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On Taking Monism Seriously

Abstract: *Analogy with the monisms of fundamental physics suggests that a concept of symmetry breaking is likely to help towards developing an understanding of mind/matter monism. I explore some possible consequences of this concept, arguing that a broken symmetry, involving energy and 'what-it-is-like-to-be-ness' along with time, may occur and may manifest in the course of energy measurements. The resultant proto-panpsychist picture has the advantage of indicating how our complex, human consciousness could emerge from proto-conscious elements. It's an account that has empirical, refutable implications which are briefly discussed.*

Keywords: consciousness; energy; gauge theory; monism; panpsychism; time; symmetry; uncertainty.

1. Introduction

Many of us pay lip service these days to a monistic world-view. The trouble with doing so is that our worlds don't *look* monistic; there are conscious minds in here and the rest is out there in an 'objective' environment. Therefore, unless one is willing to embrace the problematic extremes of either eliminative materialism or Berkeleyan idealism, it is necessary to reintroduce dualism in some guise or other. Property dualism and Spinozan dual aspect monism (e.g. Velmans, 2009) are examples. This strategy is arguably a stop-gap measure unlikely ever to achieve anything more than 'saving the appearances'. It performs much the same function as did adding an epicycle in Ptolemaic astronomy. Maybe we can to do better. I shall argue in what follows that an

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alternative strategy is available; one that can be used to point towards a specific theory of consciousness with empirically testable implications.[1]

The most obvious feature of any mind/matter monism is that it has to be pictured as a single entity — it possesses its own particular type of *symmetry* in other words; one that is lost when mind and matter are considered separately. As far as we are concerned, that symmetry certainly appears to be broken. We experience conscious minds as having properties distinct from, and often regarded as incommensurable with, those of brute matter. The situation is reminiscent, therefore, of one familiar from fundamental physics where all the apparently very different forces of nature (except possibly gravity) are thought to have arisen from original unities via broken symmetries of one sort or another. Symmetry breaking is the central concept underlying the various gauge theories on which the hugely successful 'standard model' of particle physics is based (e.g. Schumm, 2004; Close, 2011).

The vast complexity of the material world is thought to be entirely dependent on a fracturing of pre-existent unities. The electromagnetic force, for example, has properties very unlike those of the weak nuclear force but, as has been known for 40 years, both are manifestations of an original 'electro-weak' unity. Maybe it's not unreasonable to suppose that the richness of our mental world derives from some similar divorce in an original monogamy. It's worth keeping in mind that, when a symmetry has broken, consequences of the original unity may still persist to influence the sundered parties. For example, the original electro-weak unity requires that properties of the vector boson of the e-m force (the photon) are modified to a small extent as a consequence of the very existence of one of the vector bosons of the weak nuclear force (the Z particle), and vice versa. Because symmetry-based theories allowed physicists to predict all sorts of phenomena (including the existence of Z particles) that were later observed in experiments, there's some reason to hope that useful predictions might be extractable from a similar approach to mind/matter problems.

In brief, analogy with the monisms of physics strongly suggests that, if we are to be serious about mind/matter monism, we have to allow that it is likely to involve a centrally important capacity to manifest broken symmetry. Before looking at possible consequences of any break, however, we need first to try to pin down what might have

[1] This paper develops some of the ideas that I sketched out in a book (*Who Was Mrs. Willett?*, 2011).

been involved in the original monism (still assuming that the opposed extremes of either eliminative materialism or idealism are both incorrect). The 'matter' component of the monism is fairly straightforward since all matter and all material dynamics are, so far as we know, manifestations of aspects of energy. It's energy in all its many forms that we're talking about here. The 'mind' aspect is a lot trickier since it can't be much like our ordinary human consciousness — if only because it must lack the perceptual and other memories that underlie so much of the content of our experience. Some vague idea of universal, elementary awareness may be the best one can do at present when it comes to conceiving its nature. I'll call it 'subjectivity' in what follows, as a shorthand term for a primitive and hard to imagine 'what-it-is-like-to-be-ness'. Although 'subjectivity' is not an entirely satisfactory term and is possibly misleading in some respects, alternative terms might be more misleading. The original monism that we'll be discussing is therefore to be envisaged as an energy/'subjectivity' one, though its nature is even harder to imagine than that of 'subjectivity' alone — how would an energy/'subjectivity' unity look or feel? How could its dynamics be pictured or described? These are not questions likely to gain firm answers any time soon.

