

Logical foundations of a new quantum based theory explaining light propagation and gravity with a link to field theory.

B. C. Fawcett.

Retired from Rutherford Appleton Laboratory.

ABSTRACT.

Existing data or observations initiate this logical study which takes Max Planck's advice that "Pure reasoning can enable man to gain insight into the mechanism of the *world*". This paper sequentially describes the logical steps on which the foundations of this theory are built. From this analysis a deeper physical explanation of light propagation and gravity is deduced. The basis of the theory is presented in section one while links with nuclear physics are briefly mentioned in section two which tentatively presents more controversial cosmological ideas suggested by this theory.

Keywords: Gravity,light,propagation,field,theory.

Section One:. Main proposals of Planck Cell Theory.

I. The Foundations of the Theory.

1) The first foundation starts with Planck's discovery of quantum theory. It asks the question 'Why is the physical world quantised'? This theory claims that the logical answer to this question is that space is subdivided by a ruler with Planck Length divisions. A graduated ruler of the universe ensues from Planck's famous discovery of the Planck constant from which the Planck length has been established as approximately 1.6×10^{-35} m. All that is shorter than this is invisible, no matter what instrument we use we cannot observe below this length. Although we cannot observe isolated structures or energy below the Planck length, we cannot intuitively deny their existence. Furthermore since space is three dimensional it is proposed that it consists of Planck sized cells of volume $4.2 \times 10^{-105} \text{m}^3$. As these cells are too small for direct observation secondary effects of their interaction with matter have to be considered to reveal their properties. These include light propagation, gravity, bending of light under gravitational influence and red shift of spectra also under gravitational influence. It also contributes to field theory in agreement but studied from a smaller viewpoint indicating shorter ranged carriers than hitherto revealed.

2) The second foundation stone is found by answering the question with which Einstein grappled with namely: 'What media carries light?' It is recorded in his early paper⁽¹⁾ that he intuitively considered that light had aether as carrier. He was diverted from his initial judgement by the Michelson Morley experiment⁽²⁾ which could not detect light moving with respect to the earth. By reason of known physics of matter Lorentz⁽³⁾ quickly dismissed Stokes' suggestion that the aether could be dragged by the earth. The international community agreed with Lorentz thereby establishing the currently held belief^(1, 4). Nobody subsequently envisaged that Planck cells could exist so the prevailing idea '*that light travels through a void*' persisted as a mind set and Einstein overlooked the answer that these cells should be considered since with zero mass they do not possess all the properties of observed matter.

Hence as a consequence of the unique properties of Planck cells they can be bound to the inertial field under which they interact. It is therefore suggested that Einstein's initial intuition is correct and that the supposition that light travels through a void is not only intuitively ludicrous but logically ridiculous. When an atom radiates a quantity of energy it is carried by polarisation effects involving Planck cells. Their constituent charges are shifted cooperatively to generate a wave packet with shorter wavelengths corresponding to higher energy and longer to lower energies: driven by forces generated by cooperative effects. Once formed the photons as wave packets of energy dynamically move on at the velocity of light resonating with sub-Planck length cells as carriers.

3) The third foundation arises because the Planck cells carry electromagnetic radiation. Because of this they must logically be subject to polarisation. This indicates they possess both positive and negative electric charge maintained in equilibrium. Evidence for the independent electric charge follows. The electron is spun off from the neutron through transfer of negative charge into the electron domain leaving the proton oppositely polarised. If separate negative and positive particles exist as sub-Planck sized particles the charge redistribution involved in this division is possible. Symmetry between positrons and electrons means that these smallest charges are of equal size. It is thus suggested that separation of the negative and positive charges is achieved through spin forces so the charges exist as spinning sub Planck length oscillators. The inertial spin forces have to be balanced by elastic restoring forces in the opposite direction and that these are at the heart of gravitation. Cooperative polarisation and oscillation of sub Planck charges are responsible for electromagnetic effects. It is also clear that the Universe could equally have been of the opposite polarity but nature had two choices. It chose matter rather than antimatter. The aforementioned discussion points to the existence of independent charges of zero mass. To maintain equilibrium the cells have to contain energy but not in the form of mass as we know it. To maintain equilibrium they need to interact with one another and their surroundings and these interactions bind all together. Furthermore light travels slower close to the sun under higher gravitational fields than at greater distances. Gravitational influences on the cells are therefore crucial to the interaction of light with them. Spectra generated near massive stars radiate spectral lines with lower energies than those generated on the earth. This slowing down of processes and reduction of energies is consistent with Planck cells possessing less energy under the influence of large masses. This necessarily will mean proportionate reductions in all dependant variables such as lengths, time, and charge and Planck length as perceived from the inertial field of the earth. The perception of mass could be complex. It can also be added the Planck cells nearest the centre of mass acquire the least energy through interaction with nearby particles which make up the mass. On Planck cell scales there is plenty of distance between nuclear particles and this is filled with Planck cells. This can transmit information about total mass to the cells but the exchange mechanism for this is unknown.

