# Connecting Consciousness and Matter: seeing them together in a non-reductive way, paying respect to simple acknowledged scientific facts about matter and the human brain

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The author can be contacted at berlinib@aol.com and has made a programming language which is available at g15pmn.com, a place where also a number of references to physics studies can be found.
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Preface

In this little text I seek to create a thought-image which makes sense both for those who come from a more scientific viewpoint, and for those who come from a more spiritual viewpoint (in some vague sense). The scientific concepts in this text are widely known and depicted in a large number of easily available books and articles over the past century, including in articles and books by the physicists Richard Feynmann, David Bohm and Roger Penrose. The easy availability of the few scientific facts that I refer to in this text is the reason why there is no 'reading list' in the sense of footnotes at the completion. [Some of the formulations in this text were helped by conversations with my late father, Stein Braten. Also thanks for conversation with Dr Helene Amundsen Nissen-Lie about the response of the humanities to the notion of 'Artificial Intelligence'.]

I'm going to attempt to construct a thought-image which will, or at least can, satisfy both those who come from a spiritual outlook and wish to understand brain/mind/body, and those who come from what we loosely can call a more 'scientific' outlook. The spiritual outlook may be vague or, for some, more precise, but it is found in all those who are fascinated by such as what philosophers call e.g., 'the stream of consiousness', while at the same time being uneasy about assuming that this is merely the result of machine-like activity e.g. of the brain. In other words, those who do not wish to reduce the immediacy of human consciousness, feeling, mind and intelligence to a mechanical description, have what I here call a more 'spiritual outlook'. Many have both a spiritual outlook and a scientific outlook. The task of the following little article is to suggest a way in which these two outlooks can be at peace with each other. Simultaneously, we are describing a way, or some would say, a 'theory', of how consciousness relates to matter.

For centuries, before the advent of computers in mid 20th century, there were machines around with interesting features, including clocks and damp engines. The idea of trying to see the human as a machine was to some gripping, but even for Newton it didn't deeply challenge the more spiritual view that whatever the human body is, it also has something else--soul, consciousness, the light of the mind,--something which is present with the living aware human being and absent in the case of a dead human body.

With computers mimicking and replaying many features of

human behaviour, the machine image is a far more potent competitor in the mind of people--as regards how we view the human being. And this more potent image is tougher to fight--it becomes more and more easy to view the human being as a machine, and the spiritual outlook does not seem to have had a similar nurturing. So in some schools of thought in brain science, for instance, the view is held that the brain is a machine, and that the neurons interact by cause-and-effect principles although there are also more or less random fluctuations going on. These same people would regard consciousness as merely a fancy way of describing the activity, and would not object to applying such concepts to any machine, such as a robot with a vast computer program mimicking human mindful actions including talking, if it's convenient. These people regard consciousness as what we can call an 'emergent' phenomenon: in their view, when a human being says, "I am conscious and I have consciousness and I use this consciousness in making decisions", they do not interpret this as there being in fact something separate from the machine, called 'consciousness', which interacts with the machine, and changes the cause-effect actions of the machine. Rather, they regard it as a way that the machinery of the brain--the human brain, in this case--describes to itself some features of its mechanical activity. They can be said to take a 'reductionistic' attitude to consciousness: whether it is an emergent phenomenon or not, it is, as they see it, merely the activity of a vastly complex machine.

In such a strict 'atheistic' view of the human being, some forms of science--such as computer science, and the analysis of how chemicals, including those which have some electric charges, such as nerves--are often taken to be _the_ scientific attitude; and those who have a more

spiritual outlook, regarding consciousness in some sense as existing separately from matter, may appear to these reductionistists as wishful thinkers, emplying concepts which at best is unnecessary and at worst contradict clear logical thinking about the reality of human beings.

I think, for those not coming from a scientific outlook, it is important to appreciate that there is no official 'dogma' in science on the view of the brain versus consciousness. In fact, some of the most brilliant thinkers have diverged, and this is true to this day. Some of them were even friends or close collaborators in science. For instance, Alfred North Whitehead and Bertrand Russell were together in shaping brilliant expositions in logic. But while Bertrand Russell view the human mind and brain much along the lines of a machine, Whitehead eventually, especially after contact with quantum physics, regarded the human mind as something going beyond the machine. Similarly, Roger Penrose and Stephen Hawking worked closely together in shaping cosmological theories, but while Hawking preferred a more machine-like view of the human being and mind, Penrose decided that by his understanding of quantum physics, there are reasons to regard consciousness as not mechanical.

