

Re: Tom Van Flandern and Newtonian Gravity

Source: <http://sci.tech-archive.net/Archive/sci.physics.relativity/2004-08/4087.html>

From: Tom Van Flandern (*tomvf_at_starpower.net*)

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This replies to shuba, Gerald Lasser, and Mike. NOTE TO ALL: Travel during the coming week will slow any further responses from me even more than my usual slowness.

"shuba" <tim.shuba@eudoramail.com> writes:

>> [tvf]: *Here are a few quotes from Bilge's post of Aug. 10 in this thread: "But a spacetime metric does have something to do with space, tom. That's why it's called a spacetime metric and not a time metric. . A distance is what the metric measures. That is why it's called a metric. . We aren't talking about a hamming distance or some other measure here, tom. We're discussing geometry. . you think a Euclidean space is somehow ordained by god as the only 'real' geometry and can't imagine a space with a negative sign in the metric. . What do you think the space part of the metric measures? What about the fact that the metric also measures spacelike intervals?"*

> [shuba]: *None of this mentions the curvature of 3-space. I knew you couldn't find a citation to back up your fallacious claim.*

Then why did you omit citing my next sentence, which made the connection? I repeat it here: "These quotes make it clear to me that Bilge thinks of 'spacetime' as a combination of space plus time, and that the 'curvature of spacetime' clearly required by GR must therefore be at least partly a curvature in the space component of spacetime."

Never dodge the key points in a logical argument – even when it might mean your earlier post was mistaken.

>> [tvf]: *you have provided no specific example of a previous inaccurate statement. But please do provide an example or two of previous inaccurate statements and show us all that I am an untrustworthy source (the alternative being that you are).*

> [shuba]: *Also totally incorrect. You even said you changed your paper to supposedly omit the inaccurate information you presented about Robert Wald. I see no need to dwell on the many errors of your ridiculous*

paper. I've posted links to factually correct information about relativity, e.g.

http://nedwww.ipac.caltech.edu/level5/March01/Carroll3/Carroll_contents.html.

I'm happy to let any interested parties read it themselves and find out why your purposeful distortions of the terminology and concepts of relativity are nonsense.

Your first example you made up, or exists in your mind only. Vigier and I have criticized Wald's support for the geometric interpretation of GR in "Experimental Repeal of the Speed Limit for Gravitational, Electrodynamical, and Quantum Field Interactions", T. Van Flandern and J.P. Vigier, Found.Phys. 32(#7), 1031–1068 (2002); earlier preprint (with different title) at http://metaresearch.org/cosmology/gravity/speed_limit.asp. That criticism stands unchallenged, and was never modified.

The link in your other example is to a discussion of the mathematics of relativity, with which I have no problem. When did I ever say anything contrary to that?

You, like Bilge, seem to have a problem keeping your correspondents straight. I'm one of Einstein's strongest supporters. It is the people who followed Einstein, from Wheeler to Wald, who tried to change the physical meaning of the math to suit their own ideas of the universe, with whom I have a problem.

As to the conclusion of this little exercise about which of us is making inaccurate statements, your vague allusions and lack of any specific examples speak for themselves. It's not too late to back up your claims with specifics, if any exist.

and "Gerald Lasser" <antispam@nospam-me.com> writes:

>> [tvf]: *Show us how Maxwell's equations would change if the propagation speed of Coulomb force were set to infinity, thereby proving wrong my conclusion that it is already set to infinity.*

> [Lasser]: *Okay. First, be aware that the term "Coulomb force" comes from electroSTATICS, where all charges are stationary, so there is no time dependence in the charge density or any of the fields. In that context (i.e., in the absence of motion) the concept of "propagation speed" has no significance.*

I understand your point about electrostatics. But I do not agree with your inference that "propagation speed has no significance" in electrostatics. That would be true for potentials, for which only changes propagate; but not for forces, which must continually propagate. A force is the time rate of change of momentum by definition, where momentum is proportional to velocity. For force, that velocity is the propagation speed of whatever carries the new momentum. Moreover, a force must causally link a source to a target. That also implies the

need for a propagation speed.

Math has no such issues. But physics does. Each discipline must respect the constraints imposed by others.

> [Lasser]: *Coulomb's equation (the one you learned in sixth grade, giving the central electric force purely as a function of distance from the source charge) is not valid in electrodynamics, precisely because it does not account for the finite propagation speed.*

You went to a more advanced grade school than I did. :-(But remember, my focus was on the retardation of the electrical component, not on the magnetic component. So I have no need to consider a moving source charge.