4) The fourth foundation results from the Planck cells graduated energy content of Planck cells as a function of distance from mass. It means that if a mass is situated at a

distance from the earth the relative energy of Planck cells under the influence of the aforementioned mass and the earth will change due to the Planck cells energy content. This energy distribution fuels gravity. To support this thesis and focus on its gravitational considerations, we now turn our attention to the implications of collapsing mass on this available energy. Consider there a mass a distance from the earth with its own inertial gravitational field and corresponding Planck cell energies. As this mass descends towards the earth it enters where the Planck cell energies are less. The field associated with the mass hence loses energy. This energy drives gravitation and is divided between kinetic energy transferred to the falling body and the recoil energy transferred into Planck cells further away from the centre of mass. With this distance freedom of movement of sub Planck structures is therefore increased along with corresponding energy. As an apple moves towards the earth its mass remains constant but it picks up kinetic energy (along with velocity and momentum) vectored towards the earth. Everyone is familiar with the conversion of potential to kinetic energy under the influence of gravitational acceleration. In his book on gravitation (page 60) Vasily Yanchilin, explains how a matching quantity of energy is subsequently converted into what he describes as '*internal energy*'. The Planck cell theory now presented claims this is '*recoil energy*' or more explicitly '*energy associated with mass in its inertial field*'. This mechanism moves balanced energy into the sub-Planck 'invisible' regions situated at greater distances from the attracting mass. A gradient is created decreasing with distance from the influencing mass matching decreasing gravitational forces. Cells furthest from mass contain the most energy in this invisible domain.

5) The fifth foundation ensues from consideration of interactions necessary to maintain energy equilibrium and transmit forces. Exchange between fundamental particles occurs when they are in close proximity which is why exchange, such as by correlation, has been so successfully included in quantum mechanical calculations in atomic physics. Quantum mechanical calculations are macroscopic compared with dimensions considered by Planck cell theory. From the point of view of Planck cell theory there are a few instances in which exchange has been applied distances over which they cannot operate and this error is most outstanding in the case of gravity. Intermediate communicators are therefore essential to communicate this exchange in the case of gravity. Overlooked are the short ranged exchange processes which transmit gravity, energy and forces. The assumption that gravity has some direct long ranged reach which holds the earth in the sun's orbit hides the whole truth. Between the earth and sun short range carriers are required to transmit gravitational forces from the sun to earth. Likewise with electric and magnetic fields they cannot transmit across a vacuum or through large distances without short range carriers. The Planck sized cells, aided by their intrinsic cooperative properties, can therefore provide the medium for transfer of the aforementioned energy or forces. The cooperative effects are studied in the penultimate section which links Planck cell carriers to existing field theory with some crucial revisions.

6) A sixth foundation is supported by consideration of the information transmitted by Planck cells. To appreciate where information is hidden, let us consider dividing space into

cells of 'Planck volume' equal to $4.2 \times 10^{-105} \text{m}^3$. Consider one such cell and its relationship with energy. Impacted on it from every direction is light including all forms of electromagnetic radiation. Gravitational energy and electromagnetic forces are registered from all directions. Structures at or below the Planck length can involve energy and be influenced by the aforementioned transient energy. Cells contain undecipherable information because it arises from multiple sources but a large number of cells provide a hologram of information we all read every day. Deciphering these pixels provides us with the views we see and everything communicated by our vision and sight. Regarding gravity as we sit on the beach and watch the tides roll in we unconsciously read the combined effect of the gravitational content of these cells initiated by the moon and sun. When we place an aerial on our roof we detect photons of the corresponding wavelength: only because we are interpreting information contained in a large number of Planck sized cells. When we place iron near a magnet we experience the force communicated by cooperative effects of sub-Planck cells (not exchanged over large distances through a void). Planck cells combine and superimpose effects from all directions. A void transmits nothing.

II) Further deductions and discussion of implications of this theory.

The physics and cosmology of yesterday almost entirely ignored transplanckian considerations and therefore based its vision of the universe on more macroscopic viewpoints. This critical logical analysis investigates dimensions beyond the limits of observation. It indicates that the invisible part of the universe hides surprising secrets about gravity and the propagation of light. Short range exchange requirements verify the necessity of involvement of structures shorter than the Planck length.

