

The Wave Medium, the Electron, and the Proton - Part 1

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rev02 - Nov 02, 2013

Summary

A geometric argument is presented that the true ratio between the rest mass of the proton and the rest mass of the electron is $6\pi^5$. The deviation of the measured value for this ratio from $6\pi^5$ is interpreted to be a relativistic mass correction due to movement through, for lack of a better term, the aether. This aether is a scalar field and consists of electrons in a true rest frame. Based upon the Lorentz Transformation, the velocity of the Earth associated with this motion through the aether is 0.006136 c. This allows for a unification of Special Relativity with Quantum Mechanics. The necessary condition for this unification is that the Lorentz Transform of the observer with respect to the aether must be considered. The hypothesis described herein can be supported or disproved by using an observer in a frame of reference at a velocity significantly different than that of the Earth. The hypothesis presented herein can also be supported or disproved by re-analysis of existing particle accelerator data and by examination of cosmological data.

Preface

The author is educated as a chemical engineer. The mathematics in Part 1 of this work is limited to basic trigonometry. The Lorentz Transform is briefly used. This is not a theoretical text concerning Quantum Mechanics. Instead, the author begins with an assumption regarding the mass ratio between the proton and the electron. An apparent coincidence is taken to be more than a coincidence. The author then develops a model that is consistent with that assumption. The resulting hypothesis links the complex time exponential from Quantum Mechanics to absolute motion through the wave medium. Part 2 of this work develops the mathematics.

Discussion

Quantum Mechanics and Relativity have coexisted in their present form for roughly 80 years. Each is correct, yet each excludes the other. There appears to be no way to merge them without one or both being changed. Hotson^{1,2} presents a very eloquent argument that it was a mistake to eliminate the aether. The essence of his argument is that the negative solutions to the Dirac Wave Equation cannot be ignored. He also lists indicators of the complexity of physics and concludes that there was a major error near 1930. The author can add nothing to his arguments other than to state that what is needed is a shared reference point at which Quantum Mechanics and Relativity must produce the same answer. The author believes that the proton at rest is such a reference. It will be argued below that inclusion of the Lorentz Transform of the observer is necessary for Quantum Mechanics to match Relativity.

$6\pi^5$. In April of 1951, Friedrich Lenz³ of Düsseldorf, Germany sent a letter to Physical Review noting that the ratio of the mass of the proton to the mass of the electron is very nearly $6\pi^5$. Unfortunately, no supporting theory or reasoning was provided. Perhaps this was thought to be a coincidence. Perhaps this was thought to be unimportant. For whatever reason, this observation appears to have been either ignored, dismissed, or forgotten.

In a previous work⁴, the author independently made the same observation concerning this ratio of particle masses. However, the author does not believe in coincidence in the physical sciences. That work concerned the use of quaternions and vector rotations to produce solutions to the wave equation. The author speculated that somehow rotation was involved and that perhaps particle mass was somehow related to string length. The author can now offer a feasible explanation for this observation. The hypothesis presented here is that the complex time exponential of Quantum Mechanics can be represented as follows:

$$e^{+i\alpha ct} = \cos(\alpha ct) + \mathbf{i} \sin(\alpha ct) = \sqrt{1 - \frac{v^2}{c^2}} + \mathbf{i} \frac{v}{c}$$

Returning to $6\pi^5$, please refer to Figure 1 below. Similar triangles are used to project a line segment of length "d" onto a line segment of length πd . There is also a circle of diameter "d" associated with the smaller line segment but it is not visible in the sketch since it is perpendicular to the sketch. It is simple to show that $L_2/L_1 = \pi$ for this to be true. Now suppose that the projected line segment is rotated 90° in addition to being scaled by a factor of π . This is equivalent to multiplication by a quaternion. Performing 4 such multiplications will scale an arbitrary vector by a factor of π^4 and return it to its original orientation.

One of the beautiful things regarding the wave equation is that a solution to it can be used to produce other solutions if certain criteria are true. Therefore, if you begin with a solution - hopefully the electron is a solution - and scale it by a factor of π^4 , it is possible that you still have a solution. With respect to the

proton, this reasoning still needs a factor of 6π . The factor of π can be rationalized by using the circumference of the circle associated with the projected line segment.

