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Short Communication

Fourteen Observational Evidences Suggesting a Need for Reconsideration of the Laws of Motion

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It is proposed here that: to understand some recent observations, we need to reconsider the nature of motions of physical objects; and the laws followed by them. 'Absolute-motion' can be defined as: motion of an object with respect to its previous position. Every piece of matter, and every chunk of energy, produces a curvature of space-time around it. Since the speed of light is finite, the re-adjustment of curvature needs some time; so, when a massive body tries to move in any direction, it has to 'climb' its own 'gravitational-potential-well'. Therefore, every piece of matter, and every chunk of energy, has to continuously spend a part of its kinetic-energy to maintain its 'absolute motion'. Based on this new hypothesis: (i) anomalous decelerations of: Pioneer-10, Pioneer-11, Galileo and Ulysses space-probes are explained; and (ii) the 'cosmological red-shift' is re-interpreted. And the seven different recurrences of the 'critical-acceleration' of MOND noticed by Sivaram (1994) are shown as supportive-evidences for this proposal.

Key Words: Absolute Motion; Relative Motion; Pioneer-Anomaly; Cosmological Red-shift; Modified Newtonian Dynamics MOND

Introduction

Einstein's relativity-theory is certainly an important progress, that: since the speed of light is finite, the time taken by light to reach the observer significantly alters the perception of speed of the approaching object; particularly when the speed of the approaching object is comparable with the speed of light. But supposing there is only one object in the universe, and there is only one observer riding on that object, then what would the term 'motion' mean to him? It is shown here that: for him 'motion' means a change in its position with respect to its previous position; and since a massive object has the gravitational-field, a change in its position needs consumption of some energy. Based on this hypothesis, the 'cosmological-red-shift' is re-interpreted; and Pioneer-anomaly is explained as an observational-evidence of this new hypothesis, that: every piece of matter, and every chunk of energy, produces a curvature of space-time around it. Since the speed of light is finite, the re-adjustment of curvature needs some time; so, when a massive body tries to move in any direction, it has to 'climb' of its own 'gravitational-potential-well'. Therefore, every piece of matter, and every chunk of energy, has to continuously spend a part of its kinetic-energy to maintain its 'absolute motion'.

The reader must have seen the circus-artists walking on the safety net. The net gets distorted where the artist is standing, so he has to keep on climbing while walking on the safety net.

Observational Supportive Evidences

Inter-galactic-photons experience the 'cosmological red-shift' because they are in absolute motion as well. We can express the cosmological red-shift z_c in terms of de-acceleration experienced by the photon, as

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follows (Tank, 2010, 2011):

$$z_c = (f_0 - f) / f = H_0 D/c$$

i.e. $(h \Delta f / h f) = H_0 D/c$

i.e. $h \Delta f = (h f / c^2) (H_0 c) D$ (1)

That is, the loss in energy of the photon is equal to its mass (hf / c^2) times the acceleration $a = H_0 c$, times the distance D travelled by it, where, H_0 is Hubble-parameter. And the value of constant acceleration a is: $a = H_0 c$, $a = 6.87 \times 10^{-10}$ meter/sec^2.

Now, we will verify that the accelerations experienced by the Pioneer-10, Pioneer-11, Galileo, Ulysses space-probes do match strikingly with the expression (1):

Carefully observed values of de-accelerations:

(Anderson J. D. *et al*. 1998)

For Pioneer-10, $a = (8.09 \pm 0.2) \times 10^{-10}$ m/s^2

$= H_0 c \pm$ local-effect (2)

For Pioneer-11, $a = (8.56 \pm 0.15) \times 10^{-10}$ m/s^2

$= H_0 c \pm$ local-effect (3)

For Ulysses, $a = (12 \pm 3) \times 10^{-10}$ m/s^2

$= H_0 c \pm$ local-effect (4)

For Galileo, $a = (8.0 \pm 3) \times 10^{-10}$ m/s^2

$= H_0 c \pm$ local-effect, (5)

and

For Cosmologically-red-shifted-photon,

$a = 6.87 \times 10^{-10}$ m/s$^2 = H_0 c$ (6)

This value of acceleration is also the 'critical acceleration' of modified Newtonian dynamics MOND (7)

and the rate of 'accelerated-expansion of the universe' (8)

Perfect matching of values of decelerations of all the four space-probes is itself an interesting observation; and its matching with the deceleration of cosmologically-red-shifting-photons cannot be ignored by a scientific mind as a coincidence. There is one more interesting thing about the value of this deceleration as first noticed by Milgrom, that: with this value of deceleration, an object moving with the speed of light would come to rest exactly after the time T_0 which is the age of the universe.

