Complex Time to unify Gravity, Inertia and Electromagnetism

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" There is in particular one problem whose exhaustive solution could provide considerable elucidation. What becomes of the energy of a photon after complete emission? Does it spread out in all directions with further propagation in the sense of Huygens' wave theory, so constantly taking up more space, in boundless progressive attenuation? Or does it fly out like a projectile in one direction in the sense of Newton's emanation theory? In the first case, the quantum would no longer be in the position to concentrate energy upon a single point in space in such a way as to release an electron from its atomic bond, and in the second case, the main triumph of the Maxwell theory - the continuity between the static and the dynamic fields and, with it, the complete understanding we have enjoyed, until now, of the fully investigated interference phenomena - would have to be sacrificed, both being very unhappy consequences for today's theoreticians."

Max Planck, Nobel Lecture, June 2, 1920.

In the century since Einstein's general relativity we have translated all of our solutions for relativity and quantum mechanics back into clock time, despite that dimension being too limited and too localised to describe those relationships. If we accept that clock time can have a natural complex conjugate, we can resolve quantum mechanics by appreciating the photon as a quantum without extension in its own time. We can then unify gravity and inertia with electromagnetic action, without paradox, in a Machian universe.

The evidence that photons exist between emission and absorption is not strong. Everything they do and everything they are, can be explained by action at a distance, if, for the exchange of energy and momentum we know as a photon,

$$t + ivt/c = 0$$

where t is clock time, c is light speed, v is velocity from an observers perspective and i is the square root of minus one. There being zero separation between the emission and the absorption of a quantum of energy where complex time is the covariant (agreeing from all perspectives) measure of time for their separation.

Complex time is a sequence of moments each of which exists everywhere that is at the speed of light, ct , away from a point in space and clock time where a charge exists. Time, for any one charge, being a scalar able to fully resolve the force equals mass times acceleration relationships between charges which remain even temporarily local to it. But time, from more than one perspective, cannot be a scalar because clocks have different rates in different depths of a gravitational field.

This is also true for charges which have different rates of progress through clock time when they have different rates of acceleration, even when they reside in the same depth of a gravitational field. All objects at distance, velocity or acceleration with respect to each-other, have then, a proximity in time which requires a complex conjugate for its complete description. This is revealed by the equations of special relativity, but not discussed in the text.

Complex numbers did not appear in the mathematical tool kit until Euler and his friends began discussing them some three hundred years ago, though they must have been known since the development of the quadratic equation. They were labelled imaginary because their functionality was, and remains, conceptually challenging. The real (scalar) component and its imaginary (complex) conjugate were brought into stark contrast by their names, as if the former existed but the latter did not. Nothing could be further from the truth.

Complex numbers arise naturally as irreplaceable predictors of physical reality at the level of quadratic equations and argand diagrams. At the level of general relativity they are essential to every concept. Either complex numbers are a valid mathematical form or they are not, if they are, their judicial application to a set of observations can clarify our understanding of observed relationships just as the application of any other number set can.

A moment in complex time has an origin unique to an individual charge, its relevance being the immediate forward electrical connection between that charge and all other charges. But this is not true in reverse, a moment of complex time consisting of all displacements, ct , from the absorption of a quantum of energy, does not include its emission. This presents an unfamiliar unidirectional connection which must be appreciated before the forward action of charges in complex time can be understood.

Special relativity shows us that time is infinitely dilated at the speed of light, which allows no extension in linear time for a quantum of energy between its emission and its absorption, even if time passes during that exchange from a remote perspective. A thing without extension in its own time surely cannot have an independent structure, the photon cannot be anything more than the relocation of a quantum of energy from one place to another.

The influence that charges have upon each-other is then two-fold. The immediate forward electrical connection between all charges, in coincidence within complex time. Each contributing to a sum of forces in continuous action upon each-other, proportional to their electrical attraction or repulsion and inversely proportional to the square of their separation. This can account for gravity by its sum as well as accounting for inertia by induction of motion everywhere in response to acceleration of any charge.

Electromagnetic action, on the other hand, must be the consequence of discreet quanta, transmitted forward between pairs of charges which are already in resonance across complex time. The energy they transmit is conserved so it must be equal to Planck's constant multiplied by their frequency, with respect separately, to the rate of passage of clock time at their emission and also at their absorption. Action at a distance may then be a seamless explanation unifying gravity, inertia and electromagnetism, because their mechanisms of action are the same.

Since Newton's time the possibility of action at a distance has been denied. Einstein failed in his attempts to include Mach's Principle into general relativity, because he refused to accept action at a distance. Electrical interactions, not composed of photons but simply consequent upon the distribution of charges, fully account for the behaviours we currently attribute to magnetic fields. This does nothing to undermine Maxwell's wonderful work on the nature of light, but it does provide an alternate resolution for it in terms of Special Relativity.

