

THE PRACTICE OF PRESENCE; CONSCIOUSNESS, MEDITATION, HEALTH AND SPIRITUALITY

Sean O Nuallain UOI/FOM

ABSTRACT: This paper has several different aims. The first is to extend the “zero power” hypothesis that the health benefits of meditation are energetic in two ways. The first way involves engaging with the mindfulness movement; the second is extending the “zero power” hypothesis to consideration of entropy. The mindfulness movement may be considered a discipline of presence including conscious states not normally viewed as meditative and we consider these as practicing presence as we explore a synthetic view of consciousness.

Recent analysis of the thermodynamics of brain metabolism is engaged with, and the fact that the brain consumes an order of magnitude more energy than its weight should warrant is investigated. The attenuation of this demand by the synchronized gamma oscillations that are a signature of both meditation and consciousness is proposed, and the Carnot cycle is supplied as an explanation for how low-entropy energy may become accessible to the rest of the organism by meditation. This in turn may have substantial health benefits.

Before arriving at the conclusion, there is an attack on that incident of archness in Francis Crick’s writing called the “central dogma of molecular biology”. The issue of how gene expression can be changed by metabolic factors leads to discussion of the foundations of biology. Meditation, it is argued, allows relatively permanent changes in gene expression, along with openness to quantum effects that might seem a natural consequence of a thermodynamically quietened biological system.

It is fair to say that followers of the Abrahamic religions have, for better and often for worse, demanded more from their religion than mere meditation. In the final section, we discuss this. We leave the door open to imprecatory prayer, as ironically quantum mechanics, the most precise of sciences, in certain very limited contexts allows the observer to determine states both in the present and past.

KEYWORDS: Meditation; Consciousness; Carnot cycle; Gamma oscillations; Quantum biology

I INTRODUCTION; MEDITATION AND CONSCIOUSNESS

It is fair to say that meditation and its variants like mindfulness are the most popular, robust and least controversial religious practices current today. Melloni et al (2007), as we mention below, postulated the same neural process underlay meditation as consciousness. The difference, we postulate, is one of context; whereas meditation in general occurs in monotonous environments that have restricted stimuli, consciousness is discontinuous precisely because the gamma synchrony underlying it is often disrupted by afferent stimuli. Alternatively put, meditation is nurtured consciousness. Mindfulness, in turn is that capacity we have in conscious states to become aware of thoughts, feelings and other processes that often proceed independent of our awareness. A meditative state is a mindful state.

The perennial and more ambitious search for personal experience of a Ground of Being that normally would frame spirituality and thus meditation has stalled in the face of sexual and financial scandals, cogent rational/scientific argument, and the fact that faith often gives rise to dangerous intolerance of others (Harris, 2004). The Abrahamic god is All; infinite, absolute, Being itself. When sifted through Mosaic Law, it precipitated an avalanche giving rise to the excesses of Sharia today. This paper will end by briefly revisiting this theme.

For the moment, it is worth pointing out that believers in Yahweh do meditate. They may conceive of themselves as being in touch with an omnipotent cosmic person who can intercede for them, rather than experiencing a Buddhist stillness and extinction of craving, but it is a very safe bet that the physiology of the two meditating groups is very similar. In particular, it may be the case that the brilliant insight due to Muhammad is surrender to god; while it is deeply impressive to watch thousands prostrate themselves in synchrony, at an existential level this surrender allows precisely that abnegation of self that the meditative state requires.

This author's first foray into this theme of meditation (2009) quoted extensively from Krishnamurti (1999). It is arguable that Krishnamurti was a harbinger of a new approach to religion, considered as the cultivation of the sacred, which he argues is immediately recognizable by the mind. For him, the meditative mind is the religious mind; imprecatory prayer is condemned as the self-pitying request that, just for now, $2+2$ should = 5.

While Buddhism is a break from the Indian thought from which it sprang in abandoning a constant, eternal self (Atman), Krishnamurti tends to question even the replacement of Atman by any complex metaphysical system, even one that ends with a view of mind as pure awareness as do some schools of Buddhism. Yet that requires relatively comfortable material circumstances; it is unlikely that those emerging from the bloodbath of Syria to a harsh welcome in Europe would find Kabat-Zinn or Tolle

useful. They will of course abide in Islam

Kabat-Zinn (2016, P 17) is very influenced by Buddhism as he gives a definition;

“Mindfulness...is paying attention in the present moment and non-judgmentally...as if your life depended on it”

Its relation to Buddhism is complex (23);

“Mindfulness is often described as the heart of Buddhist meditation. Nevertheless, cultivating Mindfulness is not a Buddhist activity....Still...the most refined and developed articulations of Mindfulness and how to cultivate it stem from the Buddhist tradition “

In fact, Buddhism (or, more precisely, the teaching of Gotama) can be summarized in a sentence (41);

“Nothing is to be clung to as ‘I, ‘me’ or ‘mine’”

A central practice is thus dissociation from – in the sense of a deliberate lapse of identification with – one’s own thoughts (39);

“It is a big step toward reclaiming our lives when we realize that, no matter what their content – good, bad or ugly – we do not have to take our thoughts personally....we do not have to think of them as ours. We can recognize them simply as thoughts, as events in the field of awareness, events that arise and pass away quickly”

As the bumper sticker goes, don’t believe everything you think. Indeed (43);

“We have become so highly conditioned by our patterns of thinking that we don’t even recognize thoughts as thoughts anymore”.

To become aware of one’s own thoughts and feelings is itself a non-trivial task, particularly in an era in which the electoral politics of whole countries are manipulated by deviously-placed social media messages,

Techniques are suggested to help with this realization (37);

“The ocean is not the only metaphor for mind, and waves are not the only metaphor for thoughts...Thoughts are likened to the bubbles coming off the bottom of a pot of boiling water; they nucleate at the bottom, rise to the surface and dissipate unimpeded into the air”

In summary, in a quotation from the Heart sutra (79);

“There is no place to go, , nothing to do, nothing to attain”

Kabat-Zinn somewhat archly continues to remind us that “It’s now again”. The fact that a certain amount of energy is liberated by Now-centeredness has been the leitmotif

of Tolle's (2005, 201) paradoxical career, as he stresses his own lack of charisma;

