

A new understanding of gravity and particles voids the need for dark matter, dark energy, and cosmic expansion

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A new theory for gravity and a new model for cosmology are demanded by particle physics, observations and self-consistency.

OBSERVATIONS

A background field is required for action-at-a distance. This field is the massless medium that allows the cyclic patterns (eigenstates) that we observe as wave-particles: massive (baryons & leptons) and massless quanta (photon, gluons). All mass is stored energy, i.e. momentum held at a location. ALL trapped momentum gives rise to mass. All matter (every massive wave-particle) carries energy in direct proportion to its Compton frequency of oscillation. A faster ticking (frequency) of atomic clocks (e.g. those of the GPS satellites) means their atoms carry more energy.

CONSEQUENCE

The supposed **redshift** of photons in escaping a gravitational field is a **blueshift** of atoms. Photon momentum/energy is unchanged, after emission, consistent with Newton's law of gravity when $m = 0$.

OBSERVATIONS

Mass is constant in Special Relativity because it only applies within a region where there is no gradient in gravitational potential. There is no requirement for the mass of the same matter and the speed of light to be constant in regions of different gravitational potential.

If $m_0 = E / c^2$ always holds, then rest mass per unit matter (currently holding energy E) carries LESS energy when the speed of light (c) is larger (i.e. faster).

CONSEQUENCE

Light travels faster when the surrounding density of mass is larger, and the mass/unit matter smaller. This is consistent with particle eigenstates where patterns contract if the wave-speed is faster and with atomic orbitals where energy is released when electrons move closer to the nucleus.

OBSERVATIONS

General Relativity keeps mass and light-speed locally invariant by distorting both space and time by relative gravitational potential, based on the belief that gravity is transformed away by free-fall. This is a misunderstanding. The force remains but is exactly matched by inertial resistance to acceleration as the object moves into a region of reduced potential.

CONSEQUENCES FOR RELATIVITY

The Equivalence Principle does not hold – mass reduces during free-fall and c increases. There is no need for a contraction of “space” – the scale of distance between objects not in relative motion. Distance and time are linked via a variable speed of light; time for light to travel is always: $Time = distance/c$. Relativity to the background field replaces relativity to the speed and potential of the observer. The key claimed predictions of General Relativity are reproduced because energy/momentum and time are linked.

OBSERVATIONS

The $1/R$ dependence of gravitational potential energy, with distance R from a source, implies that the background field cannot carry energy because conservation of energy is violated if it does not fall off as $1/4\pi R^2$. The Higgs mechanism as the source of mass implies that chirality (handedness) is the primary property that allows trapping of energy. Matter and anti-matter have opposite chirality and particle and antiparticle states have equal mass but can annihilate into only energy while conserving momentum. The implication is that the $1/R$ dependence of potential arises from opposing components of matched chirality in a background of nearly equal contributions from opposite chirality. It is proposed that, if only one chirality of the background increases, then the size of the increase is reduced by movement of the point of balanced rotation by the opposite chirality present in the background. The change in c is proportional to the mean of the components. However, the asymmetry will result in a rotation with motion of the particle state relative to the background giving rise to a sensitivity, an increasing resistance to changes in speed relative to c , i.e. to inertia.

EXPECTATIONS

The early universe will have evolved into separated regions of matter and antimatter, so no annihilation signal will be seen. The like matter in each region will have clumped over time leading to a steady decrease in c and an opposite increase in mass per unit matter. Thus, the redshift of galaxies looking back in time is the same phenomenon as gravitational attraction. Both arise from matter holding less energy when light-speed is/was faster.

CONSEQUENCES FOR COSMOLOGY

The Universe is NOT expanding. A curved fabric of spacetime does not exist. No need for an accelerating expansion, or any expansion at all. No need for dark energy, a big bang or cosmic inflation. The value of inertia will vary within an isolated galaxy; no need for dark matter or MOND. The Hubble tension and CMB dipole anomaly are explained & removed. The horizon and flatness problems are avoided. The singularities inside black holes and their event horizons are removed; their “shadows” from bending of light remain. Gravitational “waves” are travelling variations in the background field that alter light-speed, they do not carry energy.