2. Breaking the Symmetry

There are no doubt many conceivable ways of breaking an energy/'subjectivity' symmetry. What we need to do is try to identify the most plausible candidate — the original fault line, so to speak. I should first of all point out that, following the analogy with physics, it is unlikely that anything within the monism (other than a *potential* for a break to occur) is needed to cause a break. In gauge theories the symmetries break 'spontaneously' in the course of 'phase transitions' which are dependent on some overall context such as the ambient temperature of the universe. The situation is a bit like, to give an everyday example, the phase transition that breaks the symmetries of liquid water and allows manifestation of the new, more limited, symmetries of ice crystals.

I won't offer any speculations about what sort of context could affect maintenance or promote breakage of an original energy/'subjectivity' symmetry for I have no ideas about this that are sufficiently coherent to be worth reporting here. But I shall be suggesting that the fault line has something to do with *time*. Here's why: energy and time are deeply interrelated. Conservation of energy depends (via Noether's theorem) on the fact that fundamental physics isn't affected

by displacements in time. In other words, energy conservation has been proved to follow from the circumstance that basic physics always looks the same regardless of whether you do your experiment at lunchtime or teatime, this year or next. Moreover, energy and time are generally said to share a Heisenberg uncertainty relationship in quantum theory (the more precisely the energy is measured the more uncertain is the time measurement, and vice versa). However the 'time' in question is typically conceived as clock time; either Newtonian time or the space-time of special relativity. It's especially notable that both these types of 'physics time' are summed from 'instants' of infinitesimal duration — the calculus on which so much of physics depends requires this.

On the other hand, the time that manifests in our conscious experience is very different from 'physics time'. Sometimes it runs fast, sometimes slow; the present moment (William James's 'specious present'), far from being of infinitesimal duration, can vary from around 0.1 sec. to several seconds. Listening to music, each note can appear to occupy its own moment; change one's focus and an entire bar or musical phrase can seem present all at once. Maybe these features can be attributed to the vagaries of neurology and will be explained when we properly understand our brains' temporal computations, but there also appears to be a more fundamental difference from 'physics time'. As noted by Jeffrey Gray (2006), it is actually impossible to assign *any* precise time to a conscious experience over clock durations of the order of 0.2 sec. The evidence for this derives mainly from the moving coloured dot illusion. If a dot is flashed at one position on a screen and is followed 0.2 sec. later by another dot at another position, one perceives a single dot moving from the first to the second position. If the first dot is coloured red and the second green, the dot that is perceived as moving appears to change colour about half way across the screen — i.e. about 0.1 sec. *before* the green dot actually appears. This phenomenon can probably be attributed to Libet's (1996) 'backward referral' of conscious experience in association with a probability estimate by the brain of when the colour change 'ought' to have occurred, but is nevertheless quite unlike anything familiar from 'physics time'.[2]

While the contrast between physics time and conscious time offers only a hint that the fault line we're looking for may be time-related, there are grounds to regard it as a possibly useful hint. There's literally

[2] Richard Feynman and others have of course discussed possibilities for time reversal in physics, but these are unlike the 'green dot' phenomenon for they either involve reversals of parity and charge or are confined to the world of quantum superpositions.

