LETTERS TO PROGRESS IN PHYSICS

Comment on N. A. Kozyrev's "Possibility of Experimental Study of the Properties of Time"

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More than 60 years ago, N. A. Kozyrev predicted the need for a second universal velocity, one that is associated with rotational motion, in addition to the well-known first universal velocity, the velocity of light, which is associated with linear motion. Kozyrev predicted that there should be additional forces which act along the axis of rotation and are on the order of 10^{-4} or 10^{-5} of the applied forces. For the neoclassical causal theory (Hafele J. C. *Zelm. Journ.*, 2012, v. 5, 134), the values for the ratios for the Moon are in order of magnitude consistent with Kozyrev's predicted ratios.

The neoclassical causal version for Newtonian gravitational theory requires a hypothetical induction field F_λ and a corresponding induction speed v_k [1]. The purpose of this letter is to indicate that, more than 60 years ago, N. A. Kozyrev developed a similar concept for rotational motion in classical Newtonian theory [2].

The experimental verification of Kozyrev's theoretical concepts started in the winter of 1951–1952. Kozyrev stipulates: 1) the velocity of light is a universal velocity that is to be associated with linear motion, and 2) there should be a second universal velocity that is associated with rotational motion. In his notation, c_1 is the known speed of light, and c_2 is an unknown rotational universal speed.

The following is a direct quote from page 199 of Kozyrev's article [2]:

> "Now, utilizing the Plank constant in any scalar universal constant, it is necessary to obtain a value having the dimensionality of velocity. It is easy to establish that the expression
>
> $$c_2 = \frac{\alpha e^2}{h} = \alpha \times 350 \text{ km/sec} \qquad (7)$$
>
> comprises a unique combination of this type. Here e equals the charge of an elementary particle and α equals a certain dimensionless factor. Then, based on (6), at $u = 100$ m/s, the additional forces will be of the order of 10^{-4} or 10^{-5} (at a considerable α-value) from the applied forces."

Kozyrev defines u to be the linear velocity of the rotating object. He finds that the value for $\alpha \cong 2$, and the value for $c_2 \cong 7{\times}10^5$ m/s $\cong 2.3{\times}10^{-3} c_1$ [2, p. 203]. He predicts that a small additional force is proportional to $u/c_2 \cong 100/7{\times}10^5 \cong$ $\cong 1.4{\times}10^{-4}$ [2, p.198], which is the basis for his "of the order of 10^{-4} or 10^{-5}". (The numerical value for e^2/h, 350 km/s, is calculated according to CGS system of units.)

For the neoclassical causal theory, the ratio of the transverse to the radial field for the NEAR flyby at perigee, $g_{trt}/g_r \cong 4{\times}10^{-6}$ [1, p.169]. A better comparison with Kozyrev's theory is obtained by using the case for the Moon, where the orbital motion is nearly circular [1, p.172]. Let v_{co} be the orbital speed for an equivalent circular orbit. Then

$$v_{co} \cong 1{\times}10^3 \text{ m/s}, \qquad \frac{v_{co}}{c_2} \cong 1.4{\times}10^{-3},$$

which is within one order of magnitude of Kozyrev's u/c_2. Let $\langle g_{trt} \rangle$ be the RMS average value for the time-retarded transverse field for the Moon, and let $\langle F_\lambda \rangle$ be the RMS average value for the induction field. Then

$$\langle g_{trt} \rangle \cong 1{\times}10^{-11} \text{ m/s}, \quad \langle F_\lambda \rangle \cong 1.4{\times}10^{-14} \text{ m/s},$$

$$\frac{\langle F_\lambda \rangle}{\langle g_{trt} \rangle} \cong 1.4{\times}10^{-3}.$$

These results show that the relative ratios for the secondary fields are close to the same order of magnitude as they are for Kozyrev's theory.

More than 60 years ago, N. A. Kozyrev could not have known about recently discovered flyby anomalies and a lunar orbit anomaly, but he did have an uncanny insight that has now been brought to fruition. If more attention had been paid to Kozyrev's theory, it may have preempted the neoclassical causal theory. It may also be helpful in designing a ground-based instrument for detecting the Earth's time-retarded transverse gravitational field.

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References

1. Hafele J. C. Earth flyby anomalies explained by a time-retarded causal version of Newtonian gravitational theory. *The Abraham Zelmanov Journal*, 2012, v. 5, 134–187.
2. Kozyrev N. A. Possibility of experimental study of the properties of time. *The Abraham Zelmanov Journal*, 2012, v. 5, 188–220.