At this point, the reader is perhaps thinking that the author has merely traded one coincidence for several coincidences. The reader might be correct. But consider this. By setting $L_1 = d$, the length of the circumference of the circle associated with the initial line segment; the length of L_2 ; and the length of the projected line segment are each equal to πd . Therefore, the object shown in Figure 1 can be constructed using 3 strings of arbitrary and equal length πd . The associated half-angle is 26.565° with a value for the tangent of $1/2$. Perhaps this tangent value coincides with spin. It is noteworthy that the sum the lengths of the hypotenuse and the opposite side, divided by the length of the adjacent side, is the golden ratio (i.e., $(1 + \sqrt{5})/2$).

An additional way of rationalizing the π^4 factor utilizes Euler's Identity. This identity states that the sum of e raised to the exponent $i\pi$ plus 1 equals 0. By moving the one to the other side of the equation and taking the natural logarithm of both sides, it is then possible to state that $i\pi$ equals the natural logarithm of minus one. Such a statement does not have any physical meaning to the author, but by raising both sides of the equation to the 4th power, the part that makes sense becomes simply π^4 . Each multiplication by $i\pi$ toggles the result between a scalar value and a vector value. The author believes that Figure 1 is really a visual representation of Euler's Identity.

Euler's Identity:

$$e^{i\pi} + 1 = 0$$

Rationalizing the factor of 6 is a little more difficult, but still achievable. In the previous work⁴ by the author, the author developed a set of functions that were used to produce vector solutions to the wave equation. There were two such functions for each axis (i.e., x-axis, y-axis, and z-axis). These functions could be added together in pairs to produce real solutions. The functions did not precisely match the structure presented in Figure 1 but it is possible to modify them to do so. Therefore, the author believes that the needed factor of 6 is the result of adding all of these 6 modified functions together. Part 2 of this work will present the required rigorous solution to the wave equation.

In the argument presented above, mass must be proportional to length. However, the electron is believed to be a point particle. Therefore, the distances presented in Figure 1 must either be scalar values with no physical dimension or they must be in a direction that cannot be physically accessed. Perhaps this dimension is time or perhaps it is truly a fourth physical dimension. The author suspects that this is a scalar value and that it is linked to the wave-function used in Quantum Mechanics.

It is worth repeating this. It is believed that the electron is a point particle. That is, the electron has no physical dimension that can be measured with a measuring stick or a tape measure or anything that has length. **Does this mean that the electron is a scalar?** It fits the definition of a scalar. The author believes that it is, and that this is consistent with the other ideas presented herein.

The published value⁵ for the ratio of the rest mass of the proton to the rest mass of the electron is 1836.15267245(75). This value does not precisely match $6\pi^5$. Expressed numerically, the latter value is approximately 1836.118109. At this point, the reader must make a choice. The reader may choose to believe that the argument presented in Figure 1 is false and there is no rationale to explain the similarity between the two presented values (i.e., that it is a coincidence). Or the reader may choose to believe that this similarity is more than coincidence. The reader could also offer an explanation.

The author does not believe in coincidence - at least not in the physical sciences. Therefore, the author's choice requires an explanation for the deviation between these two values. The author believes that these two values must be equal for Relativity to be in agreement with Quantum Mechanics. Therefore, the author proposes to use the Lorentz Transformation. Application of the transform to the **RATIO** between the given values implies a velocity of 0.006136 c! This is roughly 64 times larger than the Earth's orbital velocity around the Sun and might explain the previous null results of Michelson-Morley. The author has casually read enough astronomy to recognize that this value is typical for a stellar explosion. As Carl Sagan once said "We are made of star-stuff". The calculated velocity supports that statement. The author will add to this by stating that we are star-stuff riding on a cosmic wave. And if our reference frame has been travelling without acceleration for 13.6 billion years then it has travelled 80+ million light years. Perhaps we actually are near the center of the universe, but not because we are special but rather because we are moving more slowly than the rest of the universe. One of Newton's Laws states that an object in motion tends to stay in motion unless acted upon by an external force. If our atoms were produced in a cosmic explosion then their resulting momentum must be conserved and they must still be moving with respect to their prior frame of reference.

