that of causation, and that of identity. The notion of existence comes first. Surprisingly, and perhaps shockingly, a ur-entity, by its very nature and upon exerting its self-reflexivity, can fluctuate *reversibly* between existence and nonexistence. Of its own accord, it can fluctuate between naught and aught. It can wax and wane between being and non-being, deliberately and intentionally. It is therefore wedded to change and impermanence. In it, nothing is rigidly fixed. In a way, a ur-entity hovers on the brink of nothingness and could almost be called a self-fluctuating naught.[84] It is a bit like the mythic uroborus snake that swallows its own tail and looks set to swallow itself entirely. Given the inherent reversibility of whatever relates to ur-entities, a genuine "ur-oborus" would be equally capable of pulling off the opposite feat—of spitting its tail out and even, of spewing itself back into existence! This illustrates almost graphically how a ur-

---

[80] I addressed the issue of transcendence at some more length in *L'Origine Quantique de la Conscience* (Le Temps Présent, 2015). See also my articles: 'Le Big Bang et la Genèse du Monde' (in *La Jaune et la Rouge*, N° 462, February 1991) and 'From Naught to Aught: A Conceptual Inquiry' (in *Mereologies*, Proceedings of ANPA 18, 1997.)

[81] Etymologically, ontogenesis means the genesis of a being. It is a branch of metaphysics that investigates the mystery of coming-into-being, of being and becoming and of existence *qua* existence; regardless of the contingent features of that which exists.

[82] The shift from ur-causation to *partial* in-causation—and, as I see it, from transcendence to immanence—amounts to emptying in-causation of any hint of out-causation that may stick to it. It loosely resonates with Isaac Luria's Zimzum theory. According to the sixteenth century kabbalist, God created the universe by making a void or a hole in himself. As Karen Armstrong explains in *The Case for God* (Vintage, 2009), Rabbi Luria "*created an entirely new creation myth that bore no resemblance to the orderly cosmology of Genesis, and that began with an act of kenosis [self-emptying]. Because God was omnipresent, there was no place for the world, no place where God was not. So En Sof, the inscrutable and unknowable Godhead, as it were, shrank into itself in a voluntary zimzum ('withdrawal'), a self-diminishment that made itself less.*" In short, in Luria's idea, "*God is everything but creates a hole in which the universe can come*." I take this *zimzum* hole as symbolizing a limited dent in God's ur-causation, a dent consisting in the self-decided and self-generated creation of some partial out-causation somewhere. Its onset would spawn a universe such as ours. Being self-decided—and hence, reversible—it wouldn't truly weaken (ur-)God.

[83] Therefore, a tailor-made "ur-language" geared to grapple with ur-concepts and with their unfamiliar ur-logic will be in order, if we are to seriously address this other-worldly issue. (Ur-logic is the logic of ur-causation. Expect it to have counter-intuitive twists of its own.)

[84] This "self-fluctuating naught" has nothing to do with the fluctuating vacuum of quantum field theory, which contains all the (out-causal) laws and rules of physics—and teems with a simmering froth of virtual particles to boot! (We should rather talk of quantum vacuums—or *vacua*—since in quantum field theory, there's a different one for each and every quantum field.)

entity bridges the gap between naught and aught, owing to its unshackled self-reflexivity.[85] This gap cannot be crossed in a context of irreversibility; but in the land of ur-causation, everything is reversible.

Consequently, no ur-causal entity can be said to exist really and fully, in the usual sense—remember, it can *reversibly* annihilate itself. Just as easily, it can self-beget or bootstrap itself into existence. This is the magic of ur-causation: a ur-entity is free to pop in and out of existence, on whim as it were. Since we belong to a world where irreversibility and out-causation prevail, we may find it hard to wrap our mind around such an idea... To avoid any confusion with ordinary existence, I'll say that a ur-entity is *beable*, **beableness** then being the quality of being in a *reversible* mode of existence—which is a dynamic and self-begetting mode as well. This chimes in with a thought of Meister Eckhart, who wrote that "*God becomes and disbecomes*." If God is a ur-god, such an idea is warranted. Denys the Areopagite is also worth mentioning here. According to his apophatic theology, "*We cannot even say that God 'exists' because our experience of existence is based solely on individual, finite beings whose mode of being bears no relation to being itself*." John Scotus Eriugena, like Denys, "*insisted that God is 'Nothing' because he does not possess 'being' in any sense that we could understand*."[86]

The second notion is that of causation. We are used to grok causation in a timed or tensed frame, where a cause always precedes its effect. The challenge here is that there's no space-time, no "ur-time" and no arrow of time. This is because a space-and-time is inextricably bound up with the out-causal dimension of a substance such as holomatter—of which ur-causation is bereft.[87] Any speculation about ur-causation ought accordingly to be un-timed and un-spaced. It must be explicitly *space-time-less*. This confronts us with the necessity to unlearn the notions of space and time, as far as it goes. A rethink is in order; but to reinvent causation without any notion of time and time arrow will certainly be a challenging and difficult task. However, there is a silver lining which may hint at a consistent solution to this conundrum: with ur-causation, cause and effect are one and the same; so that there's no time ordering, no time arrow, between them.[88]

The third notion is that of identity. The hitch here is that a ur-entity has no fixed attributes on which a definite and clear-cut identity could be unambiguously pinned. No steady and dependable strings are attached to it. The only thing that gives it away, and the only thing we may fall back on, is its meta-attribute of ur-causation—which, pointedly, is nothing like a stable and fixed attribute. Heraclitus claimed that all things are in a flux and that becoming is the very essence of life and reality. This is certainly true as regards a ur-entity, which is a dynamic process of self-production that, as such, has only transient and reversible attributes. This being so, the very concept of ur-causal identity is an oxymoron; much like, by the way, that of *dynamic* process in an un-timed framework.

To the question: *What caused God?* a traditional answer contends that "*God does not need a cause. He is a necessary being, whose cause is found within himself*." This asserts that God is His own cause, as His essence implies his existence. This indeed is fully congruent with the notion of ur-entity (say, of ur-god), which is necessary insofar as it cannot be irreversibly wiped out. As a beable being, it can always pull or bootstrap itself out of naught, regardless of any outer or prior cause. It is Phoenix-like. It is prone to ever fluctuate, both ways, from (reversible) naught to (beable) aught. The same mind-boggling magic of ur-causation enables it to kick off the onset of out-causation, thereby summoning all things into existence.[89] Interestingly, in his book *God and the New Physics*, Paul Davies raised the question: "*If God is the cause of all existing things, then does it make sense to talk about that ultimate cause itself changing?*" My answer is a resounding yes. Yes, it does make sense; provided we assume that God is a ur-god. This is because the reason why he is the cause of all that exists and the reason why he is inherently changing—or *self-changing* precisely—are one and the same. This is down to his ur-causal nature.[90]

---

[85] More accurately, in this context naught or nothingness is just a particular (reversible) state of aught, as any other of its states. Naught, or utter emptiness, becomes the paradoxical source of whatever can possibly be. It is so because "ur-naught" or "ur-nothingness" is not rigid. Being reversible and 'unstained' by out-causation, it can turn into anything that can possibly be—in the sense of being an unfolding process of self-begetting or self-generation. Nicholas of Cusa said: "*An understanding of God is not so much an approach towards something as towards nothing*." This I believe is quite appropriate if God is an "ur-god" or an ur-entity.

[86] These last two excerpts are from Karen Armstrong's book *The Case for God* (Vintage, 2009).

[87] The space-time frame of a substance (such as holomatter) is dependent on its (stable and reliable) out-causal dimension. It leaves the in-causal dimension out. This, incidentally, explains why the in-causal dimension of holomatter has no truck with its relativistic space-time.

[88] Tensed causation holds that the cause necessarily precedes its effect. Overall, this creates a chicken-and-egg problem. There is no such a problem with ur-causation, since the chicken and the egg—the cause and its consequence—are self-same.

[89] We recall that, according to the im-im insight, there is an alleged link between in-causation on the one hand, and psychism and awareness on the other hand. This suggests that a ur-causal entity might possess a sort of unknowable *hyper-awareness* or *hyper-consciousness*, even though it fluctuates between naught and aught.

[90] Questions such as this one are in the remit of ur-logic and ur-theology. They are not treated here. My point, though, is that if God is a ur-god or a ur-principle as he could conceivably be, then he is definitely *not* the "unmoving prime mover" that Aristotle envisioned. Think of it:

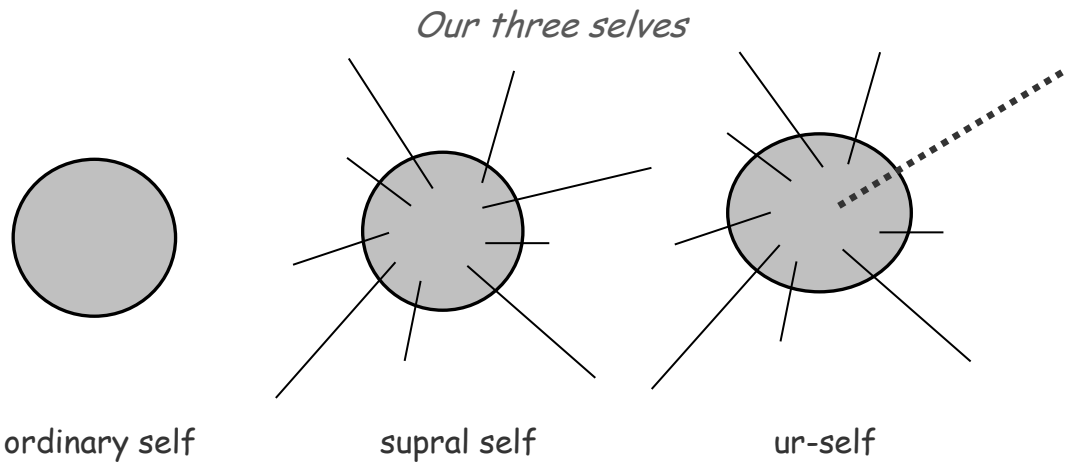
My conclusion is twofold:

(a) Ur-causation comes first—philosophers would call it an *ontological primitive*. Simply put, it means that the spirit is primary.[91] Arthur Eddington said that "*The stuff of the world is mind-stuff*." I'd rather say, to convey the primacy of the (ur-)mind: *the stuff of the world arises from ur-stuff*. (Presumably, this ur-stuff is a kind of "hyper-mind-stuff".)

