Quantum Gravity.

Peter C. Chindove

December 23, 2010

It would seem to me that paragraphs like this serve one main purpose - to make the reader aware of the reputation of the author and their ability to satisfy the proposition made by the chosen title. Basically, by the time the reader has read this abstract they will have become either more eager or more suspicious.

In my estimation, this is a kind of courtship ritual among scientists. I am like a peacock, I spread my feathers and type/whisper 'whype' sweet things that entice you into some kind of delusion.

Sadly, for you, you have neither heard of me nor are you at this stage frothing at the mouth, chomping at the bit to read on. But, surely you must be mad to stop here.

1 Courtship Ritual/The Admonishing.

The proposition of a theory of everything is such a kind of a delusion. It entices and seduces. You, the reader, are interested in reading anything captioned 'Quantum Gravity' if not for anything but to have a good laugh at me, the writer. To your annoyance and utter disappointment, I will show myself approved, insightful and revolutionary. Whilst you stutter and mutter in your grand delusion - or delusions, some read both String Theory and Loop Quantum Gravity - of unification.

Unification. Sounds like something German, or Soviet-Stalinsky. Now, before I appear utterly scathing; there is need to explain what I mean by delusion. I mean that set of propositions, in physics, which make no physical predictions (weak delusion) or cannot be used to measure experimentally verified and known parameters (strong delusion).

In introducing the strong and weak principles of delusion in physics, I have also introduced a measure of the extent to which one may be regarded a crackpot. We simply, qualitatively measure the position of a theory on the Delusion Index. A crackpot being that person fallen into the charms of a strong delusion.

According to our Delusional Index, the history of theoretical physics suggests that most revolutions in physics begin with crackpots. Strongly delusional thinkers with no experimental evidence. In fact, it would seem as though the norm is a progression from strongly delusional to weakly delusional. Sadly, and back again as theorists age and the desire for revolution overcomes the prerequisite elbow grease.

2 The Beginning Of A New Chapter In Physics.

You are probably thinking that I am some sort of historian or archivist whichever the fancier. Well, again, I must deflate your epileptic, apoplectic expectations. I am neither, nor am I a crackpot. At least not according to the Delusion Index which I have just made up. Not according to t'Hoot's own criteria either.

We know now that the one most deluded is the unadulterated, living, breathing cracked pot. Not that that is such a bad thing either! String Theorists are hoping the LHC will prove to them, more than to anyone else, that over the years they have progressed from strong delusions to weaker ones. The point being that, it is not being a crackpot that is bad. It is remaining one that is bad. Not Michael Jackson bad...but bad bad.

3 Forward, Onward To A Weak Delusion Or Less.

Well, you and I know that what I am about to propose to you is a delusion of some kind. I hope it will be at worst weak. Whereas, you the reader, may hope that it is strong, After all, there must be some entertainment value in what I am doing. Perhaps that is an unfair statement. Perhaps you are a congenial sort of chap (or chap-her) willing to cut me some slack. Even if you have to be patronising to do so. I appreciate your patronage (cheeky-n tongue). I will leave my email address and bank details for you to commiserate and fatten. In that order.

4 Magnetic Induction

We can the write the expression for magnetic induction $\frac{dE}{dx} = \frac{dB}{dt}$. We now suggest a similar expression that is equivalent in some limit;

$$\frac{d\mathbf{E}^\dagger}{dx} = \frac{d\mathbf{B}^\dagger}{dt} + \frac{d^2\mathbf{B}^\dagger_\gamma}{dx^2} + \epsilon\frac{d\mathbf{B}^\dagger_\gamma}{dx}$$

where we make a notational adjustment $\mathbf{B}^\dagger_\gamma := \mathbf{B}^\dagger\gamma$, $\mathbf{E}^\dagger$ is a conjugate expression for the induced electric field $\mathbf{E}$, $\mathbf{B}^\dagger$ is an expression for the magnetic field that is also, in some broad sense, conjugate to a partner field with the expression $\mathbf{B}$. We will look at these more closely, for now let it suffice to simply state what they represent. We now write a similar expression but for $\mathbf{B}$.

$$\frac{d\mathbf{E}}{dx} = \frac{d\mathbf{B}}{dt} - \frac{d^2\mathbf{B}_\gamma}{dx^2} - \epsilon\frac{d\mathbf{B}_\gamma}{dx}$$

where the nicer looking $\mathbf{B}_\gamma$ is notation, $\mathbf{B}_\gamma := \mathbf{B}\gamma$.