In the following text in this article, I will sometimes refer to words which make most sense to those who are acquainted with the fundamentals of modern physics. But if your starting-point is more humanistic, so to speak, you can skim more lightly over just those parts of the text initially and focus, at first, on that which makes most sense. Eventually, like a jigsaw where everything gradually comes into place as the whole image emerges, you may want to re-read the more physics-oriented parts to make still more sense of the entire thought-image of

consciousness relative to the human brain as here presented. And while the comments on the human body focus on the brain, they are meant to be applicable, in many ways, to the whole of the human body.

Those who skim through the developments of the physics worldview since around the 1920ss find that, in what is called quantum physics, we hear of light particles, or photons, as something which interact with matter particles, such as electrons. The photons seem to be able to be 'many in one place', in contrast to matter particles which are also called 'fermions', where 'only one in one place' seems to be the principle.

It has been said by many that quantum fluctuations have the appearance of random at some time, but that these fluctuations also may involve not only wave patterns, but intense orderings challenging even the time-space continuum as conceived in the theories of Albert Einstein. We speak of nonlocality--that there are some sort of non-transferring, perhaps in a sense instantaneous, connection or interconnectedness. What we call 'quantum fluctuations' may mask a spectrum from the more random through more wave-like pattern all the way to something highly coherent and light-transcending.

Those who, as I said, come from a more 'scientific' outlook are probably more or less nodding to all the latter formulations; while those who come from a more spiritual approach perhaps do not easily see a clear line from their thought to such thoughts. Indeed, it's rather complex, and the image of the computer, which is ever-present in every affluent society, is far more easy to conjure; and so we are seeing a situation in which the computer image can, if we don't watch it, be the main image that we have of brains, minds, and human beings and their hearts and lives in general--in other words, that

the computer and its activities provide the main metaphor for the sort of thinking we do about ourselves, about humanity.

And so my task here is to try and construct a thought-image that learns from the spiritual outlook, and which learns from that which we vaguely can call the scientific outlook, and which is not subjecting the human being to the reductionism of being viewed as yet another machine. It goes without saying that I regard the view of the human being as a machine as wrong in all important aspects.

In the following paragraphs, I will use the word 'consciousness' much, but I don't mean it to the exclusion of feeling, nor do I mean to put it in contrast to such as attention and awareness, but I use it in an inclusive sense, so that it includes also leaps of imagination, intelligent understanding, intuition, creativity, love, compassion, a relationship to pain, etc. Those who come from the spiritual outlook should therefore feel free to include such as soul and spirit in this rather encompassing concept of 'consciousness'. And, as said, when I refer to the human brain, I do not mean to exclude reference to the whole human body; I merely regard it as convenient to focus on brain as that which most obviously, for all, associated with human thinking and consciousness, and so representative of the relevant type of 'matter' when we seek a view of consciousness.

Since the early days of quantum physics, with some rather 'dogmatic' schools of thought around it connected to such as (the otherwise very intelligent) Niels Bohr, a lot of opening up of interpretations have taken place. For those who are knowledgable about the historical discussions in this field, I'm not merely speaking of the pilot wave

theory by Louis de Broglie, the hidden variable theory of David Bohm, but of the many re-definitions by an array of physicists of the notion of 'probability density' and where the original assumption by Einstein that no signal can transfer faster than light has been hammered on from many angles. Only some, relatively insignificant features of this re-interpretation has gone into the notion of the proposed 'quons' for a so-called 'quantum computes'. All computers rely, as is known, on semi-conductors, whose theories are grounded in some properties of quantum physics. So all computers are in that sense 'quantum computers'. The suggested 'quon quantum computer' is merely an attempt to make gains on speed on an otherwise entirely mechanical product and is not reflecting more than a minuscle element of the scope of quantum theory.

While I have my takes on interpretations of quantum physics, I'm going to use here a concept that can be seen as compatible with most versions of quantum theory that has learned some lessons from the early days of discussion, and at least picked up a tiny bit of ideas from the counter-perspectives presented by Louis de Broglie.

In other words, what I will here talk of as a quantum feature is something that is compatible with many or most modern takes on quantum physics--in some cases after some discussion, in other cases more obviously so.

This quantum feature is this: extra information inside the probability cloud. Let us make this long phrase easy to refer to: Extra Information inside the Probability cloud = EIP.

I will endavour to make EIP a lively concept for those who have not, prior to this point, thought much about quantum theory or physics in its various shapes and forms.