(b) Ur-causation delineates a transcendent layer of reality. It is self-reflexive and reversible, and may morph, as it were, into all manner of things and beings. An ur-causal entity may spawn a universe such as ours; and it is not so far-fetched to think of it as a creator ur-principle, or as a ur-god.

Larger than life: our unlimited selves

Holomatter leads to an extended view of the human nature and of our inner power. As physical *and mental* beings, we possess the gift of in-causation. And, thanks to zillions of hidden, unseen supral links or psi-threads that connect us to the outside world, we are broader than our physical body. Much broader indeed! We are connected in the deep to the world at large. And to mankind. And to life. And to whatever is. Roughly speaking, we can distinguish three conceptions of who we are, of what our self is. We have an ordinary self, a supral self and a ur-self or whole self, as shown below:



This fairly rough drawing sketches three views of the human self, as seen through the lens of holomatter. On the left, we have a symbol of the ordinary self. In the middle, we have that of the supral self, or "supral hedgehog", which adds to the ordinary self its countless supral links, that ever lurk unseen. Lastly, the sketch on the right represents the whole self or the ur-self, which adds to the supral one a transcendent connection to the ur-dimension (*dotted line*).

These three selves are somehow like *matryoshka* dolls. The ordinary self is our workaday self. It is the obvious one. It includes our physical traits and appearance, our cognitive abilities—like our mother tongue, our cultural heritage, etc…—and so forth. The supral and the whole or "ural" (i.e., ur-connected) selves lend weight to the claims of many mystics and to the teachings of many traditions, that we are connected in the deep to something larger than ourselves. The supral self is nonlocal. It underscores the invisible inner interconnectedness that unites us to the world. As I wrote: "*Through [the extended supral fabric formed by supral links or psi-threads,] we relate to our fellow humans in a very intimate way. Unfortunately, we normally fail to realize this (in our usual level of consciousness). Owing to this interconnectedness, our selves are genuinely transpersonal. They are neither hide-bound nor separate. They partake in a Great Whole*."[92] True to it, the supral self is inherently transpersonal. With it, we're not islands unto ourselves. Rather, to quote William James again, "*We are all like islands, separate at the surface but connected in the deep*." As we know, these connections hold regardless of the distances; and, due to their psychic nature, they are telepathic bonds in a way. The ur-self, finally, adds to the supral self our possible "ural" connection to a transcendent ur-entity, that some would call 'divine'.

---

if God were an unmoving prime mover, rigidly unchanging, then he would be out-causal. Now, isn't it clearly inconsistent to assume that God almighty is not ur-causal? (While we're at it, let me stress that our world is, so to say, ethically flawed. This is due to Einstein's formula, $E = mc^2$. It implies that to survive (to have enough energy to stay alive), life must eat—and kill—life. Ours is a world or predators and preys…)

[91] In this view, non-conscious out-causation could be seen as a sort of "frozen" in-causation generated by some ur-causal initiative.

[92] From my article 'Mind, Body and Healing', in the *International Journal of Complementary Medicine* (JACM, UK), November 1994.

If the eternal—and really, the *atemporal*—soul exists, it relates to the ur-self. This is how I see it. Science has very little to say about it; and indeed, spiritual masters insist that direct experience, perhaps coming through specific practices and non-ordinary states of consciousness, is key to fuller and deeper understanding.

With our three selves come three kinds of intuition. The first one is the ordinary intuition. It allows us to guess, for example, what someone really intends to do while pretending otherwise. It is useful but isn't always reliable. More trustworthy is the supral intuition. With this one, we may know things that objectively we shouldn't know, because the information is not available to us by conventional means. This extra-sensory "gift" feeds on supral information. When some of its suprels resonate in us, we may experience a flash of supral intuition. Suprels are available everywhere, regardless of the distance as we know, on the Great Supral Web or the Great Cosmic Web. This universe-wide cosmic web or network, structured here and there as a tangled patchwork of suprels, is a fantastic treasure trove akin to the so-called Akashic records. It is a shared resource that belongs to all. I believe that mediumship and a technique known as Remote Viewing rely on this supral intuition. Perhaps, too, a case of supral intuitive insight is that of soldiers who reportedly can "*sense a land mine on a street but can't tell you why. (…) They have a sensation of coldness but they can't tell you why*."[93]

The third and last kind of intuition is the one that possibly results from our ur-causal connection. This *ural* intuition, or better, this ur-intuition, refers to any knowledge, information, and in-depth understanding, that we may garner from the ur-causal dimension of reality. Some transcendent truths and comprehensions, felt or experienced in non-ordinary states of consciousness and during some NDEs, may belong to this ur-intuition. This possibility cannot be firmly established—nor should it be dismissed just because it goes against our prejudices and cognitive biases.

Supralness or quantum entanglement, and its universe-wide network of supral links or psi-threads, can provide information from yonder and elsewhere. It can also make nonphysical energies available to all. As I wrote, "*We are (…) entangled in a boundless network of supral threads; whereby we can communicate in a subtle way and exchange psychic energy. [This] provides a [possible framework] for psychic or spiritual healing—including* absent [*or* faith] *healing*."[94] This psychic and nonphysical energy, which I call supral energy, is defined as the sum of three terms, according to the formula:

supral energy = suprels + intent + resonance

To illustrate this notion concretely, let Heather, because of a skin condition, pay a visit to Tom, a local healer with a good reputation of efficiency (Heather and Tom are fancy names). As a result, Tom decides to send her some healing energies. We can very sketchily, and quite tentatively, figure out what follows. Tom creates specific suprels in his mind, inspired from his grasp of the skin condition and of a possible healing process. These suprels are readily shared with Heather but, to be effective, they must convey and radiate with Tom's healing intent or purpose to cure, and at least improve, her condition. That's not all, however, because Heather may or may not accept Tom's "supral remedy". More often than not, this will be unwittingly—on unconscious rather than conscious grounds. These may hark back to long forgotten events in her childhood.[95] And this is where the resonance comes in and plays out: for the "intent suprels" to be taken in by her, and hence to be fully efficient, they must *resonate* with her; unconsciously even more than consciously.

When these three factors—the suprels, Tom's intent, and Heather's resonant acceptance—work together, the healing may take place with an optimal efficiency. I must add that, fairly seldom, there's a "supral twist" to such a healing session, in that it appears to work for the benefit of another person. This happens when the other person—who needs not be present—is (suprally) connected, both directly or indirectly, to the one coming to the healing session.[96]

The global tapestry wrought by supralness or entanglement, and specifically by its supral links or psi-threads, forms a gigantic pool of psychic resources that are distance-blind and are potentially shared by all. Recall that these threads can

---

[93] From David Brooks' book, *The Social Animal: the hidden sources of love, character and achievements* (Random House, 2011).

[94] Again, from my article 'Mind, Body and Healing'.

[95] These events may even predate her own birth and go, at times, as far back as a few generations before—due to the collective unconscious.

[96] This happened spectacularly, and of course quite unexpectedly, to a healer whom I know personally. I call it the Aunt Agatha's syndrome (Aunt Agatha is the one who unwittingly benefitted from her nephew's healing session—not her real name). As for the practical efficiency of strong supral connections, I believe that they played a significant part in the astonishing paranormal experiments carried out by René Péoc'h in France. He spent 15 years studying animal telepathy and psychokinesis using young chicks and rabbits, along with a programmable robot which, being made of holomatter like everything else as I surmise, has an in-causal and psychic dimension. Going back to the healing sessions, it is worth stressing that the healer's mindset must always be one of openness. He must let go of judgments *and even of expectations*. There are two major reasons for this: (1) it could well be that Heather's ailment is a blessing in disguise because, say, she needs to go through this experience to learn something important for her; and (2) too strong and specific expectations would bring Tom's ego on board, putting the whole process in danger of becoming toxic rather than positively constructive.

be thought of as telepathic bonds. They are prone to give rise to telepathic events and to synchronicities.[97] They can be harnessed to channel supral energies, like those that aid healing processes. They may even drive psychokinetic events (somehow, a supral healing process is bio-psychokinetic). Within the im-im framework, we can therefore distinguish four types of medicine, understood in the broad sense of healing practice. Here they are, briefly presented:

(a) ***pre-quantum***, or classical, medicine: this quite successful Western type of medicine rests mainly on an understanding inspired by classical physics. Many consider that it tends to focus on the sick organs and body exclusively, forgetting that the individual is a larger and richer body-and-mind (or body-and-mind-and-spirit) whole.

(b) ***quantum*** medicine: it has some popular success today; and as far as I know it is chiefly based on the subtle and nonlocal action of the electromagnetic field, which admittedly plays a key role in living organisms.

(c) ***supra-quantum*** medicine: this is the "true", or full-blown, quantum medicine. It harnesses the fantastic potential of supralness, with its suprels and supral energies. However, these are unseen, and consequently, this medicine is at presence more art and intuitive practice than objective science.[98]

(d) ***ur-quantum*** medicine: this one, quite literally, is the medicine of miracles. By definition, a genuine miracle is a tangible effect of a transcendent cause that is above physical laws. It is, so to speak, an act of God.[99]

Let me add a few words about the afterlife. The im-im approach envisions two kinds of afterlife. One is immanent, the other is transcendent. The immanent one rests on the notion of suprel. The qualia we experience in our inner life are grounded in specific clusters of suprels, as we saw. Once these are formed, they have a life of their own as long as they aren't destroyed. They can survive and persist anywhere in the world around us, for near-endless eons, sheltered in the great cosmic supral web, this universe-wide net of invisible supral links that pervades everything, everywhere and everywhen. These clusters of suprels are witnesses of what we lived and thought on earth. Some of these are nigh-on eternal. Collectively they form an immanent afterlife of ours; one that, perhaps, can be revived—or partially and momentarily resurrected—through mediumship and through other means too. This agrees with this phrase of Allan Poe: "*No thought can perish*." Then, on top of this immanent afterlife of ours, there is a transcendent one, that could be bestowed upon us, undoubtedly as a priceless gift, by a creator ur-principle or ur-entity—by a ur-god if you will. This afterlife fits in with the idea of an eternal—and more accurately, of an *atemporal*—soul.[100]

A world of meaning and purpose

Life, *our* life, has purpose and meaning. Some facts strongly suggest it, and this is what I set out to emphasize here. Free will, our fine-tuned universe, and the assumed ubiquitous presence of in-causation—which has six problem-solving facets as we'll see—will successively help me make my point. I start with the vast and controversial issue of free will, which asserts that we are the originators of some of our decisions and actions, and that we can exercise conscious control over some of them. It posits that people could wilfully choose, at times, to act differently from the way they act and that, consequently, they are not mere deterministic robots or puppets.[101] Their "self-willedness" clearly smacks of in-causation. Today however, it is quite fashionable to believe, with Francis Crick, that "*We are nothing but a pack of neurons and free will is an illusion*." Thomas Hobbes, in the 17th century, already contended that "*Free will is a meaningless conjunction of words, an insignificant nonsense*." I suspect that the dislike, and even the outright loathing, of free will has to do with its "sinful" nature. Its "sin" is to acknowledge the possibility of purposeful acts and choices, when matter has no purposes and

---

[97] Recall that synchronicities are meaningful in-causal occurrence that can happen in people's lives. Their logic isn't out-causal, or material and deterministic. It is in-causal and driven by meaning.