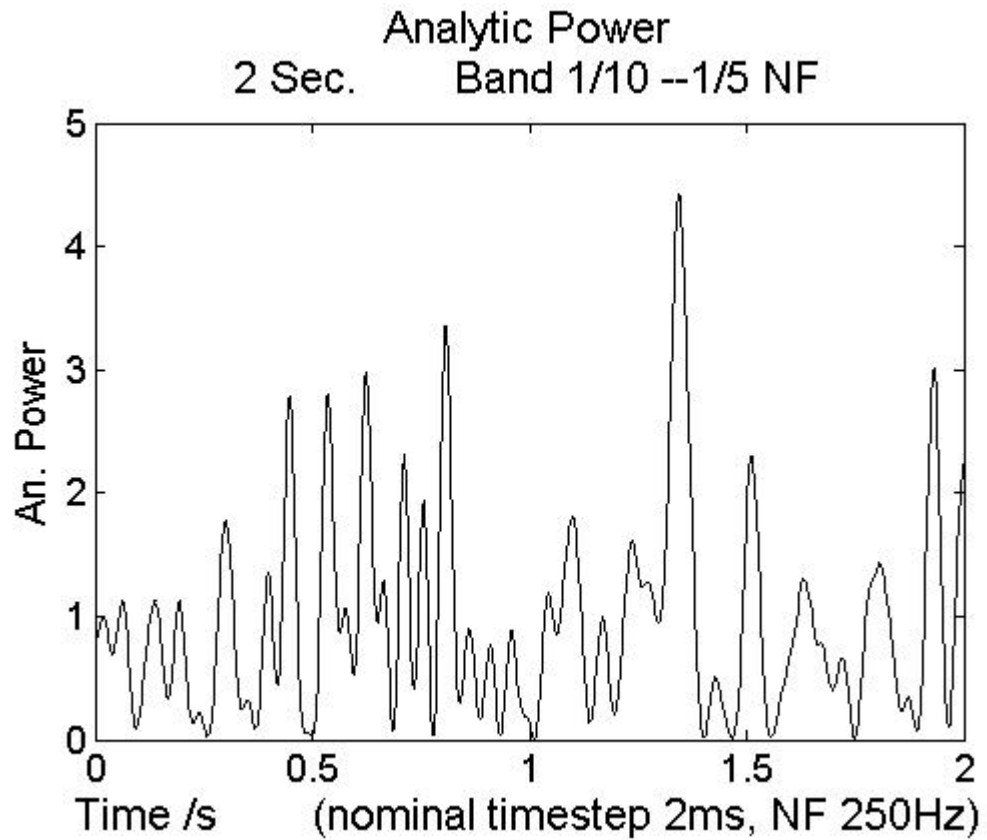
“The ego could be defined simply in this way; a dysfunctional relationship with the present moment”

As my 2006 article on the subject puts it, the ultimate goal is participation in our own lives. This we term “presence” and the task of this work is to combine it with a realistic theory of human mentation.

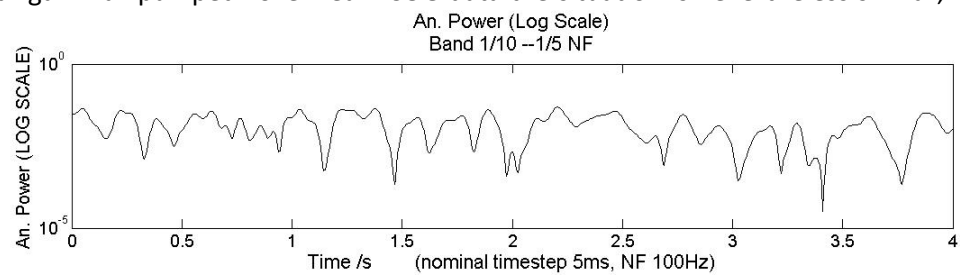
In the aughts, several researchers began to converge on the finding that meditation was medically beneficial, that it involved synchrony of gamma waves (from about 40 to 80 Hz, and possibly the product of feedback from inhibitory neurons) across the cortex (Lutz et al, 2005). Remarkably, the same process seemed to hold for any conscious experience (Melloni et al, 2007). This gave rise to two findings in my 2009 paper;

1. That the beneficial consequences of meditation like cortical thickening (Lazar et al, 2004) are due to energy being freed up in a process we explore below;
2. That meditation and consciousness refer to the same process of gamma phase synchronization, with the former being sustained in environments with deliberately attenuated stimulation (like a monastery) .

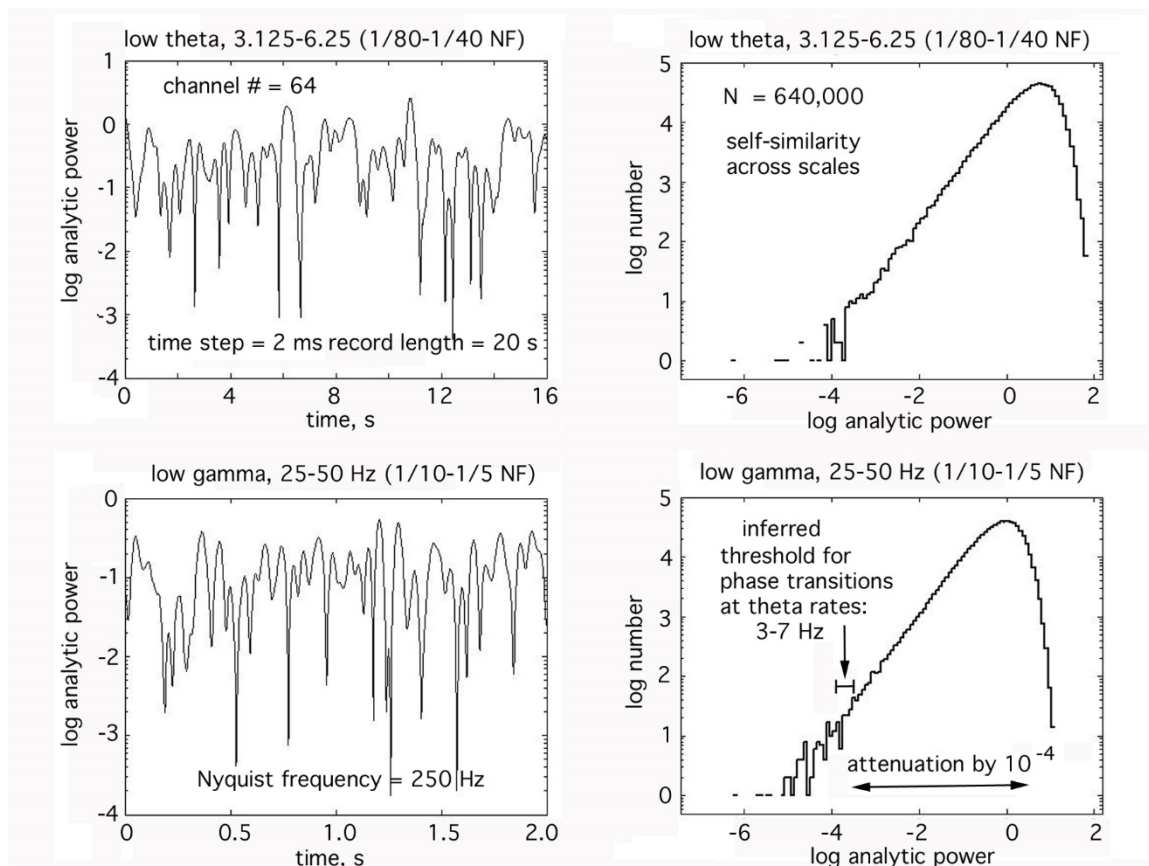
We can now outline the framework arrived at in my earlier papers. Random neural firing can be simulated with white noise. This random firing is superimposed upon by the phase synchronized gamma of mindful mentation and the Hilbert transform is used to calculate the power consumption. In an idealization with simulated data we can see there are dips in the power 3-7 times per second;



With gamma “pumped” over real ECOG data the situation is nevertheless similar;



We note that the other lower frequency oscillations like theta give similar results, but at a lower rate of power lulls, and also that the power dips are of more than 3 orders of magnitude (from Freeman, O Nuallain and Rodriguez, 2008);



Since then, the field of cortical thermodynamics has moved on considerably (Capolupo et al., 2013; Freeman et al., 2012, Harris et al 2011) and we need to check if my use of the Hilbert transform to calculate power in the 2009 and 2011 papers, while still valid, should be augmented by consideration of entropy. In his later work (Capolupo et al., 2013), Freeman suggests that the power dips are of 6, not 3, orders of magnitude. What has changed, and what has stayed the same?