There is a whole host of ideas that these formulae generate. In fact, it turns out that what we actually have are a pair of Feynman-Kac solvable (FKs) partial differentiable equations (PDE). In particular, we have represented magnetic induction in terms of a special case of these FKs, the Langevin equation.

We are not at the moment interested in a generalization to FKs, something which we shall leave for a future project.

5 Electro-Magnetic Diffusion

In what follows we propose that one of the consequences of our equation is that the magnetic field, likewise the electric field, can under reasonable conditions behave like heat. We notice that the magnetic field $\mathbf{B}$ and its conjugate $\mathbf{B}^\dagger$ can behave analogously to temperature if we set the condition for the Heat Diffusion equation as

$$\frac{d\mathbf{B}}{dt} - \frac{d^2\mathbf{B}_\gamma}{dx^2} = 0 ... Condition A(CI)$$

It is worth thinking carefully about this because it suggests that the magnetic field behaves like temperature. That is to say that we can, in this context, discuss a kind of Electromagnetic Diffusion. For example, in superconductors, induction is finite up to the point where the superconductor expels the magnetic field. This can be compared to a similar scenario with heat. Where temperature flows into a cold thermal object from a hot one until equilibrium is reached. CI is an important means to obtaining the usual expressions for magnetic induction.

Another way of thinking about superconductors, in light of these formulae, is that they exhibit all the characteristic behaviour of heat transfer systems. The electromagnetic fields involved behave much like the movement of heat from regions of higher temperatures (read: higher concentration of electromagnetic charge) to regions of lower temperature (read: lower numbers/concentration of electromagnetic charge). That is, the electric field induced into a superconductor reaches a critical point which, analogous to heat, we may regard as the equilibrium stage. In fact, it turns out that for our purposes it is indeed necessary to consider this electromagnetic diffusion in order to retrieve the classical expression for magnetic induction. Hence, in our theory, it is completely plausible that there exists a kind of electromagnetic diffusion, however, it is not necessary. We can retrieve the classical expression in a more straightforward interpretation of the theory.

6 The Dirac Quantisation Condition

In our theory, the Dirac quantisation Condition falls out naturally from the covariant representation of the theory. We write down the covariant expression from which the expression given above is derived. We here consider the conjugate case;

$$\partial\!\!\!/ \mathbf{G}^{\dagger}_{\mu} = \partial\!\!\!/ \mathbf{B}^{\dagger}_{\mu} + \frac{\partial\!\!\!/^2 \mathbf{B}^{\dagger}_{\mu}\gamma_{\mu}}{n+2m} + \epsilon_{\mu}\partial\!\!\!/ \mathbf{B}^{\dagger}_{\mu}\gamma_{\mu}$$

This is the D = d + 1 dimensional theory of electromagnetism from which we derive the classical theory. We can see that the factor n + 2m is precisely the Dirac quantisation condition, that is if we rewrite our theory as;

$$\frac{n}{2}\partial\!\!\!/ \mathbf{G}_{\mu} = \frac{n}{2}\partial\!\!\!/ \mathbf{B}_{\mu} + \frac{\partial\!\!\!/^2 \mathbf{B}_{\mu}\gamma_{\mu}}{2+\frac{4m}{n}} + \frac{n}{2}\epsilon_{\mu}\partial\!\!\!/ \mathbf{B}_{\mu}\gamma_{\mu}$$

where the last equation is on the non-conjugate side. Now, we define n,m as elements of the set **Z** of integers. In our case, these integers can take on both positive and negative integer values.