[98] Traditional healers—whether shamans, faith healers or practitioners of so-called energy and vibratory medicines, and other specialists of nonconventional therapies—practice it 'unwittingly' if I may say so; in the sense that they don't need to think and to know about quantum physics and holomatter to perform their art!

[99] I mean that they're acts of a ur-entity or ur-god. There is a wealth of evidence as regards miracles. I found intriguing accounts of some—yet I always keep a pinch of salt handy—in Piero Vigorelli's *Miracoli* (Piemme Pocket, 2004; an Italian book).

[100] My book *La Conscience Quantique et l'Au-delà* (Guy Trédaniel, 2nd edit., 2013) develops this idea of both an immanent afterlife, inherent in our holomaterial universe, and a transcendent afterlife. It also dwells on some paranormal phenomena. (It also explains that in the context of organ grafting the donor's qualia may be partially 'reawaken' in the beneficiary's mind.)

[101] William James, in his diary, gave this personal testimony: *"I finished the first part of Renouvier's second Essais and see no reason why his definition of free will – 'the sustaining of a thought because I choose to when I might have other thoughts'—need be the definition of an illusion. (…) My first act of free will shall be to believe in free will."*

no intentions: "*The brain has neither will nor intention; only the mind does. The brain also has no free will, even though the higher brain organizes choices and decisions*."[102] Free will is a threat to the materialist dogma.

Granted, many of our actions are driven by causes that lie beyond our control. It has even been shown that over 40% of our actions are governed by unconscious habits rather than by actual decisions. We are also much influenced by prejudices and cognitive biases that we're not even aware of. Still, there's a huge difference between having little or less free will and having none at all. To be bounded or limited doesn't mean *not* to be, and, as someone indignantly wondered, "*How did we accept as scientific facts that we don't have free-will, that our self doesn't exist, that nature and evolution have no purpose? Our subjective experience of a self, of free-will and of consciousness cannot be swept under the carpet just because our materialistic prejudice makes them inconvenient*." Have we been brainwashed?...

In defence of free will, I'll mention four facts.[103] The first one refers to experiments in social psychology. The second one deals with what I call the sensory lobbying. Next, I'll touch on the therapeutic method of self-directed neuroplasticity; and lastly, we shall find out why the dolphin sleeps in a puzzling "half-slumber" way.

Social psychologists have carried out experiments that reveal the significant impact that our conscious reasoning and intentions have on our actions. For example, "*A body of psychological research shows that conscious, purposeful processing of our thoughts really does make a difference to what we do*." In one experiment, "*dieters who consciously formed an intention to ignore thoughts about tempting foods whenever they came to mind then ate less of those foods than those dieters who simply set the goal to lose weight*."[104] In another study, Kathleen Vohs and Jonathan Schooler changed people's behaviour by persuading them that free will is largely an illusion. As a result, these otherwise honest people behaved more dishonestly, more selfishly and more aggressively. They were also more likely to treat wrongdoers leniently. This does make sense: what would be the point of punishing an automaton? And why to forgo some selfish advantages and stifle oneself on moral grounds? If free will is an illusion, morality becomes an empty concept…

Free will is a contextual property. It is a matter of *constrained* freedom of choice—this is what renders it adaptative, and hence useful, in the vagaries of life and survival. An aspect of its selective advantage is the sensory lobbying. By this I refer to a brain-made sensory language geared towards influencing our conscious decisions, by being either pleasant or unpleasant. This lobbying tends to induce actions and behaviours that are beneficial to the individual and to the species. This is the whole point of pleasure and pain; and the mere existence of this sensory lobbying affords compelling evidence that free will isn't a mere illusion—lobbying someone with no clout and no decision-making power would be a pure waste of time and energy, and our lobbying brain knows better! Pain, for example, elicits behaviours that protect against physical damage; and people with a rare condition called congenital analgesia keep hurting themselves because they feel no pain. This is not a blessing *because mental causation is a reality*. They live dangerous lives and often die young. On the pleasant side, the brain has a reward system. It was serendipitously discovered in 1953 by James Olds and Peter Milner in a rat's brain, and a similar system was later found in people.[105]

My third argument is based on Jeffrey Schwartz' method of self-directed neuroplasticity.[106] This method, of proven therapeutic efficacy, shows that our willed thoughts and directed mental activity can rewire our brain. This remarkable method, which "*doesn't only rescue the patients but rescues free will too*", is presented in *The Mind and the Brain*, a book co-written by Jeffrey Schwartz and Sharon Begley. They wrote: "*The time has come for science to confront the serious implications of the fact that directed and willed mental activity can clearly and systematically alter brain function; that the exertion of wilful effort generates a physical force that has the power to change how the brain works and even its physical structure*." What a powerful message of hope!

---

[102] From the book of Deepak Chopra & Rudolph Tanzi entitled *Super Brain* (Harmony Books, 2012). Interestingly, the brain has some areas that help in our decision-making, notably the anterior cingulate, the dorsolateral prefrontal cortices and the middle frontal gyrus.

[103] I mentioned other facts and gave further arguments in defence of free will in my book *Huit Leçons Essentielles sur la Science Quantique* (Guy Trédaniel, 2018). Perhaps free will is actually more a freedom to choose than a power to will. Schopenhauer would agree. He wrote: "*Man can do what he wills, but he cannot choose what he wills*." We can do what we decide to do but we are not quite free to decide what we will decide to do. For some, free will is simply about having a feeling of agency, of authorship or ownership of our actions. This might be why the physicist Euan Squires wrote that "*Freedom is a property of the conscious mind: if I* think *I am free then I* am *free."*

[104] These last two quotations are out of Eddy Nahmias' paper in *Scientific American*, Special collector's edition, Summer 2017.

[105] The brain reward or pleasure system includes the ventral tegmentum, the striatum, the nucleus accumbens (located in the septum), and various parts of the hypothalamus (which has pleasure as well as pain areas). The im-im suggestion is that these various brain regions are involved in cobbling up either pleasure suprels or pain suprels, perhaps in some of their cortical columns.

[106] Neuroscience demonstrates that the brain is not a finished product and can rewire itself in response to new experiments. It does so through new connections (or synapses) between neurons or through the production of new neurons in some specific brain areas—such as the hippocampus and olfactive cortex. Neuroplasticity is this phenomenon whereby the brain continually changes with what we experience.

My fourth and last piece of evidence comes from the animal kingdom. It could be called the breathing dolphin's dilemma or the dolphin's half-slumber. It concerns marine mammals. Poor hapless things, they have lungs rather than gills, and so they must breathe air… amidst the waves! In their watery environment this is a major handicap. The threat of drowning by inhaling water instead of air is serious and unrelenting. Things get trickier when a dolphin, like us, needs to sleep. How does it square the circle of breathing safely while asleep? The answer is that a dolphin… never sleeps! Well, I'm not totally accurate. The truth of the matter is that it never sleeps *fully*. Instead, it *half-slumbers*: when it is asleep, there's always one of its brain hemispheres that remains awake. Its sleeping half-brain switches side every twenty minutes or so. This is stunning! Besides, unlike what is the case for land animals like us, the dolphin's respiratory function evolved to be wholly deliberate. Its breathing is never automatic. It is wilful. The *raison d'être* of this half-slumber is the causal role of the mammal's conscious awareness in breathing.[107] This I believe provides compelling evidence that consciousness can be squarely in the driver's seat. If conscious awareness—whether that of a dolphin or that of a human being—were just a passive spectator of what the brain has resolved to do, the dolphin wouldn't have to half-slumber—instead, it would drown! Its half-slumber is a strong validation of mental causation and free will, since, for a dolphin breathing amidst the unruly waves of a choppy sea, free will is not a topic for idle philosophical musings. It is clearly a matter of life and death.

Overall, it appears that free will is a reality, even though it is more limited that we may think. We are not the automatons or the delusional robots that some claim we are. We live in a world where we can decide to work for the common good and for a better future. This world makes sense. As an aside, the so-called free will theorem, published by John Conway and Simon Kochen in 2006, is worth mentioning. It states that "*if indeed there exist any experimenters with a modicum of free will, then elementary particles must have their own share of this valuable commodity*," with the proviso that "*The free will we assume is just that the experimenter can freely choose to make any one of a small number of observations*." This theorem, as I see it, sounds like an endorsement of the in-causation hypothesis on which the notion of holomatter rests.[108] To conclude, let me quote this thought of Isaac Bashevis Singer: "*The greatest gift which humankind has received is free choice. It is true that we are limited in our use of free choice. But the little free choice we have is such a great gift and is potentially worth so much that for it life is worthwhile living*."

My last point touches on the discovery that our universe appears to be unthinkably fine-tuned—at an eye-popping and mind-shredding precision—for life to be possible in it. The constants of physics and the initial conditions of the universe, at the time of the big bang some 13.8 billion years ago, made life possible but, if any of these had been different, even by an exceedingly trifling amount, life wouldn't have arisen.[109] This is totally unexpected and utterly mysterious. For example, we learn from Paul Davies that "*An alteration in, say, the strengths of the gravitational force by a mere one part in 10^{-40} would be sufficient to [turn all the stars into} either be blue giants or red dwarfs. Stars like the sun would not exist, nor, one might argue, would any form of life that depends on solar-type stars for its sustenance*."[110] Wherever we care to look, we arrive at the same conclusion: upon changing the values of the physical constants, even by a ridiculously small amount, life becomes impossible in our universe. We're lucky—in a way which is nothing short of mind-boggling.

