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What is G?

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Abstract: In this paper I show that G acts as a transform between the two separate fields that compose the uber-field of Newton's gravitational equation. First I write each mass as density times volume. I then give V to one field and D to the other field. This makes gravity, taken singly, dependent on volume or radius alone. Density then becomes a consideration of the foundational E/M field. That is, density is important only in that field. This density must apply to the density of the so-called "messenger photons" which mediate the foundational E/M field. But we cannot apply the density directly to this field. We require a transform. The reason we require the transform is that gravity is now dependent on radius, in the re-expanded equation. This means that forces and accelerations are not directly comparable to different-sized objects without a transform. Accelerations are comparable only when velocities are equal, but velocities at the surfaces of "gravitating" objects are not equal. Therefore, in order to put both fields in the same equation, we must transform one size to the other, or one velocity to the other. This is what G does. And because velocity is proportional to radius, the radius of the messenger photon must be 6.67×10^{-11} times less than the radius of the hydrogen atom (or average particle of the physical field). This also explains the variation in G, since not all macro-objects are composed of hydrogen atoms.

In previous papers I have unraveled the dimensions of the universal gravitational constant, http://milesmathis.com/ug.html, and shown its place in the unified field equation, http://milesmathis.com/uft.html (Newton's equation re-expanded). In this paper I will tell you what the number in the constant refers to. Never before in history has anyone attempted to explain why G is the number it is, instead of some other number, or applied it to the mechanical relationship between real particles or fields. This has always been seen as akin to discovering why pi is 3.14 instead of 3.5, say, or why a cow has four legs instead of five. It has been thought that that is just the way things are. Up till now, G has maintained a heuristic presence only, known from experiment but otherwise unknown. Even in experiment, G has remained mysterious and ephemeral up to the present time. As proof of this assertion, I point you to Gillies well-known review from *IOP*:*

Abstract: Improvements in our knowledge of the absolute value of the Newtonian gravitational constant, G, have come very slowly over the years. Most other constants of nature are known (and some even predictable) to parts per billion, or parts per million at worst. However, G stands mysteriously alone, its history being that of a quantity which is extremely difficult to measure and which remains virtually isolated from the theoretical structure of the rest of physics. Several attempts aimed at changing this situation are now underway, but the most recent experimental results have once again produced conflicting values of G and, in spite of some progress and much interest, there remains to date no universally accepted way of predicting its absolute value. The review will assess the role of G in physics, examine the status of attempts to derive its value and provide an overview of the experimental efforts that are directed at increasing the accuracy of its determination. Regarding the latter, emphasis will be placed on describing the instrumentational aspects of the experimental work. Related topics that are also discussed include the search for temporal variation of G and recent investigations of possible anomalous gravitational effects that lie outside of presently accepted theories.[1]

Only recently has my theory of gravitation filled out to the point where I could see precisely what the

number of G referred to. When I wrote my first paper on G about five years ago, I still could not see why the number must be so small. What was this number doing? Was it some sort of transform? If so, what was it transforming? I now believe I can tell you, and do so rather quickly.

In my unified field paper, I made great progress in unraveling Newton's famous equation. I showed that $F = Gmm/R^2$ must be a compound equation. That is, it is a distillation of two field equations, simplifying them into one *uber*-field. Newton interpreted terrestrial attractions and astronomical attractions as being caused by a single field, which has become known as the gravitational field. From experiment, he distilled an equation that successfully explained both local and orbital phenomena in a very compelling manner.

In re-interpreting Newton's equation, I have not brought into question the heuristic success of the equation. I accept that Newton's equation is correct as written (minus Relativity). But I have shown that Newton's force F is a compound of two fields working simultaneously, and that the right side of the equation must now be understood as a distillation or simplification of more extensive equations. Because Newton was only looking at final motions, and not at fields, he arrived at what we would called an over-simplified equation. And because he was not able to show the full derivation of the equation from the existing fields, he was not able to show all the mechanics involved.

In the centuries since then, no one has been able to re-expand the equation, to show how it expresses mechanical fields in a logical and seamless manner. The equation has remained in its compressed state, keeping it mysterious. Even Einstein was not able to tease any more information out of it. Einstein's additions are all external to Newton's equation, and they add nothing to our knowledge of Newtonian mechanics.