> [Lasser]: *According to Maxwell's equations, the field equation of the "Coulomb potential" $\phi(x,y,z,t)$ is $\frac{d^2\phi}{dx^2} + \frac{d^2\phi}{dy^2} + \frac{d^2\phi}{dz^2} - \frac{1}{c^2} \frac{d^2\phi}{dt^2} = -4\pi\rho$ (1) (The "2s" should all be superscripts, and those are second partial derivatives of ϕ with respect to x , y , z , and t). Now, in electrostatics everything is stationary, so nothing has any time dependence, we have $\frac{d^2\phi}{dt^2} = 0$, and the field equation for the Coulomb potential reduces to Poisson's equation $\frac{d^2\phi}{dx^2} + \frac{d^2\phi}{dy^2} + \frac{d^2\phi}{dz^2} = -4\pi\rho$ (2) With appropriate units, the solution of (2) for a point charge q is simply $\phi = q/r$, and since (in electrostatics) the electric field E is just the negative gradient of the scalar potential ϕ , we get Coulomb's central-force inverse-square equation $E = -q/r^2$.*

This is all very basic and obvious. In electrostatics, the potential field is time independent. No problems here.

> [Lasser]: *But this applies ONLY in electrostatics, where the field equation (1) reduces to Poisson's equation (2). In general, when we don't have stationary conditions, we must use the full time-dependent field equation (1).*

Here is where we begin to diverge. You have just swept an important part of the problem under the rug. To keep things as simple as possible, I want to stick with the non-time-varying potential field from a single static (non-moving) charge, and use an electric force sensor moving uniformly through the field without changing the field.

Going to the full time-dependent field equations would mean letting the source charge and its field move, and that introduces magnetic forces. To keep this simple, I wish to avoid magnetic forces, which in any case are not in the plane of interest to us here. So let's stay with your static field description and with Coulomb's law.

> [Lasser]: *Notice that the field equation involves a constant "c", which is the ratio of electric to magnetic units.*

Actually, the constant is c^2 , which is an energy per unit mass, not a speed, and physically represents the permeability or permittivity of space. That is a major difference of meaning in this context.

> [Lasser]: *This term is responsible for the retardation of the "Coulomb field" and of the associated electric force. The time-dependent term in (1) is the reason the Coulomb potential at a given event depends not on the distribution of charge at the present instant, but on the distribution of charge on the past light cone of that event.*

I stressed several times before that we are not interested here in retardation in the potential field, which is too small an effect to have ever been observed. Retardation in charge distribution or in radial distances does not give rise to secular effects, and the retardations are too tiny and too brief to be seen in the laboratory.

"Gradient" is just a mathematical relation, and does not indicate the direction of causality. But physical principles do indicate that direction because motion cannot arise from non-motion. (I.e., momentum cannot be created ex nihilo.) So when we are considering the physical interpretation of the equations, the dynamic electric force must induce a gradient in the static potential field (the way gravity induces a density gradient in an atmosphere), and not the other way around. For example, we would not make the mistake of saying that the gradient in an atmosphere produces the force of gravity for that body, even though the same kind of "force is the gradient of potential" mathematical relationship holds.

>> [tvf]: *If you can show me a propagation delay of D/c for forces in the existing Maxwell equations (for a target body/charge with a relative motion), my whole argument fails.*

> [Lasser]: *Done.*

Please try one more time, respecting the terms of the challenge. Consider only a stationary source charge with a static field, and a moving target body (charge or sensor). This is a case with an electric field but no magnetic component from the source, and a case where Coulomb's law should still apply. Show me the propagation delay term D/c for the electric force of a single, fixed charge on a moving charge or sensor.

In your words, the case I want to consider is one where, in your words: "there would be no magnetic field at all, so compasses and electric motors wouldn't work, and there would be no such thing as light, etc. All we would have is an instantaneous Coulomb force at a distance. This is all grossly in conflict with observation." Yet strangely enough, the case in question exists. I believe it is called an "atom". :-)

>> [tvf]: *The propagation delay is D/c for changes in the potential, and is zero for Coulomb forces.*

> [Lasser]: *It sounds as if you have been thinking Coulomb's inverse-square force law . applies to time-dependent situations. As explained above, it doesn't. Poisson's equation and the resulting Coulomb force law apply ONLY to electrostatics.*

The case of interest is non-moving source, non-time-varying field, but moving sensor. Neither the term "electrostatics" nor "electrodynamics" is rigorously applicable. So let's not confuse each other further by continuing to use them. The case that makes my point is well-defined in words without labeling it "electro-anything".