Something called the anthropic principle reminds us of the inordinate unlikelihood of our life-friendly universe. Indeed, there's more to our anthropic universe than its sole fine-tuning.[111] Another aspect is the still unexplained matter-

---

[107] The dolphin is demonstrably conscious. It passes Gordon Gallup's mirror test of visual self-recognition, which measures self-awareness (self-awareness arguably implies awareness *tout court*). Note, by the way, that the social (and highly playful) long-finned pilot whale—which is actually a dolphin—has about twice as many neurons in its cortex as human have!

[108] See John Conway & Simon Kochen, 'The Free Will Theorem', *Foundations of Physics*, **36**(10): 1441 (2006); and arXiv: quant-ph/0604079. A stronger version of it was published in 2009. We could freely infer, using the symbol '⇒' to mean 'implies', what follows. On the one hand, by holomatter we have: (1) {(*microscopic*) in-causation ⇒ (*macroscopic*) free will}. On the other hand, by the free will theorem we have: {(*macrosc*.) free will ⇒ (*microsc*.) free choice}, which can be construed as: (2) {(*macrosc*.) free will ⇒ (*microsc*.) in-causation}. Finally, (1) and (2) taken together entail the equivalence relationship: (3) {(*macrosc*.) free will ⇔ (*microsc*.) in-causation}.

[109] It should be noted that the big bang theory cannot say anything about the universe prior to the Planck time, which is around 10^{-43} seconds. This is admittedly exceedingly small, but it is nonetheless significant conceptually. Consequently, this theory cannot tell how the universe began—nor do the equations of physics, which no longer work there. It should also be noted that not everything was settled at the outset: according to our best theories, the fine-tuning of our universe depends on later events too. These events are notably the so-called symmetry breaking transitions that split an alleged primordial proto-force into the three interactions described by quantum field theory (they are: the electromagnetic, the weak nuclear, and the strong nuclear forces). Amazingly, these seemingly purely random transitions were just exquisitely right for our universe to be fit for life.

[110] From Paul Davies' book, *God and the New Physics* (Penguin, 1990).

[111] Because of this principle, I call our life-friendly-against-extravagantly-long-odds universe an anthropic universe—without explicitly referring to human life (even though anthropic is from *anthropos*, the Greek word for man as a species; as in anthropology).

antimatter imbalance.[112] There is also the unthinkably low entropy at the time of the big bang: around the Planck time (at about 10^{-43} seconds of age), the universe was in a highly ordered and extremely improbable state. Unlikely, too, is the fact that it didn't turn into an instant black hole, given its extreme density back then. This would have put a swift and untimely end to the cosmic adventure.[113] Penrose remarked that "*If this initial state of the universe were chosen at random, it seems exceedingly probable that the big bang would have coughed out black holes rather than dispersed gases*." He worked out the odds of our universe appearing by accident. His conclusion was, again, that our anthropic universe benefitted from a very special—and *unnatural*—choice of initial conditions, given that a black-hole cosmos is far more likely to arise. It actually turns out that if the big bang explosion had differed in strength by only one part in 10^{60}, our universe would have been unfit for life. As Paul Davies explains, "*To give some meaning to these numbers, suppose you wanted to fire a bullet at a one-inch target on the other side of the observable universe, twenty million light years away. Your aim would have to be accurate to that same part in 10^{60}.*"[114]

The third and last aspect I bring up here is the extraordinary and mysterious flatness and isotropy of the universe, and its uniformity in both its large-scale distribution of matter and its rate of expansion, the latter being remarkably equal in all directions of space. This near-perfect regularity is currently explained by an assumed era of runaway expansion of the very early universe, one that ironed out the wrinkles that should otherwise be observed in the universe. This putative era of so-called cosmological inflation is often regarded as a scientific truth, but no evidence and no fully convincing mechanism has yet been found for it.[115] It therefore remains a conjecture; and the cosmological flatness and regularities are still something of a mystery.

The nearly "miraculous" creation of carbon in the cosmos, so crucial for life as we know it, is a perfect illustration of the staggering fine-tuning of our anthropic universe. The extremely hot, dense, and helium-rich giant red stars are the cosmic cauldrons that forged most carbon nuclei, in a process that turns out to be truly very special.[116] The stellar nucleosynthesis of carbon-12 (also noted ^{12}C) happens through the so-called triple alpha process, which is a two-step process.[117] In the first

---

[112] Antimatter represents a mirror world of matter. Antimatter particles have the same mass as their matter counterparts, but have opposite electrical charges and other opposite properties. Theoretically, the big bang should have produced equal amounts of matter and antimatter particles; and these would have instantly destroyed or "annihilated" one another, leaving behind only a gigantic puff of energy—without any solid matter for life to appear later. No one knows why it wasn't so. This matter-antimatter problem is a big unresolved mystery.

[113] However, I see one (fairly speculative) possible explanation as to why our universe didn't become an instant black hole right after the big bang. It is inspired by the holomatter hypothesis and could be called the primordial paralation or the "ur-paralling". Here it is. The new-born universe was the theatre of an uninterrupted frenzy of parallings. Then, a high proportion of its particles were enparalled at any moment, because of the welter of inelastic high-energy collisions happening ceaselessly in this extremely hot and dense environment. Now, recall that the nonmaterial paral state doesn't contribute to gravity. The acute large-scale "ur-paralling" of the early universe would thus have markedly diminished—but less so over time—the overall intensity of the gravitation field. *Could this hypothetical effect—which needs to be quantitatively worked out—explain, at least in part, why our very early universe didn't evolve right away into a black hole?* (Another possible question is: *Could this effect account, at least in part again, for an inflation-like era of expansion of the new-born universe?*)

[114] From Davies' book *God and the New Physics*, already cited. (More recent estimates say that the universe is 13,8 billion years old.)

[115] Inflation is a very appealing idea that has may versions (e.g., cyclic inflation, eternal inflation and stochastic inflation). As cosmologist Sean Carroll spells it out, "*Inflation was conceived in 1980 by MIT physicist Alan Guth to explain why the observable universe is so flat and smooth, with galaxies distributed evenly throughout space and with almost exactly the right amount of mass to balance out its expansion. The idea is that immediately after the Big Bang, the universe was trapped in a state called a false vacuum, in which empty space was filled with an incredible, unbelievable amount of energy. The false vacuum was unstable, like a radioactive atom waiting to decay. Eventually it broke down into the ordinary vacuum of space as we know it, releasing tremendous amounts of matter and radiation. In the process, an extremely small patch of space inflated to enormous size, evening out any irregularity and giving rise to the universe we see today*."

[116] A red giant, or giant red star, is a dying star where all the hydrogen has burned off, leaving an extremely hot and dense core of helium (when a star runs out of its hydrogen, it shrinks and heats up under its own weight). There the density of helium nuclei reaches up to around 10^5 g/cm^3 (i.e., 100 kg/cm^3). As the central temperature of the red giant rises to 10^8 K, or 100 million degrees Kelvin—which is six times that of the sun's core—the helium nuclei, a.k.a. the alpha particles, fuse fast enough, despite the beryllium-8 instability, for significant amounts of stable carbon-12 to be produced by the fusion reaction (2) below. This is because of Hoyle's resonance, as I'll soon explain.

[117] The triple-alpha process (so named because it globally involves three alpha particles) is strongly dependent on the temperature and density of the star, and the nuclear fusion process described (2) below can only arise in a high-temperature environment with densely concentrated alpha particles (or helium nuclei, ^4He). Such an extreme environment is found at the heart of giant red stars. Note that the nucleosynthesis of a chemical element is the process by which its atomic nuclei are made. The heavier elements, such as carbon, were synthetized not at the time of the big bang but later, by a few generations of stars. By convention, the n in the symbol of the chemical element ^nX is the number of its nucleons, which are the protons and neutrons found in its nuclei. For example, ^4He is a helium-4 nucleus, with 2 protons and 2 neutrons; ^{12}C is a carbon-12 nucleus, with 6 protons and 6 neutrons; ^{16}O is an oxygen-16 nucleus, with 8 protons and 8 neutrons. Note that theoretically, there is another possible path to carbon nucleosynthesis, by the reaction: $^4He + {}^4He + {}^4He \rightarrow {}^{12}C$. This three-body process, however, is much too rare to explain the observed abundance of ^{12}C in the universe.

step, described by reaction (1) below, two alpha-particles—or helium-4 nuclei, noted ^{4}He—fuse into beryllium-8 (Be^8). In the second step, described by reaction (2), the beryllium nucleus captures a third alpha particle to form carbon-12 (^{12}C):

(1) $^4\text{He} + {}^4\text{He} \rightarrow {}^8\text{Be}$

(2) $^8\text{Be} + {}^4\text{He} \rightarrow {}^{12}\text{C}$

The nuclear fusion reaction (1) of two alpha particles yields a beryllium-8 nucleus. This highly unstable beryllium quickly decays back into alpha-particles, with a half-life of 8.19×10^{-17} s. *Unless*, that is, it already grabbed a third alpha particle, in line with the fusion reaction (2). Given the short half-life of ^{8}Be, reaction (2) must occur within some 10^{-16} seconds. Overall, this (1)-and-(2) two-step process happens to produce enough carbon to explain its abundance in the universe—courtesy of the Hoyle state as we'll see. This state is an excited state of carbon-12 with a precise energy and some other specific features.[118] It is the ^{12}C in (2), and it is a very unstable and short-lived resonance too, with a half-life of 2.4×10^{-16} s. Nearly always, it decays back into ^{8}Be and ^{4}He, and from there, back into its three constituent alpha particles. However, a small proportion makes it to the stable form of carbon-12, which is the ^{12}C ground state.[119] We are the lucky beneficiaries of this, and so is carbon-based life more generally. As nuclear physicist Marcus Chown declared in a press interview: "*You are made of carbon. So is every living thing on Earth. But the abundance of this element in our universe depends on a seemingly miraculous coincidence—an excited state of the carbon nucleus that our best models say shouldn't exist, but clearly does*."