The Lorentz Transform is dimensionless. It is normally applied to mass (or length, or even time) rather than to a ratio of mass ratios. The mass of the electron would be expected to be effected by relative motion in the same proportion as the mass of the proton and this effect would keep the m_p/m_e mass ratio constant. There are two implications of applying the transform to the ratio. The first implication is that our reference frame is moving with respect to something. This "something" is possibly a scalar field. The second implication is that the electron must not be affected by this motion. **The electron must be stationary.** The electrons that we perceive as being in our reference frame must actually be a stationary vibration that arises from the vacuum as needed when a proton is nearby. The direction of vibration must be perpendicular to the direction of a particle's motion. This leads the author to believe that the electron is constant in all inertial frames, and that the electron may very well be the scalar field. Electricity is then motion - rather than vibration - of the aether with respect to a reference frame.

The author asks the reader to consider the following premises:

1. The true ratio between the rest mass of the proton and the rest mass of the electron is $6\pi^5$. Or alternately, that wave mechanics predicts a solution with a rest mass equal to $6\pi^5$ times that of the electron. Presumably this particle must be the proton. The observed mass ratio must match this value for Quantum Mechanics and Relativity to agree. Part 2 of this work will produce the required solution rigorously.

2. There is a scalar wave medium composed of electrons in a reference frame at absolute rest. This is, for lack of a better term, the aether. The aether interacts with other matter through the wave equation. The value of the wave-function ψ is the value associated with this scalar electron field.

3. Our rest frame is moving with respect to the aether. This motion accounts for the deviation of the published value of the proton-to-electron mass ratio from the $6\pi^5$ value. The velocity associated with the Earth's motion is 0.006136 c.

Now let us briefly consider the neutron. This analysis is more uncertain since the author is not confident regarding the true rest mass of the neutron. Suppose that the ratio of the true rest mass of the neutron to the rest mass of the electron is $6\pi^5 + 2$. The published value⁶ for this ratio is 1838.6836605(11). Repeating the above exercise implies a velocity equal to 0.02480 c. This value is not even close to the value predicted by the proton calculation. This was initially very discouraging. However, the velocity ratio between the neutron value and the proton value is 4.04. So perhaps it is an integer value 4 or perhaps the true value of the ratio is not stated correctly. Or perhaps this in some way is related to helium. Conversely, suppose that the velocity calculated from the proton data is applied to the neutron data. That predicts a ratio between the true rest mass for the neutron and the electron equal to 1838.65. The author does not presently understand this effect but he believes that resolving it will yield insight into β -decay, the periodic table, and perhaps the structure of the cosmos. It should be possible to apply this concept to the other known particles.

How can an aether as described above be experimentally proven? In 2006, it was claimed by Reinhold⁷ *et al.* that the m_p/m_e mass ratio has changed by .002% over the last 12 billion years. If this adjustment is made to the value of $6\pi^5$ then the result becomes 1836.15. This is accurate to within roughly one part per million. Their work has been vigorously disputed of late with the apparent consensus being that their work was incorrect. Or perhaps you must look at just the right spot. In the opinion of the author, there are only two possible explanations for the value presented by Reinhold. Either they actually measured something - possibly a serendipitous error - that made them draw such a conclusion, or they knew about $6\pi^5$ and hoped to provide falsified supporting evidence for it. Coincidence is simply too much to believe.

The author will offer several possible methods of experimental verification. But before doing so, it is worthwhile to discuss the Lorentz Transform (LT). Consider for a moment three different frames of reference. The 1st being the aether at absolute rest (for the sake of argument, assume that it exists). The 2nd is that of the Earth, and the 3rd is that of a proton in a particle accelerator on the Earth. Let their velocities be v_0 , v_1 , and v_2 with v_0 being equal to zero. The LT for the Earth and for the proton with respect to the aether are as follows:

Earth LT:
$$\frac{1}{\sqrt{1 - \frac{v_1^2}{c^2}}}$$

Proton LT:

$$\frac{1}{\sqrt{1 - \frac{v_2^2}{c^2}}} = \frac{1}{\sqrt{1 - \frac{v_1^2}{c^2}}} \frac{\sqrt{1 - \frac{v_1^2}{c^2}}}{\sqrt{1 - \frac{v_2^2}{c^2}}}$$

The reason for writing the proton LT as above is to form the basis for a question. Specifically, does the LT of an observer factor into physical measurements? The author believes that it does. Therefore, all attempts to measure directly a velocity with respect to the aether will always fail because the governing equations for the observer's reference frame will adjust themselves in accordance with the LT of the observer. This is the meaning of Lorentz invariant. It is a hypothesis that cannot be disproved with only one observer's frame of reference. What is needed is an observer in a reference frame that is significantly different from that of the Earth. Since the author believes that the Earth is travelling at .006136 c, disproving this hypothesis would require an observer to determine m_p/m_e at a much different velocity such as 0%, 2%, or 5% of the speed of light. This is clearly beyond the ability of humanity.