Having moved into the covariant representation, it would seem as though we have lost our previous claim, the electromagnetic diffusion part of our theory appears to exist only the in 1+1 dimensional theory. However, I hope to make it explicit (at a later date) that the formulation persists even in this picture. In other words, there exists a D-dimensional theory of the diffusion of electromagnetic charge.

7 Explicit Form Of The Dirac Quantisation Condition

Both (n,m) arise independently of the specific nature of the magnetic field. Hence, we would like to imagine that we can choose from a set of such theories, clusters of magnetic fields which a multiples of $\frac{n}{2}\partial\!\!\!/ \mathbf{G}_{\mu}$. But first, if we specify the Dirac quantisation condition as;

$$\frac{n}{2} = \frac{q_e q_m}{\hbar c}$$

with q_e the electric charge and q_m the magnetic charge. Which is quite trivial. However, in our theory we realised that there is a special restriction which we state as $n + 2m = 1$. The Dirac quantisation condition in a general form, is a contour integral given as;

$$\frac{q_e q_m}{\hbar c} = \frac{e}{4\pi}\oint dS^i \varepsilon_{i\mu\nu} F^{\mu\nu}$$

It is possible to hypothesize that there exists a non-trivial relationship between what we have so far established and the Dirac quantisation. I am unable to understand any connection between the two at the present moment. It is something worth considering for future work.

7.1 Clusters Of The Electromagnetic Field

We can imagine that the effect of $\frac{n}{2}$ is to divide up the magnetic field $\not{\partial}\mathbf{G}_\mu$so that it is in some sense quantized. As we discussed perviously, m and n are integers which may be negative, zero or positive. It is interesting, however, that our theory in which we are discussing magnetic induction gives us a derivation of a kind of quantisation. Moreover, rather than assuming magnetic monopoles, this Dirac-type quantisation is as a consequence of the interaction between the magnetic field and the background geometry. We have not specified a particular type of geometry only the type of non-linear equation.

8 Previous Analogues/References

There is a lot of work similar to this that has been done. The point is that it is similar but not quite it. For example, papers on relativistic thermodynamics

Also see the online **M.I.T lectures on the Classical Model Of A Superconductor**, in particular the Two Fluid Model.

The PHD thesis by Mårten Sjöström on Hysteresis **Modelling Of High Temperature Superconductors** is also particularly useful.

The lectures by Terry P. Orlando (M.I.T, 2003) on superconductivity.

There is a lot of literature out there that the reader can use.

9 Special Reference

There is a paper by A.R. Hadjesfandiari, **Field Of The Magnetic Monopole** in which he discusses the Paul Dirac's own view on the electromagnetic field strength tensor stated as;

$$\mathbf{F}_{\alpha\beta} = \partial_\alpha A_\beta - \partial_\beta A_\alpha + 4\pi\mathbf{G}_{\alpha\beta}$$

What we are doing here is in effect to write something similar, without the extra tensor, which we write down schematically as;

$$\mathbf{F}_{\alpha\beta} + \partial_\beta A_\alpha = G^\dagger_{\alpha\beta}$$

Or, a much clearer statement - clearer in terms of showing the not-so-evident stochastic behaviour

$$\mathbf{F}_{\alpha\beta} = \frac{\partial^2_\beta A_\alpha \gamma_\alpha}{n+2m} - \lambda_\beta \partial_\beta A_\alpha \gamma_\alpha$$

where $\mathbf{F}_{\alpha\beta}$ is the usual Maxwell tensor, as are the derivatives the usual terms. However, we introduce new terms λ_β, $G^\dagger_{\alpha\beta}$ and γ_α which we will make clear in following work. For now, the author resteth deservedly and enjoyeth les joyeux sainté. Here is my email: petercchindove@msn.com. Scant reward for reading this far.