

PREFACE

The proposed theory in Paper I goes against some of the conventional wisdom of modern physics, so I am going to provide several pieces of information upon which the model draws or that are at least consistent with it. The hope is that the reader will read the model and whether or not he or she agrees with the model, at least support doing a key test of it.

1. Mainstream quantum mechanics (QM) regards the photon as an alloy⁽³⁴⁾ of two quanta being roughly 80% B^o and 20% W^o.
2. The sphere of influence of photons shrink⁽³⁴⁾ as they are energized and their wavelengths shrink.
3. Hidden symmetries; the living vacuum as evidenced by the Casimir effect, and background fields, such as the Higgs field⁽³⁴⁾ in which screening creates effective mass, are all consistent with main stream QM. The effective mass is presumed not to be a property of particles, but of the interaction with the surrounding background.
4. Quantum mechanics accepts that the fine structure constant, the electric charge and the strong force vary depending on the strength⁽³⁴⁾ with which they are probed. The true value of the electrical charge, for example is assumed to be masked by the living vacuum.
5. The strength of the strong force is masked⁽³⁴⁾ by the fact that quarks, do not exist free in nature, but always come packaged in groups of two or more in nature. Just as an atom containing powerful electric charges appears to be electrically neutral, nucleons and their even stronger forces do likewise unless approached very closely by another nucleon.
6. Modern cosmology posits that the permittivity of the vacuum⁽¹⁸⁾ varies with the expansion of the universe.
7. Both Newtonian physics and General Relativity (GR) have light obey gravity with GR having gravity bend light at twice the rate that Newtonian physics, as calculated by Soldner, was assumed to do. Black holes (The Reverend John Michell predicted them first.) and gravitational lensing are predicted by both Newtonian and GR physics. The Shapiro time⁽¹⁹⁾ delay, in addition to the gravitational redshift, is an experimentally demonstrated impact of gravity upon the speed of light.
8. Recent work by qualified physicists have indicated that free quarks created by the Relativistic Heavy Ion Collider in conditions believed to be similar to those existing at the time of the big bang⁽³⁶⁾ behave as a liquid.
9. Black hole⁽³⁷⁾ modeling reveals that the propagation of sound in an uneven liquid flow is closely analogous to the propagation of light in curved spacetime and contrary to Einstein's assumptions possess a preferred frame of reference that manifests itself on fine scales..

10. Bose- Einstein condensates⁽³⁸⁾ can be regarded as a quantum fluids.

11. The January/February 2010 *Discover*, story #79, reports that in June of 2009 researchers created a simulation of the effects of a black hole on light using sound in a cloud of rubidium atoms in which a laser created a void - an analogue of an idea key to the proposed model.

12. In the July 2002 *Discover* magazine article *Black Holes Spin?* Mitchell Begelman of the University of Colorado is quoted as saying, "Space isn't sitting there stationary outside the hole. It's always being stretched and pulled into the hole."

13. In the October 2009 *Scientific American* article *Black Stars Not Black Holes* Carlos Barcelo, Stephano Liberati, Sebastiano Sonego and Matt Visser propose that space itself inside black stars can provide structural support preventing them from turning into black holes.

14.. Steven Weinberg proposed in his text *Gravitation and Cosmology*⁽²¹⁾ that the Principle of Equivalence of Gravitation and Inertia provided a better bridge between gravity and particle physics than Einstein's geometrical approach.

".....At one time it was even hoped that the rest of physics could be brought into a geometric formulation, but this hope has met with disappointment, and the geometric interpretation of the theory of gravity has dwindled to a mere analogy, which lingers in our language like 'metric', 'affine connection' and 'curvature', but is not otherwise very useful....."