The Hoyle state is named after the astrophysicist Fred Hoyle who, in the early 1950s, hit on the idea that the observed amount of carbon in the cosmos could only have been made in stars if there was an excited state in carbon with precise properties. The probability of a process like the triple-alpha one is extremely small, but the Hoyle resonance greatly increases the chances that the carbon-forming nuclear reaction (2) would happen.[120] The existence of the as-yet unknown Hoyle state was soon confirmed experimentally, three years later, by collider experiments. Had this state had a different energy, more unequal to that of three helium nuclei, there would have been no carbon-based life. The fact that its energy is exactly what is necessary for such a life is an exceedingly fortunate—and *miraculous*?—coincidence.[121] There is even more of the same, as we see now. Other than the Hoyle resonance having the right energy for the nucleosynthesis of carbon ^{12}C, it is equally important that the newly minted carbon doesn't disappear immediately, through the reaction:

(3) $^{12}\text{C} + {}^4\text{He} \rightarrow {}^{16}\text{O}$

Here a new "miracle" plays out, whereby the energy level of ^{16}O is such that it prevents the nuclear process (3) destroying all the carbon.[122] As we learn from John Barrow,

> The energies of the participating alpha particles plus the ambient heat energy in the [dense and hot helium-rich red giant] star add to a value that lies just above a natural energy level of the carbon nucleus (^{12}C) and so the product of the nuclear reaction finds a natural state to drop into. (…) But this is not all. While it is doubly striking enough for there to exist not only a carbon resonance level but one positioned just [at the right energy], it is well-nigh miraculous to discover that there exists a further resonance level in the oxygen nucleus (^{16}O) that [again is just right, so that] the precious carbon fails to be totally destroyed by a further resonant nuclear reaction. This multiple coincidence of the resonance levels is a necessary condition for our existence.[123]

---

[118] The Hoyle state has just a tiny bit more energy, at 7.65 MeV—and very accurately, at 7.6549 MeV (mega-electron-volts)—than the ^{12}C ground state, which has an energy of 11,177.93 MeV. It also has zero spin and parity ("$J^\pi = 0^+$ state").

[119] This small proportion is a paltry 0.0413 percent of decays of ^{12}C in the Hoyle state, which amounts to just one every 2,421.3 decays. The carbon gotten in the highly unstable Hoyle state by (2), that ends up in the stable ground state of ^{12}C (carbon-12), does so when the ^{12}C nucleus releases some electromagnetic energy by internal conversion.

[120] It has been calculated that the existence of the resonant Hoyle state produced in helium-burning stars via the triple alpha process boosts the ^{4}He capture process in (2) by a whopping factor in the 10-100 million range, and is therefore essential for the nucleosynthesis of carbon in red giants. These stars, having converted their hydrogen to helium and some of it to carbon, produce oxygen by further fusion reactions. Here, the carbon (^{12}C) made by the triple alpha reaction grabs an extra alpha particle (^{4}He) to form oxygen (^{16}O), as described by the nuclear reaction (3) below. Both the abundance of carbon in the universe and the relative abundance of ^{12}C and ^{16}O predicted by the Hoyle state hypothesis match observations.

[121] The energy of the Hoyle state is very close to that of a beryllium nucleus (^{8}Be) and an alpha particle (^{4}He) combined. Let's work it out. The ground state energy of ^{8}Be is 7456.89 MeV and the ground state energy of ^{4}He is 3727.38 MeV. Summing up, we get 11184.27 MeV. This is a mere 6.34 MeV more than the ground state energy of ^{12}C, which is 11,177.93 MeV (11184.27 – 11,177.93 = 6.34).

[122] The energy level of ^{16}O, at 7.1187 Mev, is well under the 7,166 Mev energy of the fusion reaction (3); so that this reaction doesn't happen.

[123] From John D. Barrow's book *Theories of Everything* (Vintage, 1991).

Is it fluke, is it fat chance, or is it something else entirely? We may wonder. Anyhow, one thing is for sure: without the very precise arrangement of states in ^{8}Be, ^{12}C and ^{16}O, carbon-based life wouldn't have arisen in our universe; and perhaps the same would apply to other forms of life too (due to the lack or to the dearth of the suitable chemical elements).

Hoyle discovered that the carbon and heavier elements that make our bodies were all created by nuclear reactions inside stars. He discovered how intricate and unlikely this stellar nucleosynthesis was. In short, he discovered that we are the awesomely lucky progeny of stardust; which is grist to the mill of the anthropic view. And that's not all: the saga of the carbon nucleus doesn't end here. As if to add insult to injury, the nature of the Hoyle state is not predicted by standard nuclear models. It seems to have a rather unusual structure.[124] In an interview, Marcus Chown disclosed that "*The nature of this weird form of carbon [that the Hoyle state is] has baffled us for more than 60 years. Its existence is so essential in the sequence of reactions making life possible that our failure to explain it is deeply embarrassing*." Another nuclear physicist recently commented that *"The more we learn [about the Hoyle state], the more confusing things seem to become*."

Such a long time after its discovery, the Hoyle state is still a huge conundrum, and cracking it remains a long way off. Could it be that this unusually tough nut—which, pointedly perhaps, lies at the very heart of life as we know it—was somehow *intentionally* created? Given the giddying unlikelihood of our anthropic universe, this question is worth considering. It is too easy to dismiss it as being beyond the pale; and I'd personally bet on what I call the "wink of God" (more on it shortly).

Our universe is very precisely honed for life, in a way that is nothing short of stunning and stretches the imagination. The fine-tuning of our anthropic universe, writes Paul Davies, "*could be regarded as evidence of design [and] might be attributed to God. It is hard to resist the impression that the present structure of the universe (…) has been rather carefully thought out. Such a conclusion can, of course, only be subjective. In the end it boils down to a question of belief*."[125] We may alternatively fancy, in line with the prevailing scientific winds, that there are squillions of unseen, different and unobservable parallel universes out there—just to make our anthropic universe look more likely. Our universe would then belong to a multiverse awash with universes, most of them hostile to life as we know it. Brian Greene explains that "*The odds of a universe with the exact specifications that can sustain life are so low that many physicists argue that there must be other places where the laws are different*. *It just so happens that we live in a life-friendly patch of the universe because, well, it couldn't be any other way.*"[126] The trick here is to offset impossible long odds by an equally impossible large number of trials, or universes, each having its own physical laws, constants, and boundary conditions. All these, very kindly, do not interact in any way with ours; so that we don't have to worry about them—and the multiverse idea can hardly be proven wrong. It is nevertheless quite popular in physics because, as Davies puts it, "*it removes the need to invoke God as the explanation of the fine-tunings required for life*." However, it is unfalsifiable and *ad hoc*—it is no more a scientific idea than that of God. And it may appear metaphysically extravagant. As Bernard Carr writes,

> the fine-tunings certainly do not provide unequivocal evidence for God, nor would the existence of a multiverse preclude Him. For if God can create one universe, He can presumably create many. Nevertheless, it is not surprising that the multiverse proposal has commended itself to atheists. (…) For if ours is the only universe, then one has a problem explaining the fine-tunings and might well be forced into a theological direction. If there is a multiverse, at least one is not compelled to invoke God.[127]

The belief in a multiverse takes no less of a leap of faith than the belief in a creator god. Regardless, it is quite fashionable today to claim that life and human beings are chance products of a purposeless universe driven by purely material forces. Stephen Weinberg, in one of the very last paragraphs of his book *The First Three Minutes*, expressed this claim by this sentence: "*The more the universe seems comprehensible, the more it also seems pointless*." Considering the long anthropic odds of our life-giving universe and the fact that Weinberg knew better, this thought of his is fairly unexpected. It sounds to me little more than a tad disingenuous…

---

[124] Nuclear physicists describe the structure of many nuclei by modelling how their nucleons (protons and neutrons) interact, and they accurately work out the positioning of their resonance levels. Yet the Hoyle state is a rogue one, in that it doesn't arise from any of these models. It now seems that the carbon-12 in the Hoyle state acts like three alpha particles orbiting each other in an unusual bent arm shape. If so, it is better described as a 3 alpha-particle cluster than as a bundle of its 12 nucleons—or of its 36 quarks. Unravelling precisely why this cluster state should arise at precisely the right energy to boost the synthesis of carbon remains a tough theoretical challenge.

[125] From Paul Davies' book, *God and the New Physics* (Penguin, 1990). Of course, the adverse viewpoints—that the fine-tuning is down to brute chance or that there is a multiverse—are equally a matter of belief. However, the fine-tuning odds arguably rule out brute chance!

[126] Brian R. Greene is a string theorist. He wrote many books, including *The Elegant Universe* and *The Hidden Reality*.

[127] Excerpt from the cosmologist Bernard Carr's article 'LeMaitre's Prescience: The Beginning and End of the Cosmos', in the book *Georges LeMaitre: Life, Science, and Legacy*, *ed.s* Rodney Holder and Simon Mitton, Springer, 2013.

The evolutionary biologist Stephen Jay Gould wrote that "*Science can say nothing about the supernatural. Whether God exists or not is a question about which science is neutral*." I believe this balanced view is the only scientifically correct one, given the lack of proof for or against the existence of God. However, barring the multiverse hypothesis, the near probabilistic impossibility of our life-friendly universe tips the scales in favour of some "cosmic design". Consequently, the idea of a creator God still has a good fighting chance, with the caveat that

> There are many mysteries about the natural world that would be readily explained by postulating a natural Deity. (…) However, such an explanation falls into the old trap of attributing to God anything that happens to be beyond the scope of today's scientific understanding. Religious adherents have learnt to their cost how perilous it is to point to a phenomenon and say 'That is the evidence of God's work' only to find that scientific advances subsequently provide a perfectly adequate explanation. To invoke God as a blanket explanation of the unexplained is to invite eventual falsification, and to make God the friend of ignorance. If God is to be found, it must surely be through what we discover about the world, not what we fail to discover.[128]

Four suggestions around the fine-tuning problem

The riddle of our anthropic universe may be contemplated at least in these four ways:[129]

(1) It was just a fluke, and we are the happy winners of a cosmic lottery.

(2) It wasn't a fluke, and a grand theory will eventually explain why the laws of physics and the initial conditions of our universe couldn't have been otherwise.

(3) There is an infinite or near infinite number of universes, most of them hostile to life, in which all the possible physical characteristics can be found. We obviously live in one that is well-suited for life.

(4) Our universe was purposefully created by God or by a divine principle or by some creative transcendent force.