II CONSCIOUSNESS

A possible evolutionary scenario

There exists a variety of perspectives on consciousness. We can start with an evolutionary narrative as a sample perspective; our brains become too big for the organism. There are two options; shrink the size of the neurons is the first. However

beyond a certain point of shrinkage the neurons become unreliable.

An alternative, and the one that nature arguably chose, is to take that regime of feedback from inhibitory neurons that we call gamma waves. They are high frequency and normally localized. However if they become global and synchronized in the cortex, the metabolic demand of the brain diminishes enormously without having to risk misfiring by shrinking the neurons. This can all be calculated with the Hilbert transform and the reader can consult the diagrams above.

That is not the end of the story – not by a long shot. The idea of a “spandrel” in evolutionary theory is an innovation designed for one purpose which become useful for another. This global gamma broadcast can be modulated by frequency, phase or amplitude; let’s call this FM, PM and AM.

Now we have an architecture similar to that of the “global workspace” innovators of the Hearsay and other natural language systems; desirous of the ability to have sources of information from the phonetic, syntactic and other sources interact, they provided a model for how consciousness works. In fact, the “semantic” module provided our evolutionarily archaic physical interaction with the world now interacts with syntax and other characteristics of language, a first for intentional systems

A cognitive science perspective

In short, we now have a “Cartesian theater” model of consciousness; a single thread can broadcast to the entire nervous system, before it is supplanted by another such thread. So we talk to ourselves about last night’s game until another bike cuts us off at the intersection, supplying an interrupt, and we think about the bad driver. As far as cognitive science goes, that may be all we need to know about consciousness. It broadcasts to the entire nervous system and as its Latin root *con-scio*, I know with, suggests, the items broadcast are often previously disparate like thought and language.

The related concept of attention may be more significant. Somehow, as a result of that heightening of the sense of self we call will, we are able to cause decorrelation of the information fluctuations of a processing thread. Of course this is happening in sparsification neural events in any case; what seems near-miraculous is that we can bring it into our voluntary competence.

A physics perspective

Yet there may be more. The Hilbert transform predicts a state of biological quiescence accompanying conscious states. Those interested in quantum biology, as those assenting the quantum mind hypotheses that quantum effects are causal in mentation, may feel inclined to jump in and state that now the brain may be capable of

communion with coherent entangled states in the cosmos.

In fact, the “destiny waves” that culminate in causal influences from the future to the past, as posited by Aharonov and others, may become a factor. It is not excessive to suggest determinative influences in quantum observation as we seem able to change reality by an austere form of “observation”. Rightly or wrongly, all these arguments and many more are at play as we construct a theoretic framework for , if not a “science” of , consciousness.

On a more prosaic level, 20th century physics witnessed a burgeoning trend for the causal empowerment of the observer. In special relativity, space and time become observer-relative in order to maintain the otherwise constant laws of nature. Of course this was anticipated by Galileo and what Lorenz and Einstein anticipated was related to observation by systems in motion relative to each other. Thus, we can conceive of the essence of subjectivity as been driven by this relativity in a brain where nerve impulses are travelling at a few meters per second.

Of course, with the twin slits experiment, we encounter the possibility of nature somehow becoming reactive to our intentions to observe it. This has led to an entire “physics of consciousness” industry. The mathematics that posits a disembodied observer whose every observation changes the wave function of the universe, posited by Von Neumann and implicit in Dirac, has not been credibly challenged in the century or so since proposed.

Philosophy; consciousness as intentionality and information.

Intentionality as classically considered in Philosophy is the capacity of mind to “reach out” to objects in the environment. There is impressive empirical evidence that intentionality is implemented as the stabilization of far-from-equilibrium neural attractors by objects in the environment, including objects whose absence is a salient fact. Intentionality would seem to be critical to consciousness.

In evolutionary terms, we can see precursors to intentionality in simple chemical co-variance of organism and environment; this becomes nuanced with more sophisticated membranes. Once the organism is capable of action, we witness sensorimotor loops linking organism to environment in effectively a deterministic “coupled” fashion”. Once that bond loosens, and the organism begins to be able to point at / “intend” aspects of the environment, we see the elements of intentionality.

It is arguable that intentionality with an onboard system of a power \geq standard arithmetic begets quantum measurement. It is also possible that we will never fully be able to understand it, as it is undergirded by bonds between the microcosmic observer and the observed. In the same way as we have not yet understood the myriad chemical

reactions that undergird life, intentionality may turn out to be *sui generis*.

There have been many attempts to connect consciousness with science through the concept of information. A “dual aspect” theory, which posits a panpsychism in which informational states have a subjective component, is one of the favoured theories here. Yet there is an immediate problem; quantum information is a more fugitive concept than the Shannon/classical information on which this theory is based, and many argue that communication in biology needs a yet more specific term.

In Indian thought, consciousness is identified with being itself. The issue of how this relates to intentionality, with its clear subject/object differentiation, is not resolved. It is possible in the Hegelian/Eriugena systems that show this imprint in the West, to consider the entire cosmos as an act of self-awareness by the absolute, one evolving through time. We as individuals similarly through “preference” line up hypotheses about what’s going to happen next, and confirmation of such hypotheses leads to a consonant sense of self.

Of course, this is suspect in the eyes of proponents of Marxist material dialectics, who would – with some justification – see consciousness (or, in the schema here, its contents) as manifested in the relations of production that occupy most of us for most of our waking hours.

The fact that Marxist “revolution” was eventually administered by corrupt bureaucrats should not elide the brilliance of the westerners like Lynch Guevara who rose to the challenge. The recent economization of western life, and its subsequent financialization in casinos like Wall Street, is now guaranteed by the state in a fatal formula; privatized profit, socialized risk. In particular, it does not escape notice that the paradoxical twin desires for a dynamic executive and sage choice of leader by college system in the USA led in 2016 to the selection of a narcissistic, incompetent “leader of the Western world” who did not command an electoral majority even in the USA. Perhaps we in the consciousness research community might aspire higher?

Synthesis

Is synthesis from these perspectives possible? It is this writer’s belief that it may make more sense to step back and consider mind and world in the most general terms in the hope that consciousness will naturally emerge as a discrete concept. In psychological terms, conscious events seem to require about a tenth of a second; they seem to last for at most a few seconds before being replaced by another such; they are broadcast globally throughout the nervous system; in all, it may be best to view them as the tip of an iceberg.

This synthesis cannot proceed without reference to the real, external world in a

manner that does not reduce it simply to a set of psychological terms referring to how it is construed by the person. This fallacy, called “psychologism” by Frege, is at the root of much of the moral, aesthetic and epistemological relativism that arguably has poisoned postmodern discourse. We now have a much larger preliminary task; describing the ineluctable patterns that connect the person and her world.

We have sketched the bare bones; there is a mode called “coupled” at the sensorimotor level that correspond at the cognitive level to egocentrism, conformism and (in emotional terms) narcissism. The move from this to decoupled is presaged by the infant learning that she has a physical body not coupled to the mother. Without deviating in the slightest from good science, we can go on to identify decoupled modes that are relativistic and indeed determinative.

When these events take \geq a tenth of a second, there is a possibility of their becoming conscious. In that case, we can appropriate conscious states to science. When we wish to participate in these events in the manner that we call being present, one not accepted by science, we are now in the mode of spirituality. We are claiming that consciousness is a path to appropriating some force in the universe. To develop techniques for formalizing this in a sacred environment is the task of a new such spirituality; superimposing rites and rituals for a community makes it a religion. .