If the above objective is limited to producing a measureable effect upon the m_p/m_e ratio, then such an experiment is within the capability of humanity. Consider the following: The uncertainty in the m_p/m_e ratio is 7.5×10^{-7} . If this value is multiplied by a factor of 6, the result is 4.5×10^{-6} . Therefore, any value that is outside the range $1836.15267245 \pm 4.5 \times 10^{-6}$ would be outside 6 confidence intervals and would be judged to be statistically significant. The velocity needed to achieve this is approximately 432 km/hr. This could be achieved by an airplane or a satellite. The only question is in what direction to move. The author believes that the solar system is travelling in a direction that is parallel to the rotational axis of the Sun. Therefore, an airplane travelling North-South at the equator, or a satellite in polar orbit should be able to measure an effect in the m_p/m_e ratio. The statistical effect upon the m_p/m_e measurement would be an increase in the **variance** of the measurements of an Earth based observer.

Another method would be to re-examine existing data from particle accelerators. The proposed analysis is to allow the velocity (and the LT) of the observer to be a constant but unknown variable in the analysis of data from a particle accelerator. The objective of the analysis then would be to determine if there is an observer velocity at which the various products become simplified or at which the analysis is easier or more clear and straight-forward. It would be a least-squares type of analysis, but it would also require some type of human evaluation. For example, is there an observer velocity at which the rest masses of the three quarks of the proton are equal? The best analogy from history is the problem of Copernicus and the epicycles. If the data is available with information such as the date, time, and location, it might be possible to include the motion of the Earth around the Sun. But that motion is small compared to the predicted value of the solar system through the aether.

A 3rd possible method of experimental verification would involve a 3 dimensional map of cosmological red-shift data. If the solar system is moving, then there should be a slight bias in the observable red-shift data. Essentially, there should be slightly less red-shift in the direction of motion and slightly more red-shift in the direction away from motion.

This hypothesis allows several speculations regarding cosmology. Suppose that there was a cosmic explosion - a Big Bang - billions of years ago and that it resulted in everything that we see. In the author's opinion, the main problem with the Big Bang Theory as it presently exists is that it requires "inflation" immediately after the moment of the Big Bang and it requires "inflation" to stop just as abruptly as it began. The motivation for "inflation" is two-fold: i) the observation that distant galaxies are all moving away from us; and ii) the belief that the Earth cannot be at the center of the universe. As such the perspective from the Earth should be no different than from any other location in the universe. But suppose that we are moving very slowly compared to the other objects in the universe. It follows that we would be closer to the point of origin simply because we have not traveled as far. Therefore, we could be **near** the center of the universe without **being** the center of the universe. Let us further assume that the shock wave from the Big Bang is a simple 3 dimensional sphere that is expanding at light speed. If an observer were inside such a bubble, they would see exactly what we see. Material that had the greatest initial velocity has travelled the farthest and is at the edge of our visible universe. The only differences between what is proposed here and what is presently believed regarding the Big Bang are i) that there is no "inflation" immediately after the Big Bang; and ii) that the universe must be roughly twice as old as is currently believed (i.e., 27.2 to 27.6 billion years vs. 13.6 to 13.8 billion years). Another speculation is that the universe should be slightly lopsided from our perspective with the distance to the outer surface being 320⁺ million light years greater in one direction. This also implies that the universe is finite. It is unimaginably huge, but it is finite. It also implies that space-time is not expanding. Instead, our universe is expanding into (hopefully) empty space. Also, if electricity is net movement of aether with respect to a frame of reference, then the outer surface of our universe must have a negative electrical charge. And if the vacuum was initially electrically neutral then the external negative charge must be offset by an internal positive charge. Therefore, Dark Energy and the apparent acceleration of the expansion of the universe is simply the result of Coulomb's Law with protons that are closer to the outer surface being subjected to greater electrical attraction and hence greater acceleration.