Unless we believe that there is a mind-boggling plethora of parallel universes that, very conveniently, are impossible to detect, the universe seems far more *pointedly* adjusted than pointless. It is tightly and "miraculously" contrived, for the benefit of life—*as though by design*. An interesting question is: If a creator God or a transcendent force of sorts created the universe and wanted to leave a clear and glaring indication that it (or He, or She) did it, how would it proceed?[130] An obvious way would be by making this universe hugely improbable. This is why I am inclined to interpret the "anthropic" improbability of our universe as a kind of smoking gun evidence, or as a deliberate token, that its creation didn't result from blind chance but from a non-random, well-thought-out, and exquisitely well planned "cosmic intentionality." For me, this wink of God is really a wink of ur-god. At least three major clues point in its direction. They are:

(a) The anthropic universe, whose improbability is breathtakingly high as we already know. Because of it, barring the multiverse, the assumption of cosmic design turns out to be fairly plausible. It is no longer beyond the pale.[131]

(b) A universe could well be compatible with life *without this requiring its characteristics to be defined at an extravagant precision*. Such a life-giving universe would be unremarkable and ordinary, rather than anthropic. It would remain bio-friendly upon slightly changing its laws, its constants, its initial conditions, and its fundamental interactions.[132]

(c) Assuming that the im-im insight holds true, the very presence of in-causal and psychic inups, or seeds of awareness, within things and objects everywhere in the vast expanses of the cosmos, hardly tallies with the notion of a blind and pointless universe. These seeds wait for the off-chance of being enparalled into psi-sparks. Given the right conditions, they can even partake in a conscious state. This (supposed) fact speaks volumes about the very essence of the reality

---

[128] From the book *God and the New Physics* anew. Note that the anthropic or life-friendly coincidences of our fine-tuned universe are something that we discovered, not something that we failed to discover, about the world.

[129] This is adapted from a passage of Paul Davies' *God and the New Physics*.

[130] For me, a creator God, or a divine principle, or some transcendent creative force, are just different labels—and there are many more—that can be affixed to a ur-entity, which enjoys an untrammelled freedom and creativity. Accordingly, as we saw earlier, its existence is reversible and is to be understood in the sense of *beableness*. Furthermore, this ur-entity, or creator God if one wishes, is beyond human genders. I'd therefore rather refer to it as an 'it' than, mistakenly I think, as a gendered 'he' or 'she'.

[131] If quantum field theory is anything to go by, an act of (transcendent) cosmic design hasn't been a one-off event. This is because the fine-tuning of our universe also depends on later, post big bang, symmetry-breaking transitions. These fixed the exact values and features of the electromagnetic, strong nuclear and weak nuclear interactions that came out of an assumed primeval proto-force.

[132] The possibility that life—not necessarily as we know it—might evolve in a different universe *without* requiring a highly accurate, and hence highly unlikely, fine-tuning, could perhaps get a preliminary assessment through the computer simulation of various toy universe models.

> to which we belong. It lends some more weight to the idea that we live in a meaningful universe, and it suggests that a "hyper-psychic" ur-entity, creator of all that is, may well exist (in the sense of beableness).

Given the extreme unlikelihood of our anthropic universe, the alternative seems to be between the multiverse and a creator ur-entity—hyper-psychic or hyper-conscious—whom we may call God. I interpret this outlandish unlikelihood as a wink of God, as a kind of seal left by it (or It), aimed at imparting a compelling and hard-to-ignore smoking-gun evidence of a grand cosmic design. Accordingly, I make mine this thought of Euan Squires: "*I personally am willing to take that step: the physical Universe did not create consciousness but, in a way that I do not comprehend, was created by it. Physics exists through a design and purpose in the conscious mind of the one whom I call God*."[133]

Let me finally underscore how fruitful and resourceful in-causation is—assuming of course that the im-im approach holds water (so far this is just an assumption, not a certainty!). In-causation is arguably a sixfold problem-solver, in the sense that its presence explains or helps explain six major features of the world:[134]

> (1) In-causation enforces nature's consistency by sparking off parallings when quantum threats put the quantumhood principle in jeopardy.
>
> (2) In-causation enforces nature's consistency by means of supralness and its supral links, in the event of supra-conservation laws shared between particles.
>
> (3) In-causation ensures the consistency of quantum waves interference in cases of quantum indistinguishability, by means of supralness again.
>
> (4) In-causation contributes to sustain nature's consistency *across time*.[135]
>
> (5) In-causation allows the brain to be the organ of consciousness and it lies at the heart of its sensory-motor interplay (as do out-causal quantum threats). It also gives rise to supral information, which is psychic and nonlocal.
>
> (6) In-causation, in its pristine and unmitigated ur-causal purity, is the creative principle that brought into being whatever is.[136]

Considering all this, I personally find it nigh on impossible to believe that the adventure of life, and that of *our* life, is pointless and meaningless, and that we are mere puppets tossed around amidst a blind and gigantic machinery that we call the universe. On the contrary,

> All lifeforms are part and parcel of a big whole, of a cosmic community held together by a universe-wide patchwork of unseen 'psi' or psychic threads, tangles and webs. This is nothing short of stunning. Owing to it, we live in a truly participatory world. (…) We bask in an all-encompassing pool of shared 'psi' resources, that we can learn to harness. This pool can be likened to a world-soul, to an indwelling energy which permeates everything and everyone. It is the invisible wellspring of our egoless nature. It makes us vastly larger than life.[137]

Coming next is Part Four, which is the last one for the present article. After giving some more thought, further to Part One, to the paralling, I'll analyse some puzzling phenomena and experiments—e.g., the extended Wigner's friend, Wheeler's delayed choice, Elizur-Vaidman bomb-testing, and the Scully-Drühl quantum eraser experiments—in light of the holomatter hypothesis. I'll then mull over some of the rather tough conceptual challenges that arise around the notion of time and that of consistency across time. My conclusion will again be that the quantum world *does* make sense—once we grasp why it behaves in the seemingly counter-intuitive ways that it does.

---

[133] From Euan Squires' book, *To Acknowledge the Wonder* (Adam Hilger, 1985).

[134] What follows borrows from different Parts of this four-part paper. Point (1) was seen in Part One, points (2) and (3) were seen in Part Two, point (4) will be addressed in Part Four, and finally, points (5) and (6) have been addressed here, in this Part Three. Once more I recall that within the holomatter framework, parallings or paral phases underpin quantum jumps or wavefunction collapses. As for supralness, it stems from in-causal binding, or in-binding, of (holo)particles, and it underlies quantum entanglement. Finally, supral links are threads of supralness running between supralled or entangled particles.

[135] Again, this will be seen in Part Four.

[136] This transcendent ur-principle or ur-entity opens the possibility of an immaterial soul, and that of higher levels of consciousness. This, by the way, is the reason why I insisted that holomatter-based consciousness addresses *ordinary* brain consciousness only.

[137] This passage is adapted from my article 'Making Sense of our Mind-Body-Soul Nature, the Panpsychic Way', published in the 1980s by the International Association of Spiritual Psychiatry (I couldn't find its precise reference).

APPENDIX 3A: Additional glossary for Part Three

Beableness = it means existence in a *reversible* mode that characterises ur-causal entities (the term **beable** was coined by John S. Bell in the context of quantum mechanics).

Cognitive iceberg = it is a rough and sketchy model of perceptual sentience, made of (1) a (suprel-churning) **underaware layer**, where sensory inputs and various aspects of our mental inner life are translated into the language of the mind built on suprels, and of (2) a (paralgen-studded) **tip**, where consciousness may arise. In this two-layer model, the as yet non-conscious suprels are made in the underaware layer and are then sent to the tip, where they are *enparalled* and become consciously felt, as components of qualia.

Deed = it is the mind-body dialogue at its simplest and barest, which bear on (holo)particles and rests on quantum threats and parallings. It can be likened to a two-way road with a sensory lane and a motor lane.

Enparal = to enparal a (holo)particle or any relevant (holo)material object, is to lift or kindle it out of the matter state of holomatter, whereby it very briefly switches to the paral state.

Im-im = short for immaterial and immanent. The im-im approach—or, equivalently here, the holomatter approach—holds that ordinary brain consciousness is both immaterial and immanent.

Paralgen = alleged microbiological structure that generates paral by kindling, or enparalling, particles, ions and the like that come under its influence.

Psi-spark = paralling (or quantum jump, or wavefunction collapse) by another name. This alternative name underlines its subjective and psychic content.

Psi-thread = supral link by another name, to underline its subjective and psychic nature.

Psychism = here, this word is used as an umbrella term that covers the whole gamut of sentient states, from near non-conscious to fully conscious.

Supparal = short for supralled paral.

Supralled paral = this is the "eerie mind-stuff" that, as it is assumed within the im-im framework, is the objective basis of our subjective mental states.

Suprel = bit or unit of **supral information**, itself created by tightly knit clusters of supral links running between (holo)particles. Like threads joining beads, these links form collective patterns—some meaningful and others not (here the beads are holoparticles and the threads are the supral links binding them). The meaningful patterns make suprels. They allow the in-causal dimension of holomatter to encode (subjective) data.

Suprel ion = ion (e.g., Ca^{2+}) which is part of suprel churned out by the underaware layer of the cognitive iceberg (of course, suprel particles exist, too). Once minted, a suprel ion will be sent straightway to the tip of the iceberg, to become part of a collective quale upon being enparalled. Or it will be kept lurking somewhere, to be possibly enparalled in the tip, perhaps much later, and thus contribute to a conscious recall of whatever event or thought gave rise to it.

Suprology = systematic study of the presumed one-to-one mapping existing between the characteristics of a suprel and its bit of subjective content (revealed when it is enparalled and becomes part of a quale).

Undecidedness = arbitrary undecidability, compatible with Kurt Gödel's incompleteness theorem. It refers to predicates, sentences and axioms in formal systems that are not inherently true or false—and can therefore be arbitrarily and consistently deemed true or false.

Underaware = the underaware layer is the lower layer of the cognitive iceberg, where nonconscious parallel brain processing of incoming stimuli takes place, producing suprels.

Ur-causation = sheer untrammelled in-causation. An ur-causal entity is utterly free from out-causation and possesses some unique—and at times counter-intuitive—properties.

APPENDIX 3B: Incompleteness and the multiverse of *undecidedness*

The incompleteness of elementary arithmetic and of other formal systems was established by Kurt Gödel in his famous incompleteness theorem published in 1931. Here, I'll share a few thoughts about its meaning and implications. I'll argue that it does not sit well with a fully deterministic universe and that it brings fresh air for in-causation to breathe itself alive, through the notion of undecidedness.

Self-reference breeds contradiction

A self-referential predicate, or statement, or sentence, tells something about itself. Be warned: this feature comes with a sting in the tail. More to the point, self-reference has a knack to breed contradictions. It leads to paradoxes. Here are three famous examples thereof. The first is the liar paradox. It rests on a sentence L which reads: "*this sentence is false*". This apparently innocuous sentence, which one expects to be either true or false, poses an unsolvable conundrum. To see that, let us first assume that L is true. Then, by its own claim, it is false. So, let's suppose that L is false. Then, by its claim again, it is true. If true, it is false and if false, it is true: herein lies the paradox. The liar sentence can be neither true nor false. It is plainly contradictory.