The scenario then is this; the brain’s energy demand needs to be attenuated. Evolution finds that the solution is synchronized gamma, and not coincidentally this is also the signature of consciousness and that sustaining of a normally ephemeral conscious state we call meditation. That is to get ahead of the story; because first as a spandrel we find that modulation of this synchronized gamma allows global broadcast throughout the nervous system of cognitive items. It also allows the “operational knowledge” that constitutes our knowledge arising from physical interaction with the world interact with the diversity of sensory capabilities that are the bedrock for language.

Now we come to the surprising parts, those not within cognitive science. First it seems that this event results in a sense of subjectivity that allows humans, for better and worse, construe themselves as distinct from their environment in symbolic as in physical spaces. Millions of years after the first such event, documented in myriad novels and the achievement of heroic social revolutions, the modern self emerges. It is absurd to imagine that science will describe this process, contingent on social upheaval as it is. The language of “coupled” social existence, with the implicit ethos of conformity and authoritarianism, allows us a weapon to use against relativists who may indeed allow renascent fascism in the name of social equality.

Secondly, contact with what can only be described as a Noosphere, an entangled

nexus of matter and mind that emerged to the great shock of contemporary physicists' in the early 20th century, is achieved. It can be speculated that this is the source of the "unreasonable effectiveness of math". To describe how these processes can be cashed out in the tenths of seconds required for human subjective experience may require the quantum zeno effect, if indeed that is sufficient. What originated with consciousness as a byproduct of easing metabolic demand may require much ingenuity to be put back together with it. A field theory of symbolic action may be one solution.

There are other projects that immediately suggest themselves once the keystone that distinguishes consciousness from its contents is put in place. One is a science of consciousness itself; while the dichotomy of right hemisphere holistic versus left hemisphere analytic proved too crude, that of coupled versus decoupled may not. Another is honouring the transcendent reality of social processes and attempting to characterize the political realities that impress themselves on us; real social science in other words, one that eschews false relativism.

Likewise, a field theory of symbols may lead us to realizing Wittgenstein's dream of showing how language relates to the world, while ridding us of aesthetic relativism, the notion that art must be coupled cognition. Semantic formalisms other than math may also yield realities. All in all, the apparent antinomy that reality is relative to and yet transcends consciousness may turn out to be a perennial yet resolvable paradox.

Some of the argument in this short section is deliberately deflationary in thrust, the better to avoid category errors and relativism. Social science should become at least partially normative; its concerns cannot be reduced to "a science of consciousness". All the better as the vista opened up by such a science is enthralling.

To start with, of course there are waves other than gamma; can it be the case that beta, theta and alpha encode the object being apprehended at lower levels of resolution, so that it can in holographic fashion be reconstructed from a noisy signal? Indeed, is it the case that consciousness is a signature of an experience being etched onto the Noosphere, thus explaining simultaneous discoveries like that of the calculus by Newton and Leibniz?

In the final decade of a Promethean life, Walter Freeman began to warm to the idea of coherent "liquid" Bose-Einstein condensates forming through a state transition in the brain. As these are of lower entropy than the "gas" stage that presages them, can this explain the health benefits of meditation as our cellular powerhouse ADP is of lower energy and higher entropy than its targets? All in all, we may find ourselves in better health, at home in the cosmos, as a result of a properly construed science of consciousness.

III THE LATER FREEMAN; THE THERMODYNAMICS OF CEREBRAL CORTEX

It is only slightly controversial to suggest that Freeman was the greatest neuroscientist of all time; a modest man, he would tip his own hat to Ramón y Cajal or his own mentor Karl Pribram. What is for sure is that he continued a creative streak through the ninth and last decade of his life to rival that of Frank Lloyd Wright at the same age. Moreover, like the later Michelangelo and Beethoven, he produced work different in thrust to anything in his past. Michelangelo's last pieta anticipated Modigliani; in its original context as the final movement of a quartet, Beethoven's "Grosse fuge" is still too radical for modern audiences and is played on its own as the separate opus 133.

Capolupo et al (2013) and Freeman et al (2012) postdate my work on meditation as just described above. Before discussing them, let us briefly consider a radical argument from Penrose (2010, 77);

"One tends to think of the Sun as supplying the earth with an external source of energy, but that is not altogether correct, as the energy that the earth receives from the sun by day is essentially equal to that which the earth returns to the darkness of space...energy coming from the sun carries a considerably lower entropy than that returning to space"

He credits Schrodinger with the critical insight (ibid., 78);

"„,the green plants have, by way of photosynthesis, found a way of converting the relatively high-frequency of photons coming from the sun to photons of a lower frequency...when animals eat plants (or eat other animals)they use this source of lower entropy to keep down their own entropy"

Likewise, the cycle beginning with the universal energy carrier ATP begins with ATP degenerating into forms that are lower energy and higher entropy like ADP. There is an extended and detailed discussion on this in Paenke et al (1997).

It is not surprising that Capolupo et al (2013) should find ATP critical to the anomalous consumption of power by the brain;

"To receive and transmit information each fiber maintains the transmembrane gradients of Na⁺ and K⁺ required for the resting membrane potential by ionic pumps that are fueled by ATP from mitochondria. The rate of passive leakage of Na⁺ and K⁺ ions is proportional to the surface areas of the external membranes encasing the neurons and of passive H⁺ ions due to the gradients across the internal membranes of the mitochondria. Hence the ultrastructure of cortex required for dense connectivity imposes intensive dissipation of chemical energy by brains both at rest and engaged in cognition... The long axons impose communication by Na⁺ action potentials, so that only in neuropil (and to a lesser extent in kidney) does Na⁺/K⁺-ATPase dominate energy production from

glucose”

They expound on this anomaly;

“In comparison to other tissues the human brain has 2% of body mass but dissipates 20% – 25% of resting energy (2% – 8% in most vertebrates, 10% – 15% in lesser primates), as measured by oxygen depletion in the venous return from the brain...the neurons in cerebral cortex are most demanding followed in descending order by those in basal ganglia, brain stem and white matter... The ten-fold discrepancy for human cortex above the whole body has led to the sobriquet ‘dark energy’, in analogy to dark matter in astrophysics”

The later Freeman still held onto his notion that attractor surfaces were the correct terms in which to describe much of cortical function. However, influenced by Vitiello, he now believed that quantum field theory provided a more elliptical and veridical language for cortical function. In particular, symmetry breaking of the QFT equations led to states with long-range order like crystal; the existence of these states in biological systems had been hypothesized by Di Giudice.. we are going to make frequent reference to this concept and it is well described in Stewart, 1990, P. 319;

“Nearly all the flows have some degree of symmetry..less than that of the apparatus. This phenomenon is called symmetry-breaking. “

In fact, the primal event in Freeman’s late neurodynamics was the transitions for a random gas-type phase to a coherent liquid phase;

“In an act of recognition a conditioned stimulus triggers an operator, a Hebbian nerve cell assembly, that abstracts, amplifies and generalizes to the category of a stimulus. The assembly forms by repeated samples of information in reinforcement learning according to the Hebb rule: neurons that fire together wire together. The conditioned stimulus ignites the entire assembly, so the output signals the category of the stimulus and not the stimulus per se. The associations learned under reinforcement convert the input of sensory information to the output of a fragment of knowledge. The assembly provides the bolus of energy required to generate a structured liquid-like phase (low entropy) out of a formless gas-like phase of random activity (high entropy), with a vanishing change in the free energy F , $dF = 0$. Such a process of phase transition is by spontaneous breaking of the symmetry of the gas-like phase in the sense that the pre-stimulus phase is featureless in all directions, whereas the pattern of the post-stimulus phase cannot be rotated or translated into itself.”