The aforementioned logic underpins the theories foundations. To summarise these findings: according to this proposed theory there are two distinct separated domains in the universe. The first one we are familiar with as we can see and observe it. The second one literally is invisible and possibly contains half the universe so and has passed unseen in spite of existing clues that unmask its identity. The invisible universe exists at dimensions shorter than the Planck length consisting of Planck sized cells of volume $4.2 \times 10^{-105} \text{m}^3$. This thesis argues that light and gravity are not transmitted by a void but require a medium to carry them! What has hitherto been considered a void is filled with these cells of Planck sized dimensions. These cells provide the medium on which light is carried. These cells contain the smallest entities that can be envisaged which consist of separate positive and negative charges: with opposite spins. These charges are kept apart by oscillation generated forces either as vibrating electromagnetic dipoles or cooperatively charged assemblies of sub Planck charges. The inertial forces generated by the spins of the individual charges match their reverse elastic binding forces whose radial component may cross configuration boundaries hence binding not only cells together but cells to mass..

Planck-sized cells interact through short range exchange with their neighbours, maintaining equilibrium and containment. When stressed cells can display cooperative effects

which are also held in equilibrium. The observed gravitational increases near large masses have their roots in corresponding reductions in the energy content of Planck-sized cells. This framework provides the mechanism for energy transfer. It is important to emphasise that the energies and Planck cell sizes near large masses described in this new theory closely fit those calculated with the General Theory Relativity which applies its unique mathematical treatment of the underlying variables which does not rule out some unique answers. The sub-Planck dipole oscillators are therefore bound in a configuration of 'Planck volume' equal to $4.2 \times 10^{105} \text{m}^3$ which has two important functions. Firstly it can exchange energy with neighbouring cells maintaining equilibrium at the same time binding cells together. Secondly the energy of the sub-Planck cells is a function of distance from mass and this determines gravity. These aforementioned properties bind the Planck-sized cells to the mass by which they are influenced. Most importantly they therefore move with the inertial fields of the masses which influence them. Planck sized cells in the earth's gravitational field for instance move with the rotation of the earth. Herein lays the reason why many misinterpret the Michelson Morley experiment to assume a void because they did not detect a fixed ether and could not detect a moving sea of sub-Planck sized cells. The background space is not fixed: it moves with the resultant inertias of the attracting masses and is furthermore responsible for gravity and the propagation of light. A perfect vacuum is not a void!

III) Gravitational effects and considerations.

These small Planck length structures also carry the gravitational field by reacting to associated mass. What are the gravitational effects on these Planck sized entities? One crucial piece of evidence is revealed by the experimental observation of the bending of light passing the sun made to support the General Theory of Relativity. This thesis uses supporting evidence from another aspect of the observation that is not generally highlighted. Structures at or below Planck length dimensions, are this time perturbed not by light but by gravity. We know that these perturbations are real as the light does not take a straight path past the sun but is bent by the aforementioned gravitationally perturbed invisible structures. Their '*freedom of movement*' must be restricted by gravity. In addition we can deduce that the further away these invisible structures are from the centre of mass the less they are gravitationally perturbed and therefore the greater is their '*freedom of movement*'. The greater freedom of movement can allow storage of more available energy in the sub-Planck 'invisible' regions situated at greater distances from mass.

IV) Cooperative effects involving charge separation from Planck cells.

If an individual Planck cell is taken to be a dipole consisting of a positive and negative charge this alone cannot alone polarise sufficiently to support the transmission of a high energy photon. For this charge separation is necessary. Therefore negative and positive charges must be polarised acting at appropriate distances from one another. This polarisation generates wave packets. The restoring forces are larger for bigger energy photons which

seems to be the reason why a speedier recovery occurs generating shorter wavelengths with slower recovery for low energy longer wavelengths.

A mathematical macroscopic description of the function of magnetic fields is satisfactory although it ignores the question 'How do extremely strong magnetic fields cross a vacuum'. For small scales Planck cell theory is necessary. Planck cell theory does not consider a vacuum to be a void but filled with cells. It therefore deduces that these cells are prime candidates for carrying these fields. Strong magnetic fields can only be handled by the cooperative effects of Planck cells and although the resonances involved look like those of photons when generated, in other cases they appear to be more dynamic: changing as field strength varies. When an electron passes through Planck cells at a given velocity and the individual polarisation of these cells is insufficient to cope with the stress: then the positive and negative charges separate clearly with the positive attracted and negative repelled, on closest proximity with the electrons. The sub-Planck charges then work in cooperation as dynamic cooperative oscillators: at a frequency which absorbs the stress. At the same time they generate an magnetic force perpendicular to their axis of rotation, which has both magnitude and direction. From the viewpoint of QED and similar field theories parts of the aforementioned mechanism is modelled as '*virtual photons*'. Gauge theory regards photons as exchange particles but Planck Cell Theory looks at exchange at higher definition and shorter distances. It should not be taken that there is a disagreement between the theories but rather that existing theories have a more macroscopic viewpoint while Planck Cell Theory focuses on fine detail.