Part 2 of this work rigorously develops the mathematics. Some of the more interesting results are presented here.

The most crucial result is that the complex time exponential must be expressed as follows:

$$e^{+i\alpha ct} = \cos(\alpha ct) + \mathbf{i} \sin(\alpha ct) = \sqrt{1 - \frac{v^2}{c^2}} + \mathbf{i} \frac{v}{c}$$

The velocity v is the velocity with respect to the aether.

The electron is described as follows:

$$m_E = \pm \left(\frac{1}{2}\right) \left(\frac{h}{2\pi}\right) \left(\frac{1}{c}\right) \left[\lim_{r \rightarrow 0} (\Psi_E - \psi_0)\right] \left[\sqrt{1 - \frac{v^2}{c^2}} + \frac{v}{c} \mathbf{i}\right]$$

The wave functions for the electron and the proton are as follows:

Electron:

$$(\Psi_E - \psi_0) = \pm \frac{1}{r} \sin(\alpha r) e^{-i\alpha ct}$$

Proton:

$$(\Psi_P - \psi_0) = \pi(\mathbf{i} + \mathbf{j} + \mathbf{k})(\psi_i + \psi_j + \psi_k)$$

Where

$$\psi_i = \pm \frac{1}{r} (e^{q_0 + i\alpha r} - e^{q_0 - i\alpha r}) e^{-i\alpha ct} = \pm \frac{2i}{r} e^{q_0} \sin(\alpha r) e^{-i\alpha ct}$$

$$\psi_j = \pm \frac{1}{r} (e^{q_0 + j\alpha r} - e^{q_0 - j\alpha r}) e^{-i\alpha ct} = \pm \frac{2j}{r} e^{q_0} \sin(\alpha r) e^{-i\alpha ct}$$

$$\psi_k = \pm \frac{1}{r} (e^{q_0 + k\alpha r} - e^{q_0 - k\alpha r}) e^{-i\alpha ct} = \pm \frac{2k}{r} e^{q_0} \sin(\alpha r) e^{-i\alpha ct}$$

$$\alpha = \frac{2m_E c}{\left(\frac{h}{2\pi}\right)}; \beta = \frac{\pi m_E c}{\left(\frac{h}{2\pi}\right) \ln \pi}; \frac{\alpha}{\beta} = \frac{2 \ln(\pi)}{\pi}; q_0 = 4 \ln(\pi) = 2\pi \frac{\alpha}{\beta}$$

The diameter of the proton can be calculated from the following:

$$d = 4\sqrt{3} \left(\frac{1}{mc}\right) \left(\frac{h}{2\pi}\right) \ln(\pi) = \frac{2\sqrt{3}}{\alpha} q_0$$

The resulting value is 1.668×10^{-15} meter. This is within the accepted measured range of the proton diameter at $1.755(102) \times 10^{-15}$ meter.

Lastly, the system is quantized as follows:

$$\phi = \sin^{-1} \left(\frac{v}{c}\right)$$

$$\alpha ct = \phi \pm 2\pi n; n = 0, 1, 2, \text{etc.}$$

The reader must make a choice. One path dismisses an observation as coincidence and perhaps ignores a valid solution to the wave equation. The other path resolves this observation but does so at the price of requiring a wave medium composed of electrons at absolute rest. Choose wisely.

Conclusion

The author believes that the true value for the ratio between the rest mass of the proton and the rest mass of the electron is $6\pi^5$. The author believes that the disparity between the published value for this ratio and $6\pi^5$ is the result of movement through a scalar field. Lastly, the electron is not affected by this motion. Therefore, the author believes that the electron and the scalar field are identical. The electron is the scalar field. The scalar field is the electron. They are the aether.

Acknowledgements

The author acknowledges gratefully the works of Don Hotson and Milo Wolff. The author also thanks Charlie Papazian for the book "The Complete Joy of Home Brewing". Relax. Don't worry. Have a homebrew. Special thanks go to Karoly Kehrer, Declan Traill, Jeff Yee, Susan Barlow, and the rest of the WSM User's Group at Yahoo. The author is also grateful to viXra and Wikipedia. Lastly, the author acknowledges Friedrich Lenz. Rest in Peace Herr Lenz. Your quest is almost complete.

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Figure 1