In the past few years I have begun to re-expand this famous equation. Perhaps the key to unlocking the equation was Maxwell's suggestion that mass could be written as L^3/T^2. This made it simple to rewrite the equation, returning all of G's dimensions to the existing variables. Once I did this, I saw that G is no longer a constant with lots of dimensions; it is a constant with no dimensions. That is to say, a naked number. This allowed me to ignore the current misdirection of linking the dimensions of G to the Planck length and time and so on. To re-expand Newton's equation, we don't have to get into Planck units or any other of the mysteries of QED.

The other thing that Maxwell's dimensions did is allow me to express all force in terms of length and time. I could dispense with any idea of mass. The idea of acceleration already includes the idea of impermeability, so that we do not need a dimension like mass that restates it. The mass dimension only mucks up our equations, making them harder to decipher.

Acceleration already includes the idea of impermeability, since you have to have something to accelerate. If all things were inter-penetrable, then acceleration would have no physical or mechanical meaning. Everything would then be just a ghost, and we would have no forces by contact. The fact that we have forces and accelerations means that we must have impermeability. If we have impermeability, we don't need to talk of mass or of things being "ponderable". Mechanically, all we need is the shells of our quantum spheres to be impenetrable to some degree, and the very existence of the variables a and F gives us that. We do not need mass or the idea of mass.

The second key to unlocking Newton's equation was my discovery that the foundational E/M field must have mass equivalence. You will say I just ditched mass, so speaking of mass equivalence must appear perverse. So instead of continuing to use old terms for the sake of convenience, I will say that the foundational E/M field must have *energy*, which, by Einstein's equation, must give that field a degree of impermeability, and therefore what we have always called *material* characteristics.

Up to now, this foundational E/M field has only been represented in the standard model by the messenger

photon. The foundational E/M field is the field that mediates the force or the "charge" between the proton and the electron. QED has been very un-mechanical from the beginning, with no apology, in fact with much bragging; but the fact remains that beneath their probabilities, there must be a field creating both the forces and the probabilities. This field is what I am calling the foundational E/M field, since it exists as the sub-field underneath both electricity and magnetism.

If this field creates real motion, it must have energy. If it has energy, it must have materiality. Those messenger photons must have what is now called mass equivalence. If they have mass equivalence, I must include them in Newton's equation. And once I have done that, Newton's equation becomes a compound equation, distilling two fields. Which means that I have found the root of the second field in Newton's equation.

Even after finding that root, I was still a very long way from being able to separate Newton's equation into its constituent parts. If Newton's equation is a compound, that means that gravity, by itself, must be expressed in some other way. If Newton's equation is not gravity alone, how do we express gravity alone?

I will refer you to my UFT paper for the full derivation of the separated equations. Suffice it to say, here, that gravity is expressed only by acceleration. Gravity is the acceleration of a length or a differential. This means that the gravitational "pull" of a body is determined only by its radius. Density, and therefore "mass", is only a concern of the foundational E/M field. Which is to say that density considerations enter Newton's equation only through the E/M field. Two spheres that are the same size have the same gravitational field, by definition. If they have different total fields according to Newton's equation, it is because their densities are different; and their total fields are different only because one has more constituent quantum particles, and therefore more photon radiation.

This means that if the Earth were denser, you would weigh less, not more. You weigh less on the Moon not because it is less dense, or because it has less mass, but because its foundational E/M field is stronger. And its foundational E/M field is stronger because the Moon's radius is smaller than the Earth's. Although the Moon's body is less dense, as a whole, its E/M field is more dense, on the surface. And this is simply because it has so much less surface area than the Earth. You can't just look at mass or density, you have to look at field lines; and the density of those field lines at the surface determines the strength of the E/M field.

[Most people will pay the least attention to the preceding paragraph, since it is so shocking. But I encourage you to pay it the most attention, since I have divulged this information in this paper and nowhere else. You will not find it in any of my other papers (so far). And you will certainly not find it in the papers of anyone else.]

But now to tell you what G is. The current number for G is 6.67×10^{-11}. That number is indeed a transform, and what it does is transform the size of one field to the size of the other, so that they can be compared directly. As I said, we have two fields in Newton's equation, not one. The gravitational field, separated out from the compound field, is just the acceleration of a length. Therefore it has no mediating particle. It is not even really a field, in that sense. There is no graviton or any other radiated particle. Therefore, when I speak of the gravitational field, I am talking about the field of atoms and free electrons and so on. The field of "material particles:" particles that make up or constitute physical objects.