V) Discussion.

This is a new theory independently constructed from logical deductions from established data or observations. It does however mirror many of the results of the General Theory of Relativity as both theories show that processes are less energetic near large masses and that fundamental quantities are reduced proportionally although further mathematical studies may show minor divergences such as in the consideration of mass in an inertial field. The red shifted spectra, radiated from massive stars, are excellent observational evidence supporting both theories. The Special Theory of Relativity in its more limited approximation also highlights the implications of '*separated inertial fields*' totally in agreement with the related deductions of Planck cell theory because both a void and Planck cell theory accept that there is negligible energy loss from a photon in transit except in extreme cosmological distances. This original Planck cell theory provides new insight into gravity and the propagation of light. Importantly Planck cell Theory is Quantum Theory based. It is therefore suggested that this is a theory which links quantum theory and General Relativity: which was Einstein's quest.

Section Two: Possible consequences of Planck Cell Theory to Nuclear Physics & Cosmology.

1. Introduction.

Planck cell theory opens the doors to debate in both Cosmology and Nuclear Physics. Starting in this section with Cosmology Planck cell theory proposes that the sub-Planck invisible realm is physically divided from the observable mass universe. Furthermore as the entropy of the visible universe increases, that of the sub-Planck decreases, and vice. Therefore this is a 'steady state theory', as matter is recycled at many remote low gravity locations. As Planck Cell theory indicates that light propagation is carried by Planck Cells, an outstanding question is raised as to whether photon decay could occur after long distances due to transmission fluctuations or friction? For most it is important to emphasise that these losses will be negligible which accounts for the basis of agreement with Special and General Relativity which involve no losses in this space-time model: in which time is hypothetically bent and the meaning of space cannot be described! The possibility of very small losses from photons in transit over extreme distances might however account for some of the red shift previously interpreted as Doppler shift and hence modify calculations of universe expansion. The theory now proposed suggests that expansion can be initiated at many low gravity locations. The second problem relating Planck Cell theory to Nuclear Physics will be discussed in part three where the separation of conditions in the nuclear domain are emphasised with total agreement with the Nuclear Physics community in this domain but with an interesting viewpoint from the very small dimensions of Planck Cell theory in the electromagnetic region outside nuclear configurations.

2. Questions of synthesis of matter configurations from Planck cells.

In this model masses can collapse in the cosmos building up invisible sub-Planck energy densities at large distances from mass. It is proposed that all energy lost in the 'visible-mass regime' may reappear in the 'invisible sub-Planck domain. It is also suggested that this energy drives the fusion of sub-Planck sized particles which somehow combine to form a neutron sized structure and also that creation of neutrons probably occurs directly from sub Planck material with some quarks generated simultaneously. This thesis suggests that neutron generation occurs in regions of the cosmos most remote from mass where the sub-Planck oscillations become too energetic for stability. These oscillations acquire greater energy by release of set amounts of charge from stressed Planck Cells and they form the confining fields binding groups of Planck cells together as fundamental particles. The mechanism involved has similarities to those conceiving photons and forming magnetic field carriers but all three also have important differences. According to this thesis it is argued that neutrons are created from a large assembly of Planck-sized cells. As this process precedes the background environment changes from that suitable for neutrons to that for protons. The neutrons decay to form the more stable protons and electrons to synthesise hydrogen. Some neutrons are captured to give deuterium. Neutron generation is predicted to occur over a vast region in which Planck cell energy is excessively high.

In these notes all *fundamental particles* are considered to be *configurations* in a mass regime and are distinguished from other massless transient resonances between cooperative collections of Planck Cells.