My second example is the barber paradox. This barber boasts that in the thorp where he and a few souls live, he shaves all the men who do not shave themselves. Why not… but what about himself? Does he shave himself? This question is self-referential—which should set the alarm bells ringing. Let's think it through. If the barber shaves himself, he is one of the local folks who shave themselves and therefore, by his own claim, he does not shave himself. If on the other hand he does not shave himself, then by his claim, he shaves himself. Clearly, if he shaves himself, he doesn't; and if he doesn't, then he does. We are again caught in a paradox with no way out in sight.

My last example is Russell's paradox. It was discovered by Bertrand Russell in 1901.[138] Back then, a mathematical set was any definable collection of items, without further ado. It was possible to consider the set, R, of all the sets that are not members of themselves or that do not contain themselves. Call it R. R is self-referential… which again means trouble ahead! Does R contain itself? To find out, let's first assume that it is not a member of itself. If so however, it must contain itself by its very definition—and we have a contradiction. If we now assume that R is member of itself, then it is not so, by its very definition. Either way, we hit the wall of contradiction: this is Russell's paradox.

Overall, we have a sentence that doesn't know whether it is true or not (in the liar paradox), we have a barber who doesn't know whether he shaves himself or not (in the barber paradox), and we have a set which doesn't know whether it contains itself or not (in Russell's paradox). We even have a computer that doesn't know whether its computations will halt or run endlessly.[139] All these are logically unfit to find out something definite about themselves. It is because self-reference, with its stinging tail, is prone to wreak havoc to the consistency of whatever it bears on. A pattern is at work here. The paradoxes of self-reference are typically built on a core sentence S which, due to its self-referential nature, is such that:

(1) If S is deemed (intrinsically) true, then S is (demonstrably) false.

(2) If S is deemed (intrinsically) false, then S is (demonstrably) true.

The sentences (1) and (2) plainly show that S becomes contradictory as soon as we insist on giving it an intrinsic truth value (of being either true or false). Oddly, then, it turns out that it is inherently flawed to ascribe such a truth value to them. If we nonetheless do so, a contradiction automatically ensues. This, as a consequence is a serious threat indeed to mathematics, which to be of any worth ought to remain contradiction-free.[140]

Gödel's incompleteness theorem

Kurt Gödel's first incompleteness theorem (1931) proved that any theory or formal system containing elementary arithmetic and built on axioms satisfying some minimal requirements is incomplete, which means that there exist some

---

[138] Russell's paradox, also called Russell's antinomy, may have been named Zermelo's paradox instead, since it was discovered a year before by Ernst Zermelo—who didn't publish it, however.

[139] This refers to Turing's halting problem. This is another consequence of Gödel's theorem (see below). It was established by Alan Turing in 1936 and proved independently by Alonzo Church. Turing showed that a computer program cannot predict whether it will halt, upon having carried out its task, or run forever in a never-ending loop. The halting problem is self-referential.

[140] Contradictory or inconsistent mathematics are useless, since they allow to demonstrate everything, including 0 = 1. With it, anything goes!

sentence expressing a property in the system's language that is neither provable nor refutable in it.[141] More to the point, there are facts and properties about sets and numbers that can neither be proved nor disproved. No formal proof procedure based on the system's axioms can establish, or "decide", whether they are true or false. They are said to be undecidable. Gödel's demonstration rests on a sentence G which reads: "*G is not provable*." G says something about itself. It is clearly self-referential—and this is the whole point.[142] With it, we are faced with two possibilities:

> (i) G will eventually be proved. It is therefore provable… and is accordingly untrue since it claims its own unprovability. The system, within which we "prove" a falsity, is inconsistent.[143]
>
> (ii) G cannot be proved. Then it is true and no contradiction arises. However, the system is now incomplete since it fails to ascertain the truth value of G, which is therefore undecidable.

With L ("*this sentence is false*"), the alternative was hopelessly contradictory—it was false when it was true and it was true when it was false. With G ("*this sentence is unprovable*"), the alternative is either inconsistency or incompleteness. Therefore, if the system in consistent, it is incomplete because G is then undecidable.[144] Incompleteness and undecidability are just different ways to look at the same limitation of formal systems. Now, even if we add an axiom that makes G provable, the very same reasoning of Gödel will show that there is a sentence G′ that is both true and undecidable in the extended axiomatic system. The incompleteness is therefore *essential*—it can't be done away with. *Any* formal system or theory that contains elementary arithmetic and has a finite number of axioms is either incomplete or inconsistent.[145]

From undecidability to undecidedness

Gödel's result, it has been argued, weakens the notion of mathematical proof and foredooms hope of mathematical certitude. However, it has three positive sides as well. The first one is that Gödel's undecidability is a safeguard against the dangers of self-reference—this is actually its very *raison d'être*.[146] To find out why, let's ask the following question: Is it possible to wean mathematics off the threat and paradoxes of self-reference; and if so, how? Fortunately, it *is* possible—owing to undecidability and incompleteness precisely. To see this, let's consider the sentence:

> (3) If S is (inherently) neither true nor false, then S can (arbitrarily) be either true or false.

That is:

> (3') If S is *undecided*, then S can consistently be taken as true or false.

Unlike what is the case for a decidable sentence, that can only be (demonstrably) true or false, an undecidable sentence can be true, false, and, most significantly, *it can also be neither true nor false*. Nothing rules out its having no inherent truth value. When it is the case, this value—either true or false—must be arbitrarily ascribed. This means that we are free to decide that S is true or that it is untrue. We'll say that it is *undecided*. **Undecidedness** means arbitrary undecidability, in which a sentence or statement is neither inherently true nor inherently false but only arbitrarily so. One is free to choose or decide that it is true or false. As such, this choice is contradiction-free. This being so, we now gather that undecidedness provides a smart fix around the paradoxes of self-reference—since, with it, we get (3) and (3'), which are consistent, instead of (1) and (2), which are not. The undecidable character of S allows for this possibility.

---

[141] These minimal requirements include the consistency and the finiteness of the set of axioms of the system or theory.

[142] In his demonstration, Gödel used a formal technique now called Gödel numbering, which establishes a one-to-one mapping of sentences or statements *about* a formal system onto sentences *within* the system—that is, onto number formulas (for elementary arithmetic). With it, Gödel showed that the (arithmetical) formulas associated to the (metamathematical) sentence G and nonG are unprovable within the system. Therefore, under the assumption of consistency, this mathematical system is incomplete (and G is undecidable).

[143] In a consistent formal system, the axioms do not contradict one another *and* they do not give rise to proven sentences (or theorems) which are mutually contradictory.

[144] By definition, a system is incomplete iff (*if and only if*) there exist a sentence or a property expressed in its language that is undecidable.

[145] There also exists Gödel's second incompleteness theorem. Consequence of the first one, it demonstrates the impossibility of an arithmetical proof of the consistency of arithmetic. More generally, it asserts that no consistent set of axioms can prove its own consistency. (Ironically, then, if the consistency of, say, a set theory can be established by its own proof procedures, this shows that it is inconsistent—for only an inconsistent system can "demonstrate" a false or impossible statement!) Granted, there exist other means of proving that arithmetic is contradiction-free (like the one developed by Gerhard Gentzen in 1936, using an induction on transfinite numbers). The point is that no demonstration of this consistency can ever be *absolute*. It will always depend on the assumed consistency of the larger system used for this (relative or conditional) demonstration.

[146] The second positive side is that it opens the possibility of a wealth—that is, of a *multiverse*—of different systems based on alternative axioms. The third positive side is that it makes room for nondeterminism—it is "in-causation-friendly"!

Siblings galore: a multiverse in the making

If S is an undecided sentence, it has no *intrinsic* truth value. By definition. We can then freely decide that it is true, and consistently add it to the set of axioms of the formal system (then it formally becomes what it called a theorem). Or else, we can decide that it is false and pick out one of its possible alternatives or negations as the added axiom. Any of these "siblings" can be held as true, with no paradox involved. This creates a truckload of new possibilities:

> Since in the study of a formal system we can form statements which cannot be decided by the devices of that system, this brings in possibilities which did not arise, or seemed only pathological, in the traditional theories. The result is that various different systems of logical calculus stand here more or less on par, and there are a number of alternatives, for example, in the definition of negation.[147]

An undecidable sentence that is also undecided paves the way for legitimate and consistent alternatives. For example, "*Gödel showed that arithmetic (…) is a matter of arbitrary choice, any one set of consistent axioms being as good as any other*."[148] Gödel's theorem indirectly leads to a wealth of possibilities which pay tribute to the fruitfulness and fecundity of undecidedness. Overall, this leads to a branching out of formal systems, whereby undecidedness spawns a creative multiverse of parallel and equally legitimate formal systems or theories based on alternative "siblings."[149] Geometry is a case in point. For over two thousand years, Euclidean geometry was seen as absolute and self-evident. Then, in the early 19th century, some daring mathematicians "*showed that indeed there are alternatives to Euclidean geometry that are equally possible and equally valid*. (…) *The matter of geometry was seemingly removed from the absolute to the arbitrary*."[150] Euclid's parallel postulate was eventually acknowledged to be undecided, and its (equally undecided) siblings gave rise to non-Euclidean geometries.[151]

Another example is the axiom of choice. It postulates that given any collection—finite and infinite alike—of non-empty and non-overlapping or mutually disjoint sets, there always exist another set which contains exactly one item chosen in each of them. This axiom has been shown to be independent of the Zermelo-Fraenkel axioms of set theory. It implies that it is undecidable within this formal (ZF) system.[152] There are many ways of choosing these items, and so there are many possible axioms of choice. None of them is intrinsically true or false: all these "siblings" are on a par, and can be arbitrarily deemed true or false, to the effect that "*over the past decades, mathematicians have discovered a vast diversity of models of set theory, a chaotic jumble of set-theoretic possibilities*." Call it a runaway branching out, fed by a vast diversity of siblings!