A fundamental idea in quantum theory is that there is a certain minimum 'quantum of action', and this in many cases appear as a particle, and often a particle of very tiny energy. Thus for instance, while light--which can be described as particles, photo-particicles, or photos, are reaching, eg from distant stars, the human retina, so that an activation of neurons in the retina arises, the light doesn't arrive as a wave that gradually builds up. Rather the flash of a star--and indeed the human retina has nerves sensitive enough to pick up light from just a dozen or so photons--suddenly emerges at some spots. But when more and more of these photos arrives, a wave-like pattern is seen to arise which correspond to the wave-like understanding of light. So while the wave features are intact, the actual interaction between light and matter are particle-like. When and where a particle of light, or photon, interacts with a particle of matter, is in each particular concrete case unknown before it arises. We're speaking here of probabilities, spreading as waves, as 'densitities', or 'clouds', and these probabilities are ingrained in the core of the quantum physics apparatus.

In other words, when light--which is a wave or a sort of field--we can, informally, say, a 'photonic field', spreads, as it meets matter, there is the probability cloud and events within this probability cloud in which certain manifestations of photon particles take place. The word 'probability' refers to the fact that there is something or other, with a pattern, about to arise, but its more concrete manifestations are unknown before they do in fact arise. As the early quantum explorers found, the way we measure photonic fields affect the shape of the

probability cloud. We may focus, for instance, on the movement or momentum aspects of the photonic fields, and that shapes the probability cloud to get other properties than if we focus on the position aspects of the field.

Without splitting hairs about probability clouds, when we speak of EIP, or extra information inside the probability cloud, we refer to the simple fact that inside probability lies the notion of the unknown--in the sense of room for more structure, more information if you like. Instead of dogmatically ruling this out, with a hundred years of discussion and further research in the quantum physics and related domains, such as gravitation physics, behind us, there's a lot of general nodding amongst physicists that the probability clouds do have room for more structure than that which is confined to the typical measurements of position and momentum, and other such classical measuring situations. It is also generally assumed that the reality of the probability clouds is not merely a mathematical abstract idea, but something which, though somewhat immaterial and elusive and 'beyond-energy' in nature, is a fundamental part of the way the universe unfolds. The probability clouds, though in their original formulation were tied up to what we humans know and do not know of a physical situation, are now considered somehow subtle structures of events themselves (and indeed active in making such as super-conductivity and super-magnetism possible).

Whenever there is a finer study of material processes of any kind, then, there is the notion of probability clouds of some kind--whatever exact term is used--and due to the unpredictability here, we speak of 'quantum fluctuations' as also an intrinsic part of all matter, all energy.

Moroever, the quantum fluctuations are sometimes, in cases where there is more coherence and less noise, more orchestrated in some ways. This is related to how the probability clouds are different in some cases with more coherence and less noise. The exploration of what it means to reduce noise in situations where quantum fluctuations take place is often an essential part of the work.

By analogy, if you gently pad your eyelids when you have your eyes closed, you'll see some light-like effects and, when you open your eyes in an open space without artificial lights around to more clearly see dim stars, your eyes need all the quietude they can get to pick up stars. As in the center of the focus the more color-oriented neural rods are, --these color-oriented rods not being quite as sensitive to individual photon groups as the more black'n'white oriented rods--it can help, to pick up a dim star, to look very slightly away from it--just some degrees lets say to the left or right of it. In doing these things, you are directly experiencing two things: the energy interactions at the quantum level, and the interaction between the photonic field--also called the electromagnetic field--and the electrons (and more) in the matter of your neurons in the retina, --which in a certain sense of it are almost part of your brain.

The conditions for interaction between electromagnetic fields, or photonic fields, and neurons, in this case, is tied up to the frequencies and wavelengths of the light. But it is well known that associated with the general motion of electrons in the brain, and other activity, there is electromagnetism surrounding and penetrating the brain--in other words, a photonic field--but of entirely different frequencies and wavelength. This is not merely a question of emanation of a field, such as picked up by the

well-known EEG measurements, where it speaks of alpha, beta, theta and delta waves and such, but also a question of receptiveness on the parts of electrons in the brain to this field. The photonic field as studied in the question of EEG has frequencies such as around 10 to 13 Hertz for Alpha waves, and the wavelengths of the photonic field in this case is in the range of tens of thousannds of kilometers--this you can work out by using the equation that relates the speed of light to the frequency, with 10 Hertz meaning ten cycles pr second.