no room for conscious mind among the existing gauge theoretic monisms and symmetries that underpin much of physics, but there is a huge *terra incognita* to do with energy and time where all sorts of exotic beasts may lurk. For instance, 'what is energy and how does it arise?' questions lead straight to 'why is there something rather than nothing?' ones that we have no idea how to answer. Time is also poorly understood and defined. The Newtonian picture of time, still used for many practical purposes, is known to be simply wrong; there is no universal, observer-independent, three-dimensional interface between past and future. Relativity theory, on the other hand, is known to offer an incomplete account of time's true nature due to the incompatibility between general relativity and quantum theory. Some physicists have suggested that time is an illusion (e.g. Barbour, 1999); others that it is an emergent property of some underlying order (e.g. Smolin, 2000). There are, in brief, no *a priori* grounds for ruling out an energy/'subjectivity' monism with a fault line that may involve time as a consequence of energy/time relationships. Other conceivable mind-involving monisms and their potential fault lines are likely to present greater *a priori* difficulties.[3]

Hans Primas (2003; 2009) has investigated the idea of symmetry breaking in the context of a mind/matter monism (i.e. the Jung/Pauli *unus mundus*). His admirably detailed, formal analysis centres on a break implied by the emergence of time's arrow in the context of physical laws that are in principle fully reversible. He discussed the distinction, originally due to McTaggart, between *tensed* (pastness, nowness, and futurity) notions of time and *tenseless* (earlier than, simultaneous with, later than) ones, suggesting that: 'The tensed domain is the carrier of nonmaterial mental phenomena, while the tenseless domain is the carrier of nonmental material phenomena' (Primas, 2003, p. 113). In the argument that follows, I will suggest what might be regarded as a partial reversal of this formulation; namely that the two varieties of temporality may not be 'carriers' so much as secondary consequences of a primary energy/'subjectivity' break. In other words, I'll be suggesting a picture in which subjective, conscious phenomena can be considered to entail a type of time having much in common with Primas's 'tensed' time, while objective,

[3] For instance an anonymous reviewer suggested that, as spatial illusions exist that are comparable to the moving coloured dot illusion, a break involving space might be considered. I've argued elsewhere however (Nunn, 2007) that the spatial representational content of our consciousness is likely to be of *classical* dynamic state spaces, instantiated in fractal, probably holographic, waveforms. There's no obvious 'room' within a concept of this sort for a broken symmetry of the type needed.

energetic relationships entail the sort of 'tenseless' time[4] that figures in the equations of physics. Where could a time-related, primary energy/'subjectivity' break be plausibly thought to occur?

No such break can happen in the *classical* world for it is already fully 'objective'. Any theories, confined to the classical world, that hope to introduce consciousness into it must propose that consciousness is a new, emergent property of extremely complex systems. These theories are very different, and face very different challenges, from the type of monistic one explored in this paper. They are perhaps better in that it is easier to extract refutable predictions from them, but less satisfactory in that consciousness is introduced into them only in the form of what might be regarded as a *deus ex machina*. One of the main aims of this paper is in fact to sketch out an example of a monistic theory that *does* have refutable implications, in order to show that this is possible.

We therefore need to look for some non-classical site for a break. It should also be one with universal or at least widespread existence, in order to allow evolution some basis on which to work when it came to elaborating human-type conscious experience. As we're proposing an energy/'subjectivity' break, the obvious place to look for the necessary fault line is in events associated with manifestation of energy eigenstates which already involve a 'fault line' of a sort — namely the particular quantum-to-classical transition associated with energy measurements. If we are going to catch energy/'subjectivity' symmetry-breaking in the act, happenings associated with energy measurements have to be the first place to look if only for reasons of parsimony (i.e. not 'multiplying entities beyond necessity' in the phrase often attributed to Occam).

A plausible formalization of a suitable break originated, so far as I know, with Tal Hendel who described it in a hitherto unpublished paper (written in 2009). He pointed out that, whenever an energy eigenstate manifests, the equation of the associated Hamiltonian (energy operator) can be written in two ways, either as an operator acting in time or as one acting in space. As is well known, time itself can't be treated as a quantum operator but the Hamiltonian can and has two alternative expressions.[5] Hendel suggested that the spatial equation represents the objective energy eigenstate that we can measure, while

[4] There are obvious questions to be asked here about whether broken temporal symmetries are *always* secondary to some underlying cleavage, but I won't pursue them as they are poorly understood (at least by me!) and beyond the scope of this paper.