3. Interface with Nuclear Physics.

Planck Cell theory deals with the building blocks of matter and energy which are of orders 10^{10} smaller than quarks neutrons protons and other entities of nuclear physics. If these aforementioned '*nuclear configurations*' are considered as one state of matter which exists as mass then '*the sub Planck domain*' is another and the third distinctive domain the '*electromagnetic region*' exists between the two each with distinctive physical properties. The '*electromagnetic region*' is the most familiar region as it via this we see experience gravity, magnetism electric fields and on which atomic physics is based and it is governed by quantum theory. However the '*the sub Planck domain*' involves dimensions too small for quantum theory is invisible and only logically determined as previously described based on clues provided by its effects on the visible world. This section now relates the connections between these two distinctive domains and the '*nuclear configurations*' area of physics. There is no conflict between the descriptions provided by nuclear physicists within this region and Planck Cell theory. Quantum theory is applicable and has been applied in the nuclear physics domain and Planck cells exist both in the nuclear configurations as well as in the electromagnetic region but there is one all important difference. Within nuclear configurations the Planck cells are constrained by strong nuclear binding forces and energy and time are constricted or slowed down in mass and this state of things determines the nature of gluons and other nuclear binding forces. Charges within Planck cells however become separated within nuclear configurations due to cooperative effects which set up resonances to establish binding energies. The resultant cooperative effects are correctly described by current nuclear physics which identifies resultant colours, flavours quarks Higgs field's gluons and all the results that have ensued from great centres like CERN or elsewhere. Within the nuclear configurations these entities have been connected together in gauge theories and standard models but these theories move in the direction of a theory of everything with the help of Planck Cell theory with its inclusion and focus on shorter range interactions- These have been described in the aforementioned Planck Cell Theory. Hence a more generalised theory may be obtained: but it must be emphasised that this does not mean a theory of everything or that the beginning of time or start of the universe can be claimed as these quantities are all indeterminate or should be left for the pursuit of philosophy rather than science.

A recycling universe is proposed with the neutron being a crucial stage in this recycling. When a suitably large region of space becomes filled with Planck Cells which become too energetic for sustainability charge separation occurs and powerful resonant constraining forces are generated resulting in the binding of the neutron. A neutron is therefore conceived and born in a resonant field between sub-Planck cells of opposite parity but once this field is quenched the neutron becomes unstable. It decays into a Proton and electron with both inbuilt field and stability. Hydrogen is born and occasionally within this newborn Proton electron field a freshly generated neutron is incorporated restoring the neutron to its original field and stability. Deuterium is born. It

is remarkable to note that the Higgs Field also involves a powerful force and therefore the question is now asked as to whether Higgs arrived, through his theoretical and mathematical work, at a matching destination as Planck cell theory: which requires fields for the confinement of Planck cells into neutrons. Planck cell theory also explains where the energy for this binding field comes from. It might also be informative to consider the relationship between two up and one down quark and binding gluon and the involved cooperation of Planck Cells? Fragments either generated in man-made machines or violent cosmic events are not always building blocks but may possibly comprise composite reformed structures or items split: otherwise than how they were formed. It is argued here that the formation of the neutron and subsequent decay into proton and electron is at the heart of the cycle and that the composite quarks and gluons are of vital importance to understanding binding resonances and forces which are all based on cooperative Planck Cell effects with charge separation crucially involved in providing binding energies. There is an additional consideration of the radial non electromagnetic forces of Planck Cell charges which may provide the underlying forces of gravity independent of charge state and transmittable across all boundaries between nuclear regions and all exterior regions. These forces are predicted as the balance between inertial and restoring forces in spinning Planck charges. They are predictable because they are independent of charge separation polarisation effects. Further photon drag and gravity drag effects should be considered separately.

4. Does Reverse Fusion occur in Black Holes?

It is now suggested that the '*configurations of fundamental particles*' may be disrupted in black holes and mass is thereby converted into its sub-Planck energy: a process which can be described as reverse fusion. As sub-Planck energy has no mass, in this form it can climb out of black holes leading to their demise. This would allow black hole evaporation: a suggestion which is not new as Stephen Hawking suggested it would occur via '*Hawking Radiation*'. In the new mechanism now suggested the disruption of fundamental configurations is the causal factor. Such a mechanism would provide an additional energy transfer from the observable mass to sub-Planck divisions. Although this would add to the recycling indicated under the views on gravity discussed in this paper: a balance of entropy may well be made up by transfer of energy via photon decay due to the newly proposed 'photon drag'? According to the theory presented in this paper as visible mass-energy disappears invisible sub-Planck energy is formed in equal quantities and vice versa.

5. Conclusions. In 'Section One' of this presentation are the more reliable foundations of Planck Cell Theory while 'Section Two' explains the nuclear information gleaned from the extreme small viewpoint and the more controversial Cosmological suggestions which hopefully will not distract from the study in Part I. This presentation brings gravity and light propagation into sharper focus, builds bridges with nuclear physics and controversially challenges the status quo in cosmology. Unless such original suggestions are considered without bias the world of science may well be stuck with outstanding unsolvable discrepancies such as those dividing quantum theory and the general theory of relativity or the perplexing phenomena of dark energy and matter. Is Planck cell theory the solution to all these problems?

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