So indeed the later Freeman can motivate the contention that the energy conserved by meditative practice is low-entropy and very useful to the rest of the organism. Further speculating, we could argue that meditation subverts the normal Carnot gas vapor/Rankine cycle to continue a conversion to low entropy by aborting

the cycle; in the absence of afferent stimuli, the meditator can control the cycle. All this is extremely speculative; Freeman et al (2013, 230-236) describe the Carnot and Carnot gas vapor/Rankine cycle while addressing skepticism about the liquid analogy (235).

IV DYNAMICAL FIELD BIOLOGY AND MEDICINE

Religions have dogmas and science has paradigms, theories and working hypotheses, all of which are subject to refutation; by paradigm changes in the first instance and refutation in the latter two Religions are different in that they insist on faith/belief and do not countenance paradigm change or refutation. For example you believe in the Immaculate Conception or you are not a Catholic. It is bizarre that students are asked to believe the central dogma of molecular biology as an entry into their profession.

This is all the more so because the central dogma has many exceptions. For example retroviruses can write themselves into did DNA by using reverse transcriptase. What makes matters worse is that a lot of work is not getting done simply because people are abiding by a central dogma which is incorrect and is preventing them from many insights.

In this section, we are going to explore another counterexample to the “Central dogma”; the activity of transcription factors in assessing the state of metabolites in the cell, and so differentially affecting gene expression. We argue that this makes energetic processes at least as causally fundamental as DNA expression. Ignoring this has led to a roadblock in the treatment of metabolic syndrome. While this is an attack on the “central dogma of molecular biology” we quicken the pace by considering the work of Strohman in detail.

We saw that the attested work by Freeman and others in measuring consumption of energy in the brain can be related to meditation, which seems to attenuate this consumption. A set of recommendations for diet, exercise, and meditative regimes would seem to be a natural consequence.

This is particularly the case as “fast” metabolism” does not seem to guarantee weight loss. The production of low entropy energy in meditation may do so. By contrast, the thermodynamics of diet are trivial; eat less and you will indeed lose weight in any normal exercise regime.

Richard Strohman, emeritus at MCB Berkeley, introduced new ideas of the relationships between metabolism and symbol, instantiated as that between biochemistry and genetics in this case. In particular, along with other researchers like Evelyn Keller Fox and Brian Goodwin, he was concerned that a simplistic computational metaphor of the genome as CPU should not prevail. Without providing this biological description one is allowed to assume the computer analogy of instant

computation, followed by consultation with DNA program for instructions, followed by change in state. This is explored in my 2008 paper.

Strohman(2003, P 478) gets straight to the point we are going to explore here;

“Genetic defects require special conditions to produce a ‘disease phenotype’, Such ‘corrections’ of defects are driven by thermodynamic principles which can on occasion overcome kinetic blockades. Thus, the interconnected metabolic pathways together act as an integrated unit often able to correct genetic of other insults”

As Strohman and I expressed it in our 2006 paper, the relationship between metabolic environment and genome approximates that between behavioral context and formal linguistic apparatus; just as natural language processing is again beginning to tax the minds of the world’s best computer scientists – pace, the quick fix of “deep” learning/Mind – so gene expression cannot be understood without carefully considering metabolic context. Moreover, this context can change gene expression.

As we put it in our 2006 paper;

“The expression of the genome is regulated through biochemical mechanisms that sense the bioenergetic state of the cell. In particular, the metabolites NAD and NADH and other synaptic signals represent instant by instant changes in the bioenergetic status of the cell. Changes of metabolites like fatty acids and glucose result in differential gene expression through binding to transcription factors”

This, like retroviruses, is a strike against the “central dogma. The consequences are manifold (ibid.)

“..... Metabolism can be altered by environmental factors like sedentary behavior as by gene mutations like amyloid production. Alterations in metabolism, in non-syntactic phenomena, are the proximate cause of disease, and cures can be sought without interfering with the genome”

So gene therapy, with or without CRISPR and its attendant cancer risks, will always have limitations. Moreover, caloric restriction has indeed proved causative of longevity (ibid.);

“.... gene expression may be regulated by NAD dependent histone deacetylase via epigenetic marking of chromosomal histones as during the life extension resulting from caloric restriction. .alteration in protein amount or structure, as in dystrophin or amyloid may alter the rate of metabolic reactions resulting in an altered phenotype. Finally, posttranslational modifications like phosphorylation modify proteins.”

What we were trying to do was in short (ibid.);

“attempting an oblique attack at the central dogma of molecular biology; the

deterministic, linear, uni-directional, and encapsulated path from DNA to phenotype. ... “

This was to be replaced by a (ibid.);

“relationship of genotype and phenotype in terms of a complementarity between genetics and dynamics, linkages and feedback loops between the DNA, phenotype, proteins, environment, and behaviour.”

We need research help to do the following simple test; in a set of blood samples, is the ration NADH/NAD⁺ significantly related to adipocyte gene expression, and thence to measurable indices of obesity, including easily measured ones like waist size? Now to more of Strohmman’s published work. He first came to prominence (1997a) in theoretical biology with a paper questioning the central dogma in favour of an altogether more complex set of causal relationships. In particular, he argued that epigenetic factors, which he defined as factors controlling the spatial and temporal rollout of gene expression, were essential. His emphasis on the mistaken view of the gene as CPU is a leitmotif in my 2008 paper as already mentioned.

Please remember that this is almost a generation ago, when the HGP was being hyped as being on the cusp of curing all of humanity’s ills, and epigenetics was not yet by any means mainstream. It is now indeed mainstream and Strohmman has been thoroughly vindicated. His response to commentary on this landmark article (1997b) is eloquent and intelligent.

Strohmman was after very big game indeed. The 1997 papers propose an imminent “Kuhnian” revolution in biology. It is fair to say that abusive letters to FOM’s director is close to the quintessence of what Kuhn terms the “abnormal” science preceding a paradigm shift. Philosophically savvy, Strohmman (2000) argues that biology should include other forms of Aristotelian causality than efficient such; organization or formal cause is important as is teleological or functional *raison d’être*.

In 2001 a and b he argues that there are limits to extension of human lifespan, a lesson that should be learned by the likes of Peter Thiel, De Vere and others, and for careful consideration of bioethics. His 2003 paper is the one most consonant with the concerns of this paper about meditation and metabolism.

However, it is his 2002 paper that most clearly exemplifies his approach, and it shows how much progress he had made that Science published it. He inveighs against genetic reductionism in favour of the much more difficult “metabolic control analysis” (MCA). In particular, he argues (702) that the use of Ketone bodies as a substitute for glucose shows “that the ketone body pathway is thermodynamically about 25% more efficient than glucose alone”. The mechanism is important;

“Ketone bodies enter the energy-generation pathways...through a pathway that bypasses the glucose entry through the major pyruvate dehydrogenase (PDH) multienzyme complex” (ibid.)