Jefimenko points out that electric fields and magnetic fields are interchangeable with perspective, both being due to the dynamic arrangement of charges. If the sum of forward interactions between charges across complex time, fully account for both electrical and magnetic force, then the continuity between the static and the dynamic fields described by Planck in the above quote, is resolved. The static and the dynamic fields have continuity within complex time because their cause and consequence are inseparable and indistinguishable.

To understand complex time we must improve our definition of it as something which flows on a plane normal to the flow of clock time. Time cannot be a flow because it is a development of circumstances everywhere, and complex time cannot be a limited to an orthogonal plane because it charts coincidence in all directions from a point. Complex time is a connection, within the development of circumstance, by which a single charge influences all that occurs at displacements, ct , away from it, in all directions and at all distances.

Energy, mass and charge are conserved in all known circumstances. Einstein argued that time and space exist together as a four-dimensional space-time entity, and that space-time is curved by the presence of mass. We may now need to consider the possibility that the clock time experienced by individual charges, is dilated both positively and negatively, motivating reaction to the forward interaction between all charges.

The balance of electrical forces between a neutral atom and neutral masses local to it, has been assumed to be irrelevant to gravity outside the range of Van de Waal's forces, because gravity is very weak in comparison to the electromagnetic relationships between charges. But the weakness of gravity may be explained by electrical neutrality, which does not rule out the possibility that the displacement of electrons from their nuclei may disturb the balance of attractions and repulsions between all masses. The power of gravity being only one part in 10^{38} of electromagnetic action, it only requires a very small but consistent imbalance of electrical force to fully account for gravity.

The dilation of time may be a consequence of the presence of charge and not a consequence the presence of mass. Gravity may be incorrectly represented as a monopole and might be better described as a sum of electrical forces between all the charges of the gravitating bodies. It is possible that the dilation of time due to gravity is proportional to the sum of charge interactions and not to the total mass.

Maybe all force interactions are the consequence of a single mechanism involving dilation of time due to a change in separation between charges. When opposite charges move toward each other their rate of passage through clock time could be dilated by that change in separation

in the same way that it is for an object falling in a gravitational field, their passage through time becoming more similar.

When like charges move apart the same thing may happen but when opposite charges move apart, or like charges move toward each other, the result could be a divergence in the rate at which they progress through their own clock time, which increases the force motivating them in opposition their motion. Forward action in complex time makes this both possible and consistent with our experience of the world. The question is, does this present a simpler explanation for gravitational and electromagnet action.

If complex time is true we will be relieved of the paradox of wave / particle duality and the paradox of photon momentum. Planck's question will be answered. The price we pay for these resolutions will however, be the same price we pay for Einstein's relativity anyway, we lose the four separate dimensions of space and time. Both distance and direction vary with time dilation which distorts orthogonality as well as velocity relationships. Orthogonal spatial dimensions prove to be an approximation, useful but misleading, giving us no secure foundation for mathematical dynamics without complex numbers.

Replacing the photon with action at a distance will not be a simple matter. Old experimental results must be explained. A starting point for this should be Young's two slit experiment devised two centuries ago. Finding a reason for the difference between the shadow cast by the single slit and the fringe pattern cast by the double slits is only one part of explaining the results of these experiments.

Individual interactions where quanta of energy are absorbed at a point may be simple to explain but similar behaviour for the transit of substantial particles, requires far more developed explanation. Phase interactions are involved in the formation of fringe patterns and the transit of massive particles, but how complex time might play its part in these behaviours is beyond the scope of this discussion. It will only be understood from the perspective of the quantum which exists only in the phase dependent resonance between emitter and absorber.

Max Planck could be right, if complex time be true then it will be a difficult day for theoreticians, but a good one. Students deserve a logical explanation for the physical relationships occurring in the matter surrounding them. It may be trite for an amateur to chide professionals for their sea of mathematical complexity, and then to offer a complex solution, but complex time is offered as a simplification.

This is a chaotic universe, not one ordered by a common rate of progress through time. Uncertainty is not required to explain how history may vary with the path taken to reach the present, history is already unique to the path taken when the passage of time varies with the path. Complex time would otherwise describe a causal structure where fate consumes our free will, which it obviously does not. With Einstein's relativity we lost the veracity of the Euclidian frame and the rigidity of the universal clock. With complex time we gain the simplicity of distance and direction, charge and momentum as the knowable base variables.

These conclusions about time are the product of the search for a solution fitting all of the evidence but it is as yet poorly developed and its consequence unexplored. Yes it is a difficult conceptual leap, hopefully one that is harmless to the casual explorer. Either complex time is a reality or it is not, but if it is not, then the paradox Planck described remains to be resolved.

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