Moreover, Sivaram has noticed that (Sivaram, 1994):

$$G M_0/R_0^2 = G m_P/r_P^2 = G m_e/r_e^2 = G m_n/r_n^2$$

$$= G M_{gc}/R_{gc}^2 = G M_{gal}/R_{gal}^2 = G M_{cg}/R_{cg}^2$$

= The 'critical-acceleration' of MOND

$= H_0 c$ (9-15)

(Here: M_0 and R_0 are mass and radius of the universe respectively, m_P and r_P are mass and radius of the proton, m_e and r_e are mass and radius of the electron, m_n and r_n are mass and radius of the nucleus of an atom, M_{gc} and R_{gc} are mass and radius of the globular-clusters, M_{gal} and R_{gal} are mass and radius of the spiral-galaxies, and M_{cg} and R_{cg} are mass and radius of the galactic-clusters respectively).

That is, the self-gravitational-pulling-force experienced by all the above bodies will be:

Self-gravitational-force F = (mass of the body, say a galaxy) times (a constant value of deceleration $H_0 c$).

In all the fourteen observations, mentioned above, we find that the backwards-force experienced by them is their mass times a constant value of deceleration $H_0 c$. So, we can expect its generalization as:

Every piece of matter, and every chunk of energy, has a 'gravitational potential-well', or 'the curvature of space-time' around it; so when it tries to make absolute motion in any direction, it has to climb of its own gravitational-potential-well; so it experiences a backward-force, towards its previous position. This backward-force is proportional to its mass m, and the value of acceleration remains constant, $a = H_0 c$.

Possible Explanation for the Flattening of Galaxies Rotation-curves

Let us imagine a grandfather and his 5-year-old grandson walking in a garden holding each other's hand. Normally, the grandfather is able to maintain hold of the child; but when the grandfather is not well, the child's little force becomes helpful in holding the grandfather! Similarly, when the gravitational-attraction of a galaxy's core becomes weak, and the value of acceleration GM/r^2 reduces to less than a_0, then the self-gravitational-acceleration of the orbiting-star becomes significant in determining the velocity of its rotation.

Reason why the Apparent Value of Deceleration of the Cosmic-Photon is Slightly Small

When the extra-galactic photon enters our own milky-way-galaxy, the photon also experiences the gravitational-blue-shift, because of the gravitational-pull of our galaxy. The photon of a given frequency, if it has come from a nearby galaxy, then it gets more blue-shifted, compared to the photon which has come from very-very far-distant-galaxy; so the galaxy which is at closer distance, appears at more closer distance, than the galaxies at far away distances. That is, the cosmic photon decelerated during its long inter-galactic-journey, and then accelerated because of the gravitational-pull of our milky way galaxy; so we measure slightly lesser value of H_0; $H_0c = 6.87 \times 10^{-10}$ meter per second squared. But if we could send the Hubble-like Space-Telescope outside our milky way galaxy, then the value of H_0c will match perfectly with the value of deceleration of all the four space-probes; $= 8.5 \times 10^{-10}$ meters per second squared.

Conclusion

The re-interpretation of 'cosmological-red-shift' as deceleration of the cosmic-photon, the observations of anomalous decelerations of Pioneer-10, Pioneer-11, Galileo and Ulysses space-probes, of strikingly equal value; and the recurrences of 'critical-acceleration' of MOND in the case of the electron, the proton, the nucleus-of-atom, the globular-clusters, the spiral-galaxies, the galactic-clusters and the whole universe lead us to a hypothesis that:

Every piece of matter, and every chunk of energy, has a 'gravitational potential-well', or 'the curvature of space-time' around it; so when it tries to make absolute motion in any direction, it has to climb of its own gravitational-potential-well; so it experiences a backwards-force, towards its previous position. This backwards-force is proportional to its mass m, and the value of acceleration remains constant, $a = H_0c$.

This new law can be experimentally verified by applying force smaller than the $m.\ H_0c$ in outer space where there is no other gravitational force. We can send more and more space-probes, like the Pioneer-10 and 11, in different directions, of different masses and velocities for reconfirmation of this law.

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