Given his later Alzheimer’s disease (AD) it is piquant to find the following on P. 703;

“based on these results, one is led to consider a simple metabolic deficiency model for AD; amyloid 1-42 blockade of the PDH multienzyme complex is the source of amyloid toxicity and leads to loss of bioenergetic potential and neurotransmitter production, which ultimately leads to neuronal death. Ketone bodies....effectively bypass the amyloid blockade of PDH and so restore normal levels of acetyl coa....the metabolic hypothesis treats these events as of metabolic origin”

We need to focus on his table of levels of regulation in that Science article (702). This notion of levels haunts biology Fregnac, 20-17, in a review of the rather dismal state of “big data” neuroscience, briefly comments;

“When changing scales, symmetry breaks introduce major nonlinearities that we cannot account for at present...the hope is that understanding mesoscale organization and full network dynamics might reveal a simpler formalism than the microscale level, similar to general laws in statistical thermodynamics” (475)

Symmetry breaks emerge as we go from a symmetric whole to a part which inevitably will not have so clear a symmetry. As we go from the level of the organism to that of the cell, symmetry breaks abound. For Freeman, the solution is a discontinuity from the microscale level of individual neurons to the mesoscale level of the tens of thousands typically monitored in ECOG; he calls this the “brain laundry”. In Strohmman (2002) we find a focus on levels of transition as the levels with that, for example from genome to transcriptome being the first level, implemented inter alia by the dynamics of epigenetic control and redox reactions.

The other levels, each with its own regulatory agents, are transcriptome to proteome, proteome to dynamic system, and dynamic system to phenotype. This is all very reasonable; what is remarkable is that, unsolicited, Strohmman pressed on me documents with two utterly different parses of the same material, documents I have not seen in any of his published work. One reparsed with the key being intracellular versus intercellular levels; the former was discerned as having an architecture of protein networks and gene related circuits, dynamics of control theory and epigenesis, and products of bacterial phenotypes, distributed metabolic control and function. The latter had posited an architecture of tissues, neural networks and trajectories; dynamics of chaoplexity; and a product of growth regulation, learning and complex diseases.

That is not the end of the story and I am open to the explanation that Strohmman, unconsciously admitting his mental powers were in decline, knew he would not be able

to reconcile these different narratives. For a second document took as primary key the genetic, epigenetic/ genetic, morphogenetic/ epigenetic and organismal/ morphogenetic levels. Sample agents and rules for each level are, respectively, DNA sequences and base pairing; gene/protein networks and as yet unknown enzyme function; morphogenetic fields through unknown rules; and the organism qua morphogenetic field, perhaps to be unpacked later (perhaps by evo devo and other breakthroughs?).

We have fields and their products at each level. We cannot reduce the organism qua morphogenetic field to the cell level as symmetry breaks distort it. One informative way to parse the biology would seem to me to extend the intracellular versus intercellular levels by breaking the latter up into meso and macroscopic levels, where the latter would include the organism and the former entities like the transcriptome and proteome. The intracellular, now renamed the micro level would again be seen as having an architecture of protein networks and gene related circuits, dynamics of control theory and epigenesis, and products of bacterial phenotypes, distributed metabolic control and function.

I will leave it to card-carrying biologists to characterize architecture, dynamics, and products differentially for the meso and macro levels. It may be safer, for the moment, to adopt the schema of his 2002 Science paper, with the first level interpreted as a genomic one, with rules involving base pairing, an architecture of gene circuits, dynamics inevitably involving dynamical systems, epigenesis, redox reactions and energetics considerations like NAD^+/NADH ratios and an output of the transcriptome. To continue up the other levels is to help finish the book Strohman tragically did not complete.

In the meantime, we certainly have all the material we want for a field theory of a new, revolutionary, non-dogmatic biology. The fact it has fields means that we certainly can encompass our findings about meditation. We are positing a BEC subject to quantum superposition.

The fact that it has final causality means not only that we can responsibly talk about function, but that the vocabulary of control theory becomes relevant as we seek the effects of themes from higher-level entities after symmetry breaks bring us to low levels. In particular, we find interrelationships between metabolism and gene expression with massive consequences for health. Were we to explore evolution, as I do in other papers, we would talk about the irrelevance of the idea of gene qua inheritable entity implemented in predefined sequences of nucleotides and focus also on influences on the individual, species and population.

In my 2008 paper we asserted that, adapting Kripke, syntax is intrinsic to the biology if not the physics and thus an area like biolinguistics or better Bionoetics should emerge. That area, in turn might include also what Fred Hoyle called the anthropic principle in biology, the sheer unlikeliness of proteins or anything like that working. Above all, it would leave the door open for hierophants to sing our electromagnetic, quantum and other connection with the earth and beyond it the cosmos.

V WHAT MIGHT A NEW RELIGIOUS SYSTEM LOOK LIKE? (PART 2)

“although far away, your rays are on earth...all beasts are satisfied with their pastures, the trees and plants become green...the fish in the river dart before your face, for your rays penetrate into the depths. Of the sea...how manifold are your works” Great hymn to Aton in Craughwell ed 1998 258-261

“O lord my god, thou art very great...who laid the foundations of earth,,,the trees of the lord are full of sap[...the high hills are full of goats...man goes forth onto his work....O lord, how manifold are your works!” Psalm 104 in Craughwell ed 1998 262-264

We have inevitably fallen into discourse on consciousness, and this section is an attempt to make explicit the connection with spirituality. The first task of the author is to explain the common thread running through these apparently diverse quotations. Akhenaton, the author of the great hymn to Aton, is considered by many as the founder of monotheism, with his God initially identified as the sun. Arguably, both Judaism as exemplified by Psalm 104, and Islam are his descendents. What this may be interpreted as is a paean to the unexpected order that exists in the cosmos, an order leading to our sustained existence, and explained (away) by the anthropic principle. Penrose, in a secular context, reconstructs the sun's effects as being due to its being a provider of energy at low entropy, in a cosmos that began at very low such levels as we have seen and we have cited him to this effect.

What kind of spirituality and religious system does QM entail? Fox (1991) is among the hierophants who proclaim a new spirituality beginning with “In the beginning was the gift”(ibid., 1). After a classical account of big bang cosmology in verse (1-3), he begins to merge his account with religion; “Teachers were sent, divine incarnations....Isis and Hesiod...Jesus and Paul...Mary and Hildegard.”, shortly after, Fox left the catholic church; it is this writer's view that somewhere in the next few decades, the impulse toward the cosmic present in the work of Stapp and his peers will yield a new experience of what Karl Otto called the “Idea of the holy”.

With his characteristic cynicism, Houllébecq (2015) varies on the theme that ironically it is those espousing the religions so despised by Darwinian new atheists

who are pursuing what is in evolutionary terms a superior strategy;

“the stats are adequate, because they have examined 22 countries in the EU with similar results...to summarize their thesis, transcendence gives Darwinian advantage; couples that accept one of the three religions in the bible...have more kids than atheist or agnostic couples...it is genetically transmitted...people remain faithful, in the vast majority of cases, to the metaphysical system in which they were reared”(Houllebecq, 2015,69-70, translation by this author)

The protagonist of the book is a scholar of the 19th century Satanist Huysmans who ended his days in a Catholic monastery. Faced with this precedent, and that of his own father’s reinvention of himself, previously a Unilever executive, in later life as a hunting and shooting countryman we witness our hero tumble into a decline and depression. The premise of the book is a devastating one;

271 “liberal individualism must triumph insofar as it was satisfied to dissolve structures be they countries, corporations or social classes...when it attacked that ultimate structure which was the family, and thus demography, it reached its final self-destruction; thus entered, logically, the era of Islam.”