[5] First the Hamiltonian expressed as an operator acting in time

the temporal one may refer to what one might call a 'scintilla' of the 'subjectivity' identified in the introduction to this paper (Hendel himself dubbed this concept a 'qualion', which is a term that I prefer to avoid because it may suggest something a bit too particle-like, and thus 'material', when it in fact refers to something divorced from what we normally regard as 'material'). There is a difference between the view he advocates and the one offered here, however, in that he *identifies* 'subjectivity' with the 'temporal' equation, whereas I suggest only an *association* between the two in the sense that the alternative equations of the Hamiltonian may represent the site of the required energy/'subjectivity' break and provide an indication of the main affiliations of the sundered parties.

Both Hendel's view and mine are pan-protopsychist (also often referred to as proto-panpsychist), but the gap between views of that general sort and human-type conscious experience is notoriously hard to bridge. Identification of the 'temporal' equation with 'subjectivity' makes for difficulties with bridge-building because the time described in the equation is clock-like (essentially Newtonian). An associationist view, however, allows useful extra degrees of freedom; in particular it allows the introduction of considerations to do with Heisenberg uncertainty and the possibility that 'subjective' time could differ fundamentally from the clock time of Schrödinger equations (as indeed everyday experience appears to confirm). As noted earlier, there's an intriguing possibility that the difference between clock time and 'subjective' time may correspond to that between the tenseless and tensed times discussed by Hans Primas, but the relevant issues are complex and beyond the scope of this paper. The next section sketches the outline of a possible design for a bridge between pan-protopsychist 'scintillae of subjectivity' and our elaborate, ordered conscious experience.

3. Bridging the Gap

When we eventually discover the closest neural correlates of consciousness, whatever they may be, it's virtually certain that they will possess a wavy character of the sort that manifests in EEG activity. Many theorists have suggested that the closest neural correlates, or

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$$\hat{H}_\tau = i\hbar\frac{\partial}{\partial t}$$

whereas, in equation (2), the Hamiltonian is expressed as an operator acting in space:

$$\hat{H}_r = -\frac{\hbar^2}{2m}\nabla^2 + V(r)$$

even consciousness itself, *are* the EEG electromagnetic fields (e.g. Freeman, 1999; Pockett, 2000; McFadden, 2002); others favour claims to priority of waves of varying calcium ion concentration (e.g. Nunn, 2003; Pereira and Furlan, 2009). All such waves are associated with a huge range of energetic processes, which inevitably fluctuate in intensity along with the waves themselves.

Each of the energy eigenstates contributing to wavy activity in the brain will have a defined (in the sense of environmentally 'measured') uncertainty or range of 'error'. Some particular change in the energy level of a hydrogen atom (a 'quantum jump'), for instance, will be very precisely 'measured' (if only by its environment), while the energy associated with an action potential will have a large possible range. According to any picture that incorporates what one might refer to as a 'Hendel break' (i.e. a disjunction involving two aspects of the Hamiltonian, described in the previous section), the equation of the Heisenberg uncertainty relation between energy and time implies that the 'scintilla of subjectivity' associated with the former event (a hydrogen atomic energy level jump) will be of quite long duration while that associated with the action potential will be of almost infinitesimal duration. But note that the uncertainty in question is regarded as referring primarily to a 'subjective' duration, not directly to any 'objective', clock time duration, even though the 'subjective' uncertainty duration may be amenable to secondary description in clock time terms.

Any event with an energy uncertainty of around 10^{-33} joules will have a 'subjectivity' associated uncertainty of the order of 0.1 sec. by clock time. This energy is tiny (less than the kinetic energy of a smallish molecule at close to absolute zero[6]), but it is important to remember than it refers, not to an energy eigenstate itself, but to the *uncertainty in the 'measurement' of* an energy eigenstate. It's not improbable that some brain events are sufficiently well defined to have a roughly 0.1 sec. temporal uncertainty. Attractive candidates on general grounds would be binding energies of some sort (e.g. neurotransmitter to receptor or calcium ion to protein), though it may well turn out that their energy uncertainties are too large to qualify. In that case, one would need to look to intrinsically very low energy eigenstates, where there is reduced scope for uncertainty, such as ones involving massless particles (photons, phonons, or Goldstone bosons).