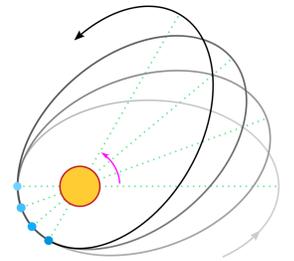
OBSERVATIONAL EVIDENCE

The distance based on brightness of type 1a supernovae, which act as standard candles because they explode with nearly the same energy, has to be corrected for the cumulative increase in light-speed, going back in time. The time taken since emission must be divided by $1 + Z/2$, because of the integrated increase of $\int_0^Z (1+Z) dZ$ in light speed. Further evidence against any expansion includes the removal of the CMB dipolar anomaly and Hubble tension.

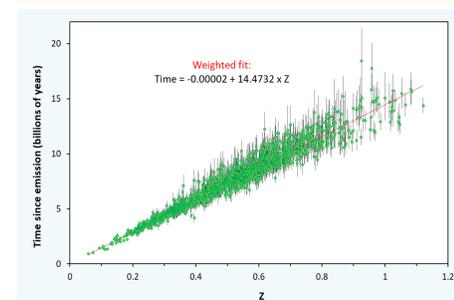
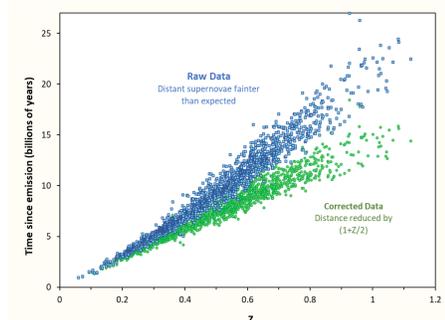
The new theory and understanding, Full Relativity, has particles and fields fully dependent on each other, not on their speed and location relative to the observer. Gravitational attraction comes from a fractional loss in mass if there is a positive gradient in light-speed. A fabric of spacetime is not needed and the Λ CDM model is rejected.

The behaviour of a swinging pendulum means that matter can release stored energy (mass) as kinetic energy of motion. It is restored to the pendulum bob when work is done in returning it to its original height.

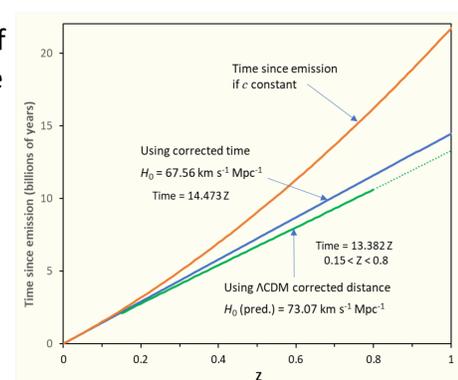
There is no requirement that the matter changes state by emitting particles or radiation.



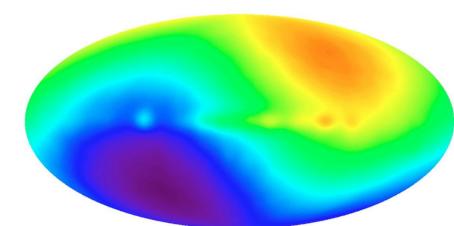
The lower mass of an object when closer to a much larger mass, but conservation of momentum, explains the advance in the perihelion of Mercury, instead of it arising from General Relativity's constant mass but contracted distance.



The publicly available DES data is plotted with and without correction. The raw data (blue) has light from distant supernovae being fainter than expected if c is constant. The corrected data (green) removes any evidence for an accelerating expansion and hence for dark energy. Changes in energy at emission can account for all the apparent expansion.



The Hubble tension arises because Λ CDM requires an expansion based on dark matter and dark energy. A polynomial correction is therefore made to the distance of type 1a supernovae based on their redshift. Applying this correction, instead of the light-speed correction, correctly predicts the discrepantly high value of the Hubble constant.



CMB dipole. Credit: NASA COBE. The dipole implies a speed of 370 km/sec towards $l=264^\circ$, $b=48^\circ$ in galactic coordinates. The claimed dipole anomaly is that our speed relative to distant radio galaxies appears much faster, but in the same direction (if Λ CDM holds). Removing any redshift due to an expansion after emission removes the speed increase with Z .



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