The crisis of the book is a conversation with the new head of the Islamic university of the Sorbonne after which our hero indeed converts to Islam – the thought that his middle years would be filled with three nubile young women as wives does concentrate his mind;

“It’s submission”, said Rediger softly. “the revolutionary idea is simple, never before said with such force, that the summit of human happiness resides in the most absolute submission...for me there is a relationship between the submission of women to men....and the submission of man to God” (260)

For Houllebecq transcendence is identified solely with the Abrahamic religions; this point became so contentious that, in the 2017 presidential campaign, Macron had to state that transcendence was open to all in a secular society. We are using the word “transcendence” in a different sense here; it bears reflecting on that Houllebecq’s sense may indeed identify religion with family dynamics so stable that women will indeed bear children. 2017 Italy saw the lowest gross childbirths since the foundation of its republic; Ireland’s abortion referendum was run in a context in which many women complain that neoliberal policies (essentially, giving your money to the already rich) prevent them from having kids.

The religious and spiritual are contrasted by the writer Lemoine as interviewed by Sauvaget (2018) and he argues that the former is winning after the plethora of new age movements in 1990’s France;

“Religion is retuning to its darkest side..the irrational, violent and

fanatical...because it justifies whatever; intolerance, refusal to dialogue with ethical and social pluralism, re-establishing boundaries and identities..."

He makes what may seem a surprising argument for "faith", often identified with dogmatic acceptance:

"For my part, I prefer a return to faith or to new spiritual quests...faith is nomadic. It does not know; it seeks"

Without doing violence to his schema; we can identify spirituality as a search for faith that can be contrasted with the dangers of religion;

"In religion, there is no more questioning....the religious dominates the spiritual...(the spiritual) plays with boundaries which is unacceptable to the religious, by nature exclusive and not inclusive...historical experience shows that the complex which is a religion (ritual, worship/cult, an ethic, a sacred text) leads to violence"

Political Islam (before Isis came the successes of this in Iran and Saudi Arabia) is generally identified as exemplifying all that's wrong with religion. Yet consider the universality of the mystical impulses in these quotations;

"in the market, in the cloister- only God I saw. In the valley and the mountain – only God I saw...I passed away into nothingness, I vanished. And lo, I was the all-living – only God I saw" (Baba Kuhi in Craughwell, 1998, P. 62)

"I take refuge in the great awakening and its unfolding within these exalted forms until I receive complete enlightenment.....O noble one of pure white form crowned with complete awareness (Chenresig/Avalokitesvara in Craughwell, 1998, Pp. 223-224)

"I arise today through a mighty strength...God's ear to hear me, god's word to speak for me" (St Patrick in Craughwell, 1998, Pp. 188-189)

Those Islamic mystics like Baba Kuhi who came to identify Allah as the "I am" and thus as identical with themselves were often martyred as heretics. It can be argued that the crusades put paid to this thread within Islam, arguably the purest monotheism. People used to liberal democracies have fought off fascism coming from their own; it is unlikely that the Islamic takeover of Houillebecq (2015) will ever happen. The fact that the Islamic God is not just One, but a tendency to unicity, to unifying the diverse arms of state under a single aegis, surely gives pause?

Moreover Allah is both anthropocentric; "the beneficent, the merciful...the all-knowing" Craughwell, 1998, P. 120)and identical with an impersonal evolutionary ethos "majestic, creator, evolver, fashioner" (ibid.)

So arguably those coincidences that lead to our lives here in this "Goldilocks" planet will continue to be celebrated in any new spirituality. The omnipresence of

meditation in western countries attests to its continuing dominance of forms of spirituality, as indeed does the anti-clericalism that inevitably follows the Catholic Church's excesses. Yet the historical continuity of the Church in this age of moral and epistemological chaos, the failure to utterly extirpate it even in France and Mexico, and the fact it still has some of the best real estate for weddings in most cities will ensure its survival.

Is there not a case for in intellectually respectable fashion allowing oneself to practice those rites of passage like Baptism and marriage in temples of monotheism? These are related to our embodiment as carbon life forms. For the rest of one's practice, processes that initiate one into "higher consciousness" like talk of Marxist-influenced revolution, dance and other physical movement, and understanding great art inevitably allows attract a penumbra of the sacred. Maybe such a smorgasbord will be a natural magnet for those genuinely seeking the infinite?

My personal experience is that regarding the natural world as an act of self-knowledge by something deathless, absolute, and yet still becoming through the cosmos is useful. It also helps explain the fact we cannot "find" ourselves in our mental space, despite having a tacit sense of self; and that identifying self as its contents leads to a null set. Of course, we can and should become aware of ourselves in the sense of being able to reflect on our past behaviour and improve it; that is quite different.

So Baba Kuhl and his fellow martyrs had a point; subjectivity can be projected onto something unborn, unoriginated, uncreated, unformed, the essence of order, the great "I am" of the Bible, pure awareness. Of the schemata we've seen here in foundations of mind, it is Sarfatti's that comes closest, and tweaking it with a little more openness to other points of view coming from other disciplines like neurodynamics may yield pure gold. What this paper has attempted to do is posit a physical, biological and social world existing independently of the excesses of much QM speculation and provoking us to be ever more conscious.

For Sarfatti, consciousness requires a "back reaction" from a living organism to the Qubit field that is the quantum potential of the pilot wave. Penrose (1989) is implicitly more stringent; it requires an intentional system of formal power \geq standard arithmetic to perform state-vector reduction, and thus do the nondeterministic process R (roughly equal to Stapp's process 1) that exemplifies consciousness. Freeman has identified neurodynamical processes culminating in Bose-Einstein condensates capable of superposition. Moreover, he argues, they can be read off scalar EEG fields. The hunt is on; and we have returned to the fields and codes theme of the accompanying paper.

We have left open the question of whether the cognitive and noetic modes admit of

determinative “reality distortion fields”. Our ancestors certainly thought so; they convened in churches and prayed that just this once, $2+2=5$ – or so it seems. In her introduction to Craughwell (1998), Karen Armstrong comments on the apparent absurdity (xiv);

“Does God really need to be told that he created the world and redeemed us and that we are miserable sinners?”

Her solution is that it’s really a psychological process, which rather reminds this asthmatic of being told in his youth that his life-endangering attacks were psychological. Remarkably, the view of life in the Psalms, where God is continually reminded of how horrible things are for His people, is at least as dark as Buddhism, where at least there is a subjectivity that knows things are suffering, partial, and non-being. It is shocking that this imprecatory prayer has a counterpart in QM.

By way of explanation, and in the same spirit that had me extend my editorial *lèse-majesté* by publishing a paper on Celtic metaphysics in a FOM special issue, let us consider Gaelic. Irish Gaelic is one of the surprise successes of the internet era. A language thought to be permanently on the verge of extinction with its life support system a wholly artificial status as Ireland’s first “official” language, now boasts 4 million learners on the Duolingo app; more than either Polish or Danish, and an order of magnitude higher than the admittedly new Mandarin program.

Gaelic is still, unlike English, a highly syntactically inflected language; while the initially rather baroque case system of classical Gaelic has been restricted somewhat, its tenses are clearly marked. While English arguably has a “precatory” or imperative mode, Irish boasts what can only be described as “imprecatory” modes (as distinct from tenses), the “Modh Foshuiteach” past and present. Often mistranslated as the subjunctive, these modes are more directly related to praying and cursing.

Both French and Italian have many subjunctives, if falling into disuse like the subjunctive present in French;

Qu’il vienne - that he may come!

Passé. que je sois venu - That I did come!

Imparfait. que je vinsse - That I was coming!