Now let us be very clear that a photonic field has a probability cloud associated with it. The photonic field--the electromagnetism--may be, if emerges from such as a radio transmitter, the shape of pop music; which, when conveyed into air waves, becomes audiable pop music. But this photonic field, when it arrives and is picked up by the antenna and this is studied on the quantum level, comes across as individual energetic particles, namely photons, and while these patterns add up to reproduce the pop music, the individual energic particles pop forth in ways and in places that is in each case determined by the probability cloud--ie, by the extra information in the probability cloud, the EIP. So the radio wave with the pop music goes along with an EIP that has addition structure.

So also in the case of the brain's photonic field. The shape of this field is one thing; the EIP is another thing --but associated with it. The shape of the field can be measured and when it is measured, the EIP is called on to give some results to our measuring apparatus. But the EIP is never directly measured. In a certain key sense, the EIP is unmeasurable.

But while the EIP is unmeasurable--and most thinkers in

quantum physics over the past hundred years would agree to this, I think it is fair to say--it is also the case that some of the features of the EIP come forth in the quantum fluctuations. The photonic field of the brain affects, and is affected by, (in particular) electrons in the neurons. Electrons are matter; the photonic field is a wave energy. The wave energy is spread out; the matter of the electrons is vast compared to the energy of each photon. The electrons are example of such 'fermions' as we referred to earlier--two electrons cannot exist on top of each other. When electrons interact with anything, quantum fluctuations are involved. When electrons interact with each other--indeed, when any matter in the brain interact with any other in the brain--the energy is largely condensed in these (comparatively) huge particles, --this easily can be a case of 'local' interaction--one thing influencing the things that are next to it. This is what a machine typically is about--the things that are (locally) near each other influence the other things; and if we spell out the rules of this interaction and the fluctuations are relatively limited, the behaviour as a whole mimicks a bit of that of a computer program--ie, it is rule-based.

Now any of those who wish to see how the concepts of the quantum can affect the understanding of the biology of the brain are looking for such as quantum coherence in the brain and there are various candidates for this and, as historically often has been the case with biology, when there are competing theories, the answer is 'both-and' rather than either-or. There is, for instance, interesting research into something which has a degree of analogy to coherent light, or laser light, in the concept of coherent water, and there is water in some of the strands of the neurons and speculation of an active form of quantum

coherence in these. The neurons are bathed in glia cells and these have features of interest also. And so on and on.

But common to all the structures of the brain is that they are bathed in a photonic field. This is known. This field is not concentrated in pockets but to some extent spread out, because photonic fields are by nature spread out. The photonic fields are not composed of fermions, but are composed of whatever-it-is, perhaps photons, which can 'stack-up' on top of one another with apparent effortlessness, having zero (or, as Louis de Broglie wanted it, near-zero) rest mass. Their energy is chiefly their energy of movement. The photonic fields are everywhere in the human body and in the brain, and they interact two-way with the electrons, the electrons having a charge that are especially suspectible to interaction and resonance with an electromagnetic, or photonic, field.

Wherever there is a photonic field, there is also a probability cloud--it is real but it is ephemeral, or subtle--it is an energy that is not quite an energy; a structure that makes itself revealed only partially, each time the field interacts with something so that energy is manifested. The probability cloud has, by the fact that we speak of it through the concept of probability, room for extra information. The EIP, or extra information of the probability cloud, goes together with the photonic field but cannot be reduced to the photonic field. But whenever the photonic field interacts with the brain, ie, with the electrons in the brain, something of it reveals itself by the exact manifestation of energy--just how an electron changes direction, or just when it gets its extra energy--and that fact that it is was this electron rather than the neighbouring electron that got its

photonic interaction--all this is due to EIP.

Those who have studied how the brain is active during such as alpha relative to such as beta, using now the EEG terminology, have noticed that during the alpha states, the activity of the brain tends to be more symphonic. The alpha waves seems to go together with more wholeness in the brain, while beta is more typically associated with 'light frustration'. If you dig into EEG archives, you'll find that people have been measuring on masters of a field while they perform actions in which they are masters, relative to how people's EEG waves are when they are about to learn a field. The masters have typically deep, slow and well-orchestrated fields, while the beginners stumble into lightly frustrated 'beta' bursts of activity. Similarly, one has found that under some forms of light hypnosis learning can take place more deeply and this is again typically associated with alpha, or even slower waves, such as theta.