Cantor's continuum hypothesis is a possible third example. Cantor discovered that there is an infinite hierarchy of infinities of unequal sizes—for instance, the infinity of the continuum of points on the number line is bigger, in a precise sense, than that of the counting numbers. The continuum hypothesis assumes that there is no infinity between these two infinities. It has been shown to be undecidable.[153] Is it also undecided? The jury is still out on that point; but if so, consistent mathematics will be equally built on Cantor's hypothesis and on any of its siblings, creating a branching out of Cantorian and non-Cantorian mathematics.

Nature's awesome wisdom

Gödel's first incompleteness theorem showed that a formal system containing elementary arithmetic is either inconsistent or incomplete. If it is consistent, then it is incomplete.[154] Why is there such a vexing and "crippling" restriction? My answer is that incompleteness or undecidability is an effective bulwark against the hazard of self-reference, which comes as we saw with a poisonous sting in the tail—that of contradiction and paradoxes. But there's even more to it: undecidability

---

[147] Quoted from Haskell B. Curry, *Foundations of Mathematical Logic*, Dover Publications, 1977.

[148] From Morris Kline, *Mathematics in Western Culture*, Oxford University Press, 1953.

[149] Often, given an undecided sentence, there are many siblings to choose from; and the one arbitrarily taken as true can be added to the set of axioms. Doing repeatedly and successively so yields a multiverse of parallel systems. Note that the arbitrary mathematical multiverse generated by undecidedness gives an interesting insight as regards the issue of whether mathematics are invented or discovered.

[150] Morris Kline, *Mathematics in Western Culture*, already cited.

[151] This parallel postulate is the fifth axiom of Euclidean geometry, out of ten axioms. It says that through a point P on a line L there passes one and only one line M (in the plane of P and L) that never meets L, no matter how far L and M are extended.

[152] Some consequences of the axiom of choice are downright weird, but the same remark holds for some consequences of ZF (i.e., for the standard ZFC without C, the axiom of choice; the ZF of ZFC stands for the Zermelo-Fraenkel axiomatic system of set theory).

[153] Gödel proved in 1940 that assuming the continuum hypothesis as true is consistent with ZFC and Paul Cohen, with his *forcing* procedure, proved in 1963 the consistency of the negation of this hypothesis with ZFC. These two results combined demonstrate that the continuum hypothesis is independent of the axioms of ZFC—it is undecidable with respect to ZFC.

[154] Gödel's result is a no-go theorem and, typically, no-go theorems are instrumental in securing consistency. Whether in mathematics or in physics, they stave off contradiction where need be.

weans not only mathematics off this danger, but nature too. It has been noted that "*even in physics undecidable questions have arisen, suggesting that Gödelian incompleteness afflicts not just math, but also reality*." This is little wonder since the book of nature, as Galileo Galilei discovered, is written in the mathematical language. Because of this, Gödel's result dashes or foredooms any hope of finding a set of axioms from which all phenomena of the outside world could be deduced. This hints that incompleteness and undecidedness rub off on nature and are more than sheer abstract and formal oddities. Actually, undecidedness takes the *concrete* world of things and events away from pure determinism (out-causation). It grants some elbow room to in-causation and creates the conditions—and even the need—for genuine choices. This is how I see it.

Generally speaking, Gödel's result shows that axiomatic theories are either inconsistent or incomplete. These include axiomatized models, or "maps", of the physical reality. The map is not the territory, but this nevertheless entails that, for nature or for the concrete world out there, the alternative is that there is either some contradiction or some choice. Apparently, nature doesn't indulge in contradictions. Never ever. If it did, the world would be chaotic, jumbled beyond repair, and plainly hostile to life. It would be an impossible one. It seems, fortunately, that nature does its darndest to shun anything that would *concretely* threaten its consistency.[155] In this line of thought, undecidedness becomes part and parcel of nature's anti-contradiction immunity toolkit. Undecidability and undecidedness are then the price to pay, for formal systems *and nature alike*, to steer clear of contradiction. If so, undecidedness illustrates nature's awesome wisdom and creativity. It illustrates, once again, how innovative and efficient nature is. Whatever the threats and challenges and as far as we can tell, its anti-contradiction immunity always gets the upper hand.[156]

If contradiction or inconsistency is off limits for nature as I surmise, what's left is choice, *in-causal* choice. Then, someone or something somewhere is free to choose. If plain matter is holomatter, this makes sense. Interestingly, this dovetails with this excerpt from the paper presenting the Conway-Kochen free will theorem:

> (…) fundamental particles are continually making their own decisions. No theory can predict exactly what these particles will do in the future for the very good reason that they may not yet have decided what this will be! Most of their decisions, of course, will not greatly affect things—we can describe them as mere ineffectual flutterings, which

---

[155] Nature turns a blind eye to contradictions that don't threaten the *concrete* world of events. That is to say that nature's anti-contradiction immunity is totally unfazed by contradictions that have no practical consequences. Examples thereof are given by black hole, where two people on both sides of the event horizon may rightfully—as seen from their own perspective—analyse the same situation in mutually incompatible ways. Their contradictory yet faithful accounts cannot threaten nature's consistency because these people, due to their respective positions, can't communicate and swap information. The contradiction is therefore hidden. It is purely abstract, and harmless, with no possible *concrete* consequence. Therefore, and so to speak, nature's anti-contradiction immunity has no qualms about it and leaves it alone. The same goes with the no-communication or no-signalling theorem of quantum physics. This theorem rules out any "spooky signalling" that could be used to run afoul of nature's consistency by transmitting—faster than light—an instant signal which could be causally exploitable and possibly acted on; as opposed to a blind, information-less and hence harmless influence.

[156] Nature has a knack for turning obstacles—I mean, *concrete* threats to its consistency—into opportunities. It protects itself by enriching and complexifying the rules of the game of existence. In Part One and Part Two, we saw how this explains some strikingly odd features of the quantum world. The fundamental interactions of physics (the electromagnetic, strong nuclear and weak nuclear ones), as described by quantum gauge field theories, also illustrate this. These can be thought of as arising from nature's commitment to remain consistent when it shifts from an easy going, but barren, *global* symmetry to a more exacting but far more fruitful *local* one. Theoretically speaking, in the Lagrangian of these gauge field theories, a "compensatory" term must be added to uphold consistency (the Lagrangian of a material system is the difference between its kinetic and its potential energies). As Sunny Auyang writes, "*A* local symmetry *is more complicated than a global symmetry because it demands the* global invariance *of the entire system under* local transformations*. Generally this requires the introduction of extra structures to reconcile the difference of various local transformations. The extra structures are usually interpreted as interaction potentials*. (…) *To ensure that the autonomy granted to the localities does not lead to anarchy, it is required that the Lagrangian of the field as a whole is invariant under the local transformations. A term is found to preserve the global invariance. It reconciles the phase factors at various points in the field*." (From Sunny Y. Auyang's book, *How is Quantum Field Theory Possible?*, Oxford University Press, 1995) This extra structure, or this compensatory term in the Lagrangian, leads to a new fundamental force—be it the electromagnetic, the strong nuclear or the weak nuclear interaction. Note that special relativity somehow falls within the same consistency shielding framework: to let the material objects enjoy variable speeds (this variability is akin to a *local* symmetry), nature invented the variable relativistic mass as a compensation to secure its overall consistency. In the matching *global* symmetry, all the particles in the universe would whizz by at the constant speed of light and they would be massless—just like photons. The universe would then be plainly uninteresting and obviously unfit for life. Like the variable mass of special relativity, the interactions of the gauge field theories are, if you will, the price to pay for having a rich and yet still consistent universe… where life becomes possible. As for general relativity, it turns out that "*Gauge field theories describe fully interactive systems, and their focus is on interaction dynamics, which is local in character. General relativity is not fully interactive, and its focus is on the global structure of the world. However, despite the slant, the logics of the theories are similar, for the logic must encompass both [local symmetry and spatio-temporal] groups and underwrite the entire theoretical structure*." (From Auyang's book anew.)

> on a large scale almost cancel each other out, and so can be ignored. The authors strongly believe, however, that there is a way our brains prevent some of this cancellation, so allowing us to integrate what remains and producing our own free will.[157]

To see how the loophole of undecidedness takes the world away from the strictures of full determinism and paves the way for choice and innovation, let's take a concrete example—that of parallings. Parallings, and hence wavefunction collapses, bring about a virtual infinity of undecided sentences in quantum physics. For instance: "*The electron now trapped in this cavity will be found with spin up when measured in exactly ten minutes' time*." This anticipatory statement is neither true nor false. It definitely smacks of undecidedness! According to the holomatter hypothesis, this is inherent in its in-causal nature. It is only by carrying out the measurement, in ten minutes' time, that its truth value will be fixed. Whether the measurement outcome will be spin up or spin down depends entirely on the electron's "choosing."[158]

To recap, we saw that the loophole of undecidedness implies freedom *thrice over*. It implies:

(1) freedom from the paradoxes of self-reference, by affording a way around their contradictory statements

(2) freedom by permitting to choose from a wealth of possible alternatives—those of the formal multiverse

(3) freedom from a wholly deterministic world wed to full-on out-causation, by giving some elbow room to arbitrary choice—that is, to in-causation

We may finally conclude that Gödelian undecidability

(a) protects formal systems against of the paradoxes of self-reference

(b) opens the possibility of undecidedness, which in turn

(b1) spawns a multiverse of alternative formal systems

(b2) opens the door to the possibility of in-causation in the concrete world of facts and events

Gödelian incompleteness or undecidability isn't just a limit to the ability of mathematics to demonstrate relevant and meaningful properties. It has very positive—and concrete—sides too. Most importantly, it beefs up nature's anti-contradiction immunity by means of undecidedness. Likewise, as we saw in Part One and Part Two, the weird features of the quantum world were also necessary to shield nature's consistency.

All this invites us to deepen our understanding of reality.

---

[157] Excerpt from the article, 'The Free Will Theorem', co-authored by John Conway and Simon Kochen and already cited.

[158] We recall (from Part One) that a quantum measurement (e.g., of the spin of an electron in a fuzzy or superposed spin state) brings about a quantum threat that is prone to elicit sooner or later a paralling. This sudden event, a.k.a. quantum jump or wave collapse, is in-causal. (Indeed, this jump or leap or collapse—or this "ineffectual fluttering"—isn't wholly in-causal but only partially so, for it must comply with some out-causal constraints that render it *probabilistically* random.) Recall, too, that the truth value of the spin anticipatory statement above is up to the (holo)electron's in-causal component, or inup, to decide on. Holomatter thus basks in a multiverse of virtual futures due to squillions of such (in-causal) choices to be made, because of squillions of future quantum threats that will inevitably happen.