The question of what 'temporal uncertainty' could mean has been much debated. Does it refer simply to a limitation on measurement

[6] Thanks to Jo Edwards (private communication, 2011) for this calculation.

precision? Alternatively, could there be an inherent 'fuzziness' of time (which is a problematic idea because hard to reconcile with the clock time succession of 'instants' implicit in the mathematical foundations of quantum theory)? Clearly the uncertainty relationship has some sort of 'reality' because the very existence of the virtual particles that play such essential roles in quantum field theory depends on it, in the sense that the energy of particles that appear for very short times and thus have very small temporal uncertainties can have a large range. Equally, any entities associated with small energy uncertainties must be considered to have a large 'temporal' range. Since the suggestion here is that 'subjectivity' is associated with the 'temporal' description of the Hamiltonian operator, it follows that the concomitant temporal uncertainty is a primarily *subjective* one. In that case the temporal uncertainty of the uncertainty relationship could probably be regarded as both a limitation on measurement precision (from an objective point of view) and as due to an inherent fuzziness or chunkiness of time (from a subjective point of view). Fortunately this uncertainty about the nature of temporal uncertainty doesn't affect the basics of the model described here, although associated questions might well prove relevant to its refinement.

Given a 'subjectivity' associated uncertainty of the order of 0.1 sec. (regardless of whether the temporal uncertainty itself should be thought of as primarily objective or subjective, epistemological or ontological) occurring in the context of wavy energetic brain activity of the order of 10 Hz,[7] there must be a direct mapping between the dynamic structure of 'objective' energy fields of the brain and that of putative 'subjective' ones. Strictly speaking, for accurate mapping, 'subjectivity' uncertainties matching the frequencies of each component of a Fourier transform of the consciousness-correlated brain activity waveform would be needed. However, the basic harmonics are both the most important and also the ones placing the greatest constraints on required energy eigenstate definition. They can probably be equated with the most obvious features of EEG records.

A local, 'subjective' field may exist, according to this picture, that reflects some of the complexity of associated 'objective' brain dynamics (i.e. reflects the dynamics of those events in the brain offering a

[7] These figures are for illustrative purposes only. Many would say that consciousness-related brain activity is in the gamma range (30–80 Hz), in which case one would need to be thinking of 'subjectivity' uncertainties of ~0.02 sec. for a simple mapping. The advantage of the higher frequency is that it entails a little more scope in the allowed energy uncertainty thought to be relevant; the disadvantage is that it doesn't relate so directly to the psychophysiological evidence that consciousness operates on timescales nearer to 10 Hz.

match between their frequency and the apparent duration in clock time of associated 'scintillae of subjectivity'). Moreover, it is a field with a built-in solution to the temporal 'binding problem' of neuropsychology, because 'subjectivity' doesn't come in the sequence of infinitesimals of 'objective' clock time but in overlapping units of extended clock time duration. Quite how one should picture the overlap would depend on whether or not Heisenberg temporal uncertainty is viewed as itself a primarily subjective or objective phenomenon, but nevertheless overlap of some sort is bound to occur. Whether an account of spatial binding also follows from this circumstance is, I think, an open question (my own guess is 'yes it does', but the arguments in favour of this guess are shaky at best and probably not worth rehearsing at this stage). Any firm answer would depend on achieving a more detailed understanding of the notion outlined here, which can be regarded as a proposal for the existence of a previously unknown type of brain-related 'temporal field'. It's a proposal, however, that shows *how* a universally broken energy/'subjectivity' symmetry could build 'subjective' fields reflecting some of the complexity of our neural computational processes. The inbuilt solution to the temporal binding problem, at least, is a nice bonus.