> [Lasser]: *Also, you seem to be dis-associating the electric potential from the electric force, as if they pertain to physically distinct phenomena, which is just insane, because the electric potential is DEFINED as the scalar field whose negative gradient (minus the time partial of the magnetic potential, in general) is the electric force. They are just two ways of talking about the same thing. If the potential doesn't change, the force doesn't change, by the very definition of the words.*

Gravitational force is the gradient of gravitational potential also. Yet, even though the Sun's gravitational potential field is static (in the same sense as in electrostatics), its gravitational force on planets is continually varying in both magnitude and direction.

Or is the whole solar system insane? :-)

>> [tvf]: *for a moving point, there is a difference between the retarded and instantaneous partial derivatives.*

> [Lasser]: *I think you coined the expression "retarded partial derivative" yourself, so only you know what it means (if anything)*

The partial derivative of a static field at a fixed field point cannot be "retarded". However, most real sensors (e.g., planets, or electrons in atoms) are moving points, and for them the difference between the instantaneous source direction and the retarded source direction is important. See the discussion of this point in the 2nd paragraph of section 2, "Principles and definitions", at http://metaresearch.org/cosmology/gravity/speed_limit.asp, which is now published in our "Foundations of Physics" paper.

>>> [Lasser]: *It's simply insane to claim that the gradient of a field can be affected prior to the field itself being affected.*

>> [tvf]: *make any argument (if you can)... that causality cannot be the other way around: the external force between bodies or charges imposes a gradient onto the potential field.*

> [Lasser]: *Okay. It is insane because the proposition in question has nothing to do with the direction of causality. The "force potential" is DEFINED in terms of the force, and vice versa; they are just two different ways of talking about (describing) the same thing. No assumption is made as to one of them "causing" the other. If you wish, you can work entirely in terms of the forces, without ever mentioning the potentials; it is entirely a matter of convenience.*

To me, this appears to be a huge deficit in your physics education. Can you name any other case where a function and its derivative are "just two different ways of talking about (describing) the same thing"? Velocity and acceleration are the simplest such example. Are these two "the same thing"? Yet in gravitation, force is proportional to acceleration and potential changes are proportional to velocity squared.

In all cases that I am aware of (in physics), functions and their derivatives are two different physical things, and have different properties. Of course, no such distinctions are made, nor are they needed, in math. But that is what this discussion is about — the non-uniqueness of the math of gravitation and electrodynamics when it comes to the physical meaning of the equations, and the importance of supplementing the math with constraints imposed by the "principles of physics" to avoid inadvertently introducing magic (physically impossible interpretations).

>> [tvf]: *Please explain in detail exactly why this is insane.*

> [Lasser]: *Your statements are the equivalent of saying something like "We have a meeting every Wednesday, but we never have a meeting on the day that comes between Tuesday and Thursday", i.e., your statements are logically self-contradictory. I call them insane, because I have no doubt the self-contradictory nature of your statements has been explained to you many times before, but you persist in repeating them. This is insanity.*

I have no doubt that it is difficult or impossible for the insane person to appreciate his/her own insanity. However, as I understand the matter from studying scientific method, one gets some pretty good clues by "reality testing" one's own ideas under controlled conditions, where experimenter bias cannot influence the outcome. Feedback from peers is one such reality check — how well (if at all) the ideas communicate to other independent minds accustomed to critical thinking.

My ideas discussed here have already undergone extensive peer review, been found worthy, and are now in print. In nearly every day's email, I hear from people who "get it" and love the simplicity and elegance of the new physical interpretation this line of reasoning has led to. So if this is insanity, beware, because it is contagious, and the inmates will soon be ruling the asylum at the rate things are going.

>> [tvf]: *But I do have an experiment that backs up my opinion: the Sherwin–Rawcliffe experiment previously cited. It demonstrated *no lightspeed delay* in the force between accelerating charges. Charges accelerated jointly in the same direction respond to each other's instantaneous positions, and not to the 'left–behind potential hill' following acceleration from zero speed.*

> [Lasser]: *That does not support your opinion, just as the absence of aberration in the electromagnetic force between uniformly moving charges does not support your position. The directions (not to mention the magnitudes) of all the forces to which moving charges are subjected in such situations are entirely in accord with the predictions of electrodynamics.*

I have no objection to the equations as they are written, only to their physical interpretation. (Is there an echo in here?) Coulomb's law contains zero propagation delay in the common case of a non–moving source and static field acting on a moving charge or sensor. That is a clear manifestation of instantaneous force propagation. The Sherwin–Rawcliffe experiment shows this mathematical fact in plain physical terms. If the force propagation speeds were as slow as lightspeed, the trailing one of two mutually accelerated charges would sense a lag in the leading charge's field. But it doesn't. Case closed.