15. Newton⁽¹³⁾ posited in a 1675 letter to Oldenburg, the Secretary of the Royal Society, and later to Robert Boyle, that gravity was the result of a *condensation causing a flow of an ether with a corresponding thinning of the ether density associated with the increased velocity of flow*. He also asserted that such a process was consistent with all his other work and Kepler's Laws of Motion. *It is unfortunate that Newton had a habit of not publishing much of his work as it would seem that the ether of Newton's correspondence and Einstein's space have properties in common.*

16 Einstein⁽²⁾ proposed in his book *Relativity* (1916):

"A curvature of rays of light *can only take place when the velocity of propagation of light varies with position.*" (Italics added.) Einstein goes on to note that the constant velocity of light is restricted to special relativity i.e. absent a gravitational field.

Einstein used a constant value for c in GR, but I suspect that the reason was that the variation in velocity is masked by the underlying dynamics.

17. General relativity predicts that the deflection of light by a gravitational field is $4GM/R_0c^2$. Einstein stated in his book *Relativity*⁽²⁾: "It may be added that according to the theory, *half* of this deflection is produced by the Newtonian field of attraction of the sun, and the *other half* by the geometrical modification ("curvature") of space caused by the sun."

18. In his 1920 book *Space, Time, & Gravitation* Arthur Eddington repeats half and half proposition.

On page 97 he ties the two halves to the formula $ds^2 = -\frac{1}{\gamma}dr^2 - r^2d\theta^2 + \gamma dt^2$

with the first γ representing the GR portion and the second the Newtonian portion. He asserts that when the speed of light is reached by particles as well as light the two elements become equal.

On P109 he also asserts that space time curvature near masses can be treated as spatial gradients and that the spatial density near the sun slows the velocity and "slews light toward the sun". This of course supports Einstein's variation of the velocity of light with position.

19. No matter how created, Newton, general relativity, and quantum mechanics regard gravitational fields as associated with and traveling with the massive bodies.

20. The Michelson-Morley experiment was conducted on the surface of the earth, thus deep in the earth's gravitational field where light was under the strong influence of the earth's gravitational field. Thus it was incapable of measuring the drift of the earth through any background ether, because of the effects of the earth's gravitational field.

21. Robert Kirkwood⁽⁴⁾ showed some fifty years ago that a flowing ether model yielded the *Schwarzschild line element* in Einstein's theory. Herbert Ives⁽⁶⁾ had done the same thing several years earlier. More recently, Tom Martin⁽⁷⁾ of the Gravity Research Institute, Boulder, Colorado has done so for a model based upon spatial flow of a physical substrate. It is generally accepted that *any theory which produces the Schwarzschild line element will produce the same results as General Relativity* for the key tests of General Relativity:

Arthur Eddington assumed an inverse relationship between the velocity of light and the refractive index of the medium. His calculations using this refractive index give the same $4m/r$ deflection as Einstein's theory. Because of the way he calculated it, his refractive index includes the effects of both the proposed model's gradient and spatial flow. At any rate in view of his thinking, I am amazed that people look askance when I propose the that light varies with position in a gravitational field today.

I believe that the most direct interpretation of the Shapiro time delay⁽¹⁹⁾, as revealed by the Viking Landers on Mars and the 1933 Dayton Miller experiments, already support this premise. I propose another unambiguous test.

PROPOSED TEST

I propose that the velocity of light be measured twice along geodesics, once on the surface of the earth and once in orbit. For reasons of experimental control the ideal situation would use the same apparatus in the same spaceship on earth and in orbit. For this test it is absolutely essential that the comparative measurements be made tangentially to the surface of the earth and to the spaceship's orbit. That is, the measurements must be made perpendicular to the radius of the gravitational field. The prediction is that the propagation of light at in orbit will be measured as faster than at the surface of the earth. In addition, I also predict that over and back type radial versus tangential measurements of the speed of light will also differ because rising light will be slowed.

If the speed of light is truly constant then no change will be detected between the two sets of measurements and Einstein's later thinking will be once again confirmed. That should be sufficient justification for the experiment. But if they are different a richer understanding of gravity will result, the horizon and flatness problems will be solved, and I suspect it will be easier to bridge GR and particle physics.