4. Refutations and Explorations

Clearly the scheme proposed here is open to refutation — in principle at least. It would be necessary to show that energetic events in the brain with the 'right' temporal uncertainty *aren't* those underpinning conscious processes. A fairly direct way of doing this, for instance, might be to show that general anaesthetic agents *don't* affect the energy uncertainties of any candidate energetic events and thus *don't* drive putative 'scintillae of subjectivity' out of the range of durations needed for any mapping of brain activity. The necessary first step in refutation, of course, would require calculation of all energy uncertainties in the brain to identify possible candidate events; a task that would need huge resources. So it may be preferable, at this stage at least, to look at possible uses for the scheme. If it were to prove useless, this too would be a refutation of a sort.

From the neuroscience angle, it suggests that the basis of consciousness will be found in energetic events of varying frequency whose individual energies are extremely well defined (have miniscule uncertainty). This at once rules out action potentials, neurotransmitter release, and the like from being anything more than remote contributors to the *content* of consciousness. But, in a way, it's what the theory

doesn't define that is perhaps more interesting than any constraints imposed by it. For, as mentioned earlier, it suggests that our human consciousness can be pictured as a time-related field, split from the matter and force fields that comprise the objective world. The properties of any such field are entirely open for exploration. Particularly interesting questions, I suspect, would centre on how it relates to the space-time of matter fields. A degree of independence might be expected, perhaps allowing apparent temporal, and possibly even spatial, anomalies of the sort for which there is so much anecdotal and statistical evidence (precognition and perhaps 'psi' effects in general, for instance). On the other hand surprising connections might also be found, rather as the photon is related to the apparently very dissimilar Z boson (see Introduction).

5. Conclusions

If the experience of physicists is anything to go by, taking monism seriously implies the likely presence and central importance of broken symmetries. Almost everything about our everyday existence shouts that mind/matter monism can be no exception. As outlined in this paper, pursuing some of the possible implications can lead to a concept of human consciousness as a type of dynamic field that is a translation of the familiar, spatio-temporal, 'objective' world into a 'subjective', tempero-spatial format. Although one can be fairly confident that an overall strategy centred on the concept of symmetry breaking should prove worthwhile when it comes to understanding consciousness, the particular 'fault line' selected here, and the conclusions drawn from it, are speculative. It would be good if other, similarly based, theories were available. If they were, one could probably see how to develop empirical tests of their relative validity. Without others for comparison, testing the theory offered here would either involve making formidable calculations of energy uncertainties in the brain or making 'fishing expeditions' into the largely unknown and controversial territories of anomalous experiences and happenings.

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Addendum

Soon after this paper had been accepted by referees, the special issue of *JCS* on monism (Max Velmans and Yugin Nagasawa (eds.) Monist Alternatives to Physicalism, *Journal of Consciousness Studies*, **19** (9–10), 2012) dropped through the letterbox. I perused it with some apprehension. Would I need to rewrite or even withdraw my paper? Certainly the philosophical sophistication displayed by contributors to the issue rather put me to shame, especially when it came to appreciating the subtlety and variety of monistic views. As I continued to read, however, morale improved. What I had written related to, and could perhaps be considered to develop, various themes. For example I offer a concrete, albeit highly speculative, answer to William Seager's (*ibid.*, pp. 19–39) question about how an 'emergentist panpsychism' might work, which goes along with a solution to the 'combination problem' that is said to

constitute a major difficulty for Russellian monism (Alter and Nagasawa, *ibid.*, pp. 90–92). Similarly Whitehead's view (discussed by Anderson Weekes, *ibid.*, pp. 40–66) that 'mind… is simply the intrinsic temporality of a physical event' is whittled into a more definite shape in my proposals. Harald Atmanspacher's (*ibid.*, pp. 96–120) erudite account of how one might conceive the nature of an original monism, and his general emphasis on the possible role of quantum 'measurement' in relation to the mind/matter distinction, provided an interesting background to specific aspects of my proposals. So far as I could see, arguments espoused in contributions to the *JCS* special issue neither prefigured nor undermined the line of thought pursued in my paper. Rather than make unwieldy attempts to deal with the philosophical complexities piecemeal in the main text, therefore, it seemed preferable to simply recommend the issue in this 'addendum' to anyone wanting an excellent account of the range of monistic philosophies.