Someday we will discover that these forces are not really instantaneous. But they cannot propagate as slowly as lightspeed. And until then, the equations we now have with zero propagation delay for forces work better than anything else we can write.

> [Lasser]: *The details of how this happens, while constantly preserving both momentum and finite propagation speed (which, after all, was Maxwell's whole motive for formulating electromagnetism as he did), is actually quite interesting, but in order to discuss it meaningfully you would first need to get past all your elementary misconceptions – which you seem disinclined to do.*

I didn't get to where I am without acquiring a lot of background, engaging in a lot of discussions with experts, and getting past a lot of wrong preconceptions. So I am always watchful for more of the same. What amazes me in this discussion is your apparent presumption that all the preconceptions must be mine — apparently for no better reason than that yours are based on a century of tradition. If that is sufficient grounds for you to feel no need to rethink the matter, then you will obviously need to content yourself with the physics you now know for the duration of your life. Speaking for myself, I still have too many unanswered questions, see too many discrepancies and anomalies, and encounter too many blind followers who cannot defend their own beliefs when questioned.

So yes, I will remain disinclined to alter my "misconceptions" while they remain in better agreement with experiments

and a simpler explanation of nature than the interpretation they would displace, and no one comes up with a good reason to show otherwise. Isn't that how physics makes progress?

and "Mike" <eleatis@yahoo.gr> writes:

>> [Lasser]: *I think you coined the expression "retarded partial derivative" yourself, so only you know what it means (if anything)*

> [Mike]: *That's a term he has invented to attack Kopeikin's work. I'm not sure about the validity of Kopeikin's work but neither the invented term did anything to disprove it.*

My comparatively gentle critique of Kopeikin's work was at least delivered before his experiment was performed. See <http://metaresearch.org/home/viewpoint/Kopeikin.asp>. After the experiment, when Kopeikin persisted with his estranged viewpoint, he was soundly attacked by all relativists who chose to comment, and his paper was rejected. It would have been to his advantage if he had taken my advice two years ago and avoided the public embarrassment.

As for the expression in question, I think I explained that pretty well in the 2nd paragraph of section 2, "Principles and definitions", at http://metaresearch.org/cosmology/gravity/speed_limit.asp, which is also now in print in our "Foundations of Physics" paper cited earlier. If there is something you do not understand about this matter, feel free to ask questions. If you don't get this fundamental point, you will have no idea what the "speed of gravity" debate is all about.

> [Mike]: *It is simply insane to call for infinite propagation speeds for a law that applies only to static situations, since, because nothing changes in such situations, it appears that assumed (wrongly) changes take place instantly.*

We agree on this point, but apparently not about which of us this criticism applies to. You should read my analogy about the different meanings of "static" as applied to frozen and flowing waterfalls. Needless to say, I'm not an advocate of invoking magic in physics, such as fields with no moving parts being able to supply new momentum to target bodies.

Eventually, if you want to, you will catch on that forces are vectors with direction, and that the instantaneous source and the retarded source are in different directions from the perspective of a moving target. And that remains true even in a static field. The Sun is a perfect example. We cannot see its instantaneous direction, but only its retarded direction relative to the distant stars. The Sun's light and gravity travel continuously from the same source to the same target along the same radial paths. Yet when they arrive, they are not parallel. If you see a way to explain that other than different

propagation speeds, don't hold back.

> [Mike]: *Are fictitious centrifugal forces needed in local non-inertial reference frames to apply his model real? If so, how? If not, can he provide a reason as to why all phenomena do not have the same explanation in ann moving reference frames in his model? If he cannot, I claim his model calls for magic, not GR. He won't answer this, I bet my two cents on that.*

You win two cents. But if anyone else can translate this question into English, I'd be willing to have a go at it. As it now stands, I have no idea what is being asked, even after a dozen reads. It seems to be about inertia, and maybe (guessing) about the equivalence principle. So the answer might be found in my paper "Does gravity have inertia?" (Meta Research Bulletin 11: 49-53, 2002). But I really can't make sense of the question. -[Tom]-

Tom Van Flandern – Washington, DC – see our web site on replacement astronomy research at <http://metaresearch.org>