The second field comprising Newton's equation is the foundational E/M field, and this field does not constitute material physical objects. This field is radiated by protons and nuclei and electrons, and mediates basic forces, but it does not physically constitute macro-objects in the same way. Certainly it exists in all the regions of all material objects, but I think it is clear what I mean here nonetheless.

Since this foundational E/M field has energy, it must have materiality. Since I have jettisoned the idea of mass, materiality is now represented only by length. Specifically, materiality is represented by radius, in all

the equations. In all gravitational or force equations, we have an accelerating radius of some sphere or spheres.

In Newton's equation we don't have a direct representation of the radius of the messenger photon, of course. We don't even have a representation of the photon, or of the field. What we have is the masses of our objects and G. But from only the masses and G, we can find the radius of the messenger photon.

To do this, we first write the mass as a density and a volume.

$M = DV$

I have shown in other papers, and glossed above, that the gravitational field is proportional to radius only, and nothing else. Therefore, the V variable applies to the gravitational field. But we give the D variable to the E/M field. The density part of both masses in Newton's equation does not apply to gravity, it applies to the foundational E/M field.

But we cannot directly assign that density to the density of the photon field. Why? Because that density is not *measured* at the level of size of the photon. Let me put it another way. In that last equation, D and V are sitting right next to each other. That means that if we achieve a number for M from observation or experiment, D is attached experimentally to V. We have measured a density *at that volume*. But all volumes are no longer equivalent in a gravitational sense. As I said in my UFT paper, velocities are not equivalent, therefore accelerations cannot be compared directly.

For those who have not read my UFT paper, let me quickly gloss the argument once again. If we take Einstein's equivalence postulate literally and simultaneously reverse all the gravitational acceleration vectors in the universe, we imply that all objects, macro and micro, are now expanding. In one sense they must be expanding at the same rate, since they all stay the same size relative to each other. We don't see objects changing size relative to us, therefore they must be expanding at the same rate relative to us and to eachother. But to achieve this, the surface of larger macro-objects must be moving faster during each dt than smaller objects. This is what I mean by dv in my UFT paper. The dv at the surface of large spheres must be much greater than at the surface of small spheres. This difference in dv's must throw off the accelerations, too. The accelerations have to be measured in these dt's, and if the dv's in these intervals are not equal, then the accelerations cannot be compared directly. If the accelerations cannot be compared directly, the forces cannot be compared directly.

Let me simplify the idea even further. Let us say that someone tells you that the acceleration of one body is x and the acceleration of a second body is 2x. Does that tell you anything about their velocities over a given interval? No. Accelerations don't give you lengths, or real motions over given times, unless you know an initial state. The velocities of the two bodies could be equal at the interval of measurement, even with totally different accelerations. By the same token, the two bodies could have the same acceleration and completely different velocities. Accelerations and forces are comparable only when dv's are equal.

Now let us take that knowledge into our analysis of our two fields. Let say that one field is made up of hydrogen atoms, on average. The hydrogen atom is the average size of each particle in the field. The other field is made up of radiated photons. Like all other bodies, these bodies have to remain the same size relative to each other while time passes. If they didn't, we would see effects that we do not see. But if we have reversed all our gravitational acceleration vectors, in order to see more clearly how our fields work mechanically, then if planets and stars expand, hydrogen atoms must also expand, and photons must also expand. In this case, the dv on the surface of the photon must be much smaller than the dv on the surface of the hydrogen atom. *Which means we require a transform* in order to compare any accelerations or forces mediated by any of these particles.

If we want to combine forces caused by gravity and forces caused by the foundational E/M field, we must transform the accelerations of the two fields during the same dt. We must transform the dv of one field to the dv of the other field. Once we do that we can compare the accelerations directly. We can put both fields in the same equation, compress them, and get a simplified final equation.

That is what Newton's equation is. And G is the transform from one dv to the other. Since dv is directly proportional to the radius, we may deduce that **the radius of the messenger photon is 6.67 x 10^{-11} smaller than the radius of the hydrogen atom**. This gives us the unified field.

This also explains variations in G. As I have shown, G is dependent on the make-up of the bodies in question. The Earth is not made up of hydrogen atoms only. G is the transform between the average size of the atoms present in the field being calculated and the size of the radiated photons. Therefore G is not really a constant. As the average atoms vary, G varies.

*http://www.iop.org/EJ/abstract/0034-4885/60/2/001

[1]George T Gillies 1997 *Rep. Prog. Phys*. 60 151-225