In the more quiet states of the mind, it follows, logically, that more quiet thoughts can be listened to by the rest of the mind. Again, the concept of star-gazing is apt: to pick up the dim light from stars that might be fascinatingly far away--so far away they may even be whole galaxies onto themselves--we must have a situation in which there are fewer 'distracting lights'. Now in the same way, if you have a good knowledge of a complex situation, and look for a solution of how to handle it, while you have may competing thoughts of how to handle it, the challenge may be that, in this state of mind of competing thoughts, the most genius thought is but a too-dim 'light', not readily appearing. But after rest and sleep and music and motion and focus on other things, when one against turn attention to the subject, these

distractions may no longer be present. Instead, a solution may present itself. Its "light", as it were, shines forth, and--unless we're stretching the analogy too far--perhaps better by not staring straight at it, but slightly to the side of it.

It's pretty clear that there is some machine-like aspects of the brain and that the brain, like a computer program, can come into states which resemble a bit that which we in programming call a 'loop'. A loop can, indeed, prevent other activity of the computer; in some cases, a loop may prevent even keyboard interaction to the extent that a reboot of the computer is necessary before other work can take place on it. So when there is a state of the brain in which the electrons interact rather feverently, and 'locally'--one 'pushes' into the other--that is a state of the brain different from one in which there is a sense of overall listening so that an individual manifestation of a particular good thought concept can be readily attended to by all the mind.

While brain science is still a young science, it is clear that there is often an activity in some neurons and some synapses when there is an activation or presence of some thoughts in the mind. This correlation doesn't mean that anybody has ever proved causation, or that a thought can be reduced to this neuronic activity. But that there is a correlation, and that this correlation is indeed part of what enables the brain to both store, and retrieve memories of past thought thoughts, has been fairly much established. So the health of the brain is a necessary, for a living human being, for the health of consciousness. And the particular synaptic and neural activity at some spots are, as it seems, typically correlated with events, such as a thought attended to, in consciousness.

And, as we've amply justified, there's a photonic field associated with all the human brain. In the states of brain activity--perhaps vaguely associated with the alpha or near-alpha states--where individual thoughts, even if initially dim, can be 'amplified' in strength by attention to them, rather than get lost in an ocean of distracting thoughts, it is not too much to assume that neural activity inside the brain, just as neural activity inside the retine when watching stars, are sensitive all the way to the quantum level, in which photonic fields are having their effects. And we said, alongside a photonic field, there is EIP. And let's be clear that for a photonic field --which can be further analyzed into many simultaneously existing photonic fields of different frequencies existing on top of each other, all in and around a human being with the living human brain--the EIP has room for a gigantic amount of subtle structure. There is no rule that says that the EIP is just this size or that size. It being subtle and not-quite-manifest as far as energy goes, being there rather to guide each energy interaction, also means that it can carry a wealth of structure or information which goes entirely beyond the waveform of the photonic wave.

It is also clear that the EIP constantly changes, in a two-way manner, become of the two-way interactions that constantly takes place between electrons and photons. With every interaction that probability cloud is completely, and in a nonlocal way changed, in a manner that is not merely a change in the photonic field. In the cases where the brain is suitably picking up and amplifying events as small as those that take place on the quantum level, or in which the quantum level events are suitably coherent so that they in an accumulated sense add up to a significant energy event in the brain, the EIP is directly affecting

how the consciousness unfolds. It is a vehicle that unfolds information by each of its interaction events with the electrons, and which constantly is informed by the presence of the electrons, and other matter features in the brain--and the body more generally.

So while, in this thought-image, we have not said that the eletromagnetic field, or photonic field, has a shape that is equal to consciousness, we have now built up an argument that permits this thought image: the EIP assoicated with the photonic field, in interaction with the brain in suitably sensitive states, may have structure going far beyond the structure of the brain and its photonic field, and may be fairly near to that which we personally experience as "consciousness".

There is an ancient understanding, or view, of consciousness that equates it, to some extent, to "light". While in a mechanical interpretation of light, light is something that enters the eyes as the eyes are opened, in this old and venerable view, light 'comes' from the light as consciousness of the person unfolds and takes in the scenery. If we allow for the Newton/Einstein conception of light as a field of energy and which, as Einstein proposed, emerges as energetic particles or photons, then we can by the latter-day understanding of quantum theory say that the feature of probability cloud associated with these photons allow for the living type of information-oriented structure that we associate with consciousness. The extra information in the probability cloud, or EIP, may match the old understanding of light as consciousness and as something which exists in parallel to matter and which is not reducible to matter.

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