Gravity as an Interaction Communicated at Finite Velocity (*c*) - as in CT

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The formula for periastron advance/perihelion advance of Mercury is not original nor unique to GR. It was first derived, and shown to work for the Mercury example, by Paul Gerber in 1898 and his follow-up paper of 1902 (republished 1917), on the basis of gravitational communication being at velocity c. This physical view differs importantly from that espoused in General Relativity, so its incorporation, unacknowledged, by Einstein into his GR equations of 1915 constitutes a serious error for GR, destroying its much-vaunted status as a physically consistent body of theory. Continuum Theory (CT) on the other hand, finds that gravitation is one of the electromagnetic family of forces, with the expectation that its communication is at velocity ***c*** or a simple multiple thereof.

Keywords: Paul Gerber; gravitation; perihelion advance; General Relativity; Continuum Theory; Pioneer anomaly.

1. The Mechanism of Perihelion Advance

The well-accepted and reputedly GR (Einstein, 1915) relation for the advance rate:-

$$\frac{d\omega}{dt} = \frac{6\pi GM_{sun}}{Pac^2\,(1-e^2)}$$

(period *P*, major axis *a*, eccentricity *e*)

was first obtained ON THE ABOVE ASSUMPTION (see title) by Paul Gerber (Z. Math. Phys. 1898) and in his 1902 version, which was republished in Ann. d. Phys. 1917 by its editor, infuriated (Gehrke 1916) by Einstein's lack of acknowledgement. In 1916 Einstein had published a long obituary on Ernst Mach (who had discussed Gerber's work in his famous book – Mach 1902), so he surely knew of Gerber's work. Thus provoked, Einstein merely responded (*'Meine Antwort'*, 1920) that Gerber's derivation was defective and had no priority value. **The fact remains that Gerber got there first and showed it to be observationally correct if *c* was the velocity of light, as then approximately known.**

Gerber's achievement was to make the gravitational potential time- and route-dependent, improving on that of Wilhelm Weber which depended on position only. (Not surprisingly, in the event, Einstein's gravitational field equations do likewise!) My diagram (Fig 1) shows my understanding of the physical effect of Gerber's communication-time delay intention, that I inferred in 1996 from part-translation of his 1898 paper. See a more-recent translation now at http://www.alternativephysics.org/gerber/Perihelion.htm Alternatively, corrected English translations of both Gerber's papers can be downloaded from http://osmaston.org.uk/continuum.htm

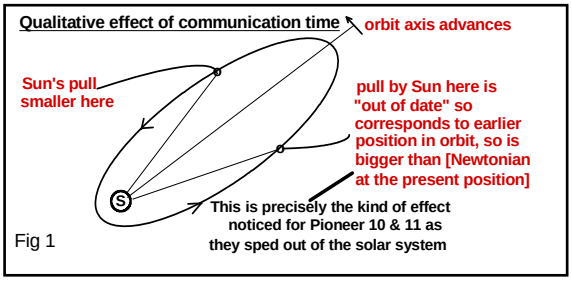

Fig 1

My calculations show that this 'Gerber's principle' formula probably yields quantitative explanation of as much as 46% of the 'Pioneer Anomaly' (Anderson *et al* 1998; Turyshev & Toth 2010) so it's of the right order here too. Plagiarism maybe, but Einstein's reluctance to admit its origin clearly sought especially to conceal that its presence in GR is harmful to GR's integrity. Even wrapped in a GR field theory envelope, its different physical basis must ruin GR as a physically consistent body of theory.

In CT, however, after James Clerk Maxwell and William Thomson(Kelvin) in the 1860s, gravitation is a mutual response (Osmaston 2013a). Mass-bearing particles are vortices of aether whose individual axes reorient themselves in response to the locally prevailing gravity potential gradient. So the extent of that interactive response between major bodies requires interactive updating communication as the separation changes, much as treated by Gerber. In that, in CT, the aether is electromagnetic in nature, so too is the resultant gravitation, so CT is not rendered inconsistent by the finding that its communication is at velocity ***c***.

2. References and further reading

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(See his Section 4 on Mercury's perihelion. He emphasizes that it has not been measured but that in combination with other data sets the formula seems to work with a precision of 1:1000.)