But this is not quite the same as they are clearly falling into disuse and they show signs of a state-sponsored grammarian simply inventing a “future subjunctive” to round off a complete definition of the language. The imprecatory modes in Gaelic correspond precisely to what Wheeler (1978) envisages is possible in QM; changing a current state of affairs and one in what Stapp (2017, P 106) calls the past in “process time” as distinct

from classical time. So while it seems to affect events in the “past”, process time – according to Stapp – may leave no record.

Examples in Gaelic are:

'go dté tú slán' is our imprecatory and means - that you (will) be safe and beautifully Go

dtachta an diabhal thú. The Devil choke you

or (my last message to my friend, the great Pat Suppes)

Nár laga Dia thú May God not weaken you

Dá dtogadh sé 5 in ionad 1! would be a prayer that the guy did not take Hwy 1, which has fallen into the sea, from LA to SF but took 5 instead which is imprecatory past, what Wheeler was hinting at.

Therefore, the Modh Foshuiteach past tense allows constructions like “That John never married her!” On the one hand, this is clearly wishful thinking. On the other – and here there is an unexpected link with Quantum mechanics (QM) originally due to the Nobel laureate Wheeler (1978) – a limited ability to change the past as well as the present has been demonstrated in numerous physics experiments (Jacques et al 2008).

No new age speculations that the ancient Irish knew QM will be countenanced. However, Malinowski (1954, 85-86) cognizant of the stereotypical and indeed dull nature of much primitive magic, nevertheless specifies its science-like characteristics;

“First of all, magic is surrounded by strict conditions: exact remembrance of the spell, unimpeachable performance of the rite....both science and magic develop a special technique”

Likewise, athletes have coaches who quietly sit on the terraces, lending them support; psychoanalysts endure projection and transference; we all have had mentors whose loss we deeply regret. Are the quantum effects present in NADH/NAD+ relevant to human voluntary action (Al-Khalili et al 2004, 133)?

At the very least we should remain open to a revolution in our views on mind, and similarly aware of radically different archaic ways of parsing nature.

The Goldilocks nature of our existence makes everything exceptional. We can regard its positive manifestations as sacred. To consider everything exceptional has led whole civilizations down blind alleys in the past – Greece alone translated 9 times more books than the entire Arab world. Yet we have some preliminary evidence for imprecation, and solid evidence for the influence of thought on metabolism and metabolism on health. What should we do?

A first step is to distinguish what is sacred from what is susceptible of ritualistic expression. The latter includes rites of passage; birth, marriage, death-to cite the three

occasions on which the French attend church – are the outstanding examples. Yet coaches support their teams through the first game with an audience, teachers attend their students' musical debut, and so on. In all these cases the neophyte is being initiated to performance in a context initially experienced as transcendent. The goal is the development of presence so modulating the others' perception, and her own performance, becomes second nature.

Relativism has led us to lose initiations into social awareness, intellectual insight, and much else. These are sacred moments. Multiculturalism has occluded the massive achievements of western culture in freedom of expression, association and democracy. There too are sacred.

The vocabulary of sensorimotor, cognitive and noetic; coupled, noumenal and intentional allows a counter to relativism while staying safely with a vocabulary recognizably with the sciences dealing with the observer – physics and cognitive science. The development of presence as we transit from coupled to decoupled modes is already effectively granted status as sacred as parents and mentors guide their kids.

Perhaps we need to formalize this into something recognizable as a naturalized religion as we need to defend our freedoms with rather more vigour than the current academy will allow as its social sciences are infected with relativism as dogma? There is no shortage of magnificent intellectual constructs that link us as directly to the cosmos as the religious landscape of the founders of the Abrahamic religions linked them. Somewhere therein in a path of presence, so tragically curtailed for Strohman as he alerted biologists to the salience of metabolism.

Coda; The schooldays of Jesus, or techne versus episteme.

In the teens of the 21st century, the South African Nobel laureate in literature, JM Coetzee published a pair of puzzling books of which the latter, *The schooldays of Jesus* (Coetzee, 2017) we will use to exemplify some of the themes of what may be a confusing paper. Coetzee revealed at a book signing that he would have preferred not to have any title; the minimalist plot features two drifters, Ines and Simon, arriving by at a town called Estrella with their unofficially adopted son, David. He caused trouble in his previous town; he left school, and ran away from a reformatory. Attempts by an engineer to tutor him about number run into Wittgensteinian paradoxes.

He finally finds a school where he is comfortable, in which number is taught through dance. This is explained by the school's director Juan Sebastian, when commenting on the aptly named Metros, the father of measurement (244);

“the teachings of Metros are based on number, but Metros did not invent number. The numbers existed before Metros was born....Metros merely used

them”

The guest lecturer, Moreno, sees this use as a catastrophe (242);

“...we abandoned as futile the quest to know things in themselves, and began instead to see the world through its metra”

The boy David/Jesus is chronically insubordinate, and a brilliant dancer whose steps can invoke primes like 7 and 11. The book, in many ways no more thick on plot than *Godot*, concerns the murder of Juan Sebastian’s wife by Dmitri, a caretaker with whom she has been having an affair.

Dmitri cannot explain his action except in terms that suggest insanity; for one so beautiful as Ana Magdalena to have sex with him was a travesty, a violation of the cosmic order. Yet he is sincere about this; he insists in the face of trail of his right to punish himself in the salt mines, versus hospitalization.

David/Jesus helps spring him from hospital several times. One is tempted to quick conclusions; the Dionysian Dmitri versus apollonian Juan Sebastian. Yet nothing is quite as it seems as Dmitri welsches on going to the mines, Ana Magdalena did not really understand Juan Sebastian’s teachings as she passed them on to David and the other children.

But that is not what Juan Sebastian thinks (244);

“Through dance she returned her students to the true numbers, which are eternal and indivisible and uncountable”

With the preoccupation on dance, and archetypes of the physical, emotional and rational, many will see the influence of Gurdjieff. We are living in a period in which symbolic expression is increasingly being taken over by machines; they guide us through every sentence we compose on our phones, and soon will compose most of the symbolic artifacts we experience. Everything will be *techne*, and the deeper episteme will face the wrath of relativists.

It seems appropriate to leave this coda as unresolved as Coetzee’s plot. Simon wonders at his warning David against Dmitri and his world of passion. Simon butchers a pair of dancing g shoes and insists on being given a lesson. A star (of course, *estrella*) appears; we are told all along that the dance has something to do with the stars, in a non-astrological sense.

Clearly also in a sense greater than pure astronomy with its metrics;

“music-dance is its own way of apprehending the universe...a way that prevailed before the coming of *Metros*...” (*Ibid.*, 243)

In his 2002, 2004 book this author attempted to extend the notion of knowledge in this way; *techne* would become episteme, the subaltern would become politically

enlightened, and so on. Coetzee takes the additional, more radical step of arguing that the essence of these Platonic realities can be found only through action, as distinct from the third person knowledge that is *techne*.

CONCLUSION

The general framework of our 2009 and 2011 papers on this subject still seem valid in that meditation does seem to free up energy to be used by the rest of the organism. There are two new wrinkles, both provoked by the gratifying new access of interest in the subject; the energy may specifically be low entropy, and QFT may be the most elliptical way of conceptualizing the brain dynamics. We look forward to future contributions by the talented researchers in the new field of the thermodynamics of cerebral cortex. We also look forward to new hierophants who will stress the unity of meditative and other spiritual experience behind the diversity of belief systems and rituals.

info@foundationsofmind.org

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