Ground potential

Steven A. Sesselmann

Bee Research Pty Ltd Suite 315 (Level 3), 247 Coward Street, Mascot - NSW 2020 – Australia

Phone: +614 1242 2318 Fax: +612 8338 1300

(Published online 1 July 2014 – last edit 25 July 2014)

Abstract

Despite the successes of the standard model of particle physics, there are many unanswered questions. The predominance of matter over antimatter, the nature of force, the invariance of the proton mass, the electron to proton mass ratio, the apparent numerical equivalence of protons and electrons, and last but not least, an accurate definition of ground potential. Herein a completely new model is proposed, where electrons and protons originate as Dirac particle pairs. Using this model it is possible to show that the mass difference between the electron and the proton is a function of the observers potential. Based on the current standards for the electron and proton energies, ground potential has been calculated as 930 million volts.

PACS numbers: 03.30.+p, 27.10.+h, 31.10.+2, 98.54.-h

I.   INTRODUCTION

For over 80 years, the standard model of particle physics has stood the test of time, yet there are problems with the standard model which can't be explained. In this paper it will be shown how the following problems led to an unexpected, yet mathematically elegant solution.

A. Matter over antimatter

A known problem in physics is the almost total absence of antimatter [1]. Both theory and experiment shows how energy is converted to matter and antimatter particles of equal mass, with opposite charge. Thus far no significant amount of antimatter has been found. This has been a known problem since Paul Dirac proposed the existence of antimatter in 1928 [2,5]. What happened to the antimatter?

B. The nature of force

Since Isaac Newton published his theory of gravity [3], the term *force* has been in common use. Most people would say it is well understood, but when asked about the nature of force, few will have an answer. Current theories have postulated force carriers and provided mathematical solutions, but the solutions which require four separate forces to work, are not elegant. We ask, what is the nature of force?

C. Protons and electrons

Not a commonly debated problem, but certainly a puzzle, is the invariance of the proton mass. We have a universe full of these particles, yet we have no theory to explain how these particles were created in such quantity and with such uniform precision. We also question why there are apparently equal numbers of negative and positive charges in the

universe. We understand that the ratio of the electron mass to proton mass is 1836:1, but why this number, and does it change over time?

D. Ground potential

The term *ground potential* is used extensively in the fields of physics and electrical engineering, but what does it mean, does electrically neutral mean equal numbers of electrons and protons? It is understood that potential needs to be referenced to some other potential, but do we measure it against the Moon, the Sun or what else? So it poses the question, what is ground potential?

II. POTENTIAL ENERGY LIMITS

By definition an electron accelerated through a potential of 1 volt will gain a total energy of 1 electron volt (eV), likewise due to charge equivalence between protons and electrons, a proton accelerated through a potential of 1 volt will also gain 1 eV of energy. The mass energy of an electron is known to be approximately 0.511 MeV, therefore if an electron was to implode and fall through it's own potential to zero energy, it would have to fall through an electric potential of,

$$\frac{0.511 \; million \; electron \; volts}{1 \; electron} = 0.511 \; million \; volts.$$

Eq. 1

Furthermore we can see that two electrons, three electrons or any arbitrary number of electrons, which may represent a multiple of charges, still only has a potential of 0.511 MeV,

$$\frac{5*0.511 \; million \; electron \; volts}{5 \; electrons} = 0.511 \; million \; volts.$$

Eq.2

Likewise we can make the same argument for protons, which demonstrates that although, there is no limit to the amount of charge one can theoretically accumulate there is an upper and lower limit to potential. We do not know of any stable particle with a higher energy than a proton, nor do we know any stable particle with less energy than an electron, it is therefore consistent to assume that all known matter should exist within the boundaries of a potential ranging from 0.511 million volts to 938 million volts. Therefore the following theory shall rest on these two postulates;

a) that, *no matter can exist at a higher potential than the potential of a proton, and*

b) that, *no matter can exist at a lower potential than the potential of an electron*

Placing an upper and a lower limit on electrical potential makes us understand that all matter in the universe must exist at a potential, which lies between this maxima and minima. Fortunately, the mass of both electrons and protons are known to high precision, so by multiplying their respective masses by c^2 we obtain their potential energies as follows.

Electron: 0.510998928(11) MeV[*]

Proton: 938.272046(21) MeV[*]

Source: The NIST Reference on Constants, Units and Uncertainty

Note here, that we are treating a particles entire rest mass as potential energy.

III.   ASSYMETRIC OBSERVER POTENTIAL

After establishing an upper and lower limit for electrical potential it would be interesting to determine ground potential. Newton was faced with a similar problem, when he was calculating the gravitational constant *G;* he would have wanted to know the mass of Earth. Newton could have made a crude estimate of the Earth's mass by filling up a bucket with rock and dirt, to obtain the density, and then he could approximate the mass of the Earth by it's volume accordingly. We may also start with a rough guess because like the electron and proton, the mass per nucleon of any atom tells us about the electrical potential of the nucleus. Therefore we may say, Earth's major component is iron, and the mass per nucleon of iron is $\sim \frac{930\ MeV}{c^2}$ therefore Earth's potential ought to be in the order of 930 MV. We shall soon see how this is not a bad guess. A picture has begun to emerge, because we discover that ground potential lies much closer to the proton potential than it does to the electron potential (Fig. 3).
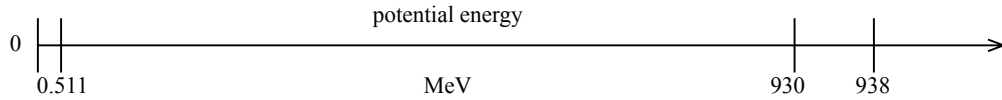

Fig. 3 Linear axis (not to scale) showing increasing potential to the right, with markers showing electron potential ground potential and proton potential.

This severely asymmetric view of the world is quite contrary to the popularly held view, where ground potential is somehow neutral or in the middle. This is an important clue as to why the electron mass is so much lower than the proton mass. The electron is trapped in its own negative potential energy well, and has consequently suffered a substantial mass defect. We are already familiar with this kind of mass defect, as we observe radioisotopes decay and loose mass in a similar way. So with this understanding of how the electron has lost mass we ask the hypothetical question; could the electron and the proton be a Dirac particle pair? According to the standard model of particle physics, one would expect the following objections:

1. the two particles have vastly different mass, and

2. the electron has no internal structure like the proton, and

3. the positron is the antiparticle to the electron

Physicists know well what happens when particle pairs are created; matter and antimatter particles of equal mass and opposite charge fly apart with great velocity. But let's consider how the same experiment looks from the individual particle's point of view. Each particle is given almost instant velocity, momentum and relativistic mass, the initial velocity is taken to be c. According to Einstein's special relativity [6], relative velocity has the effect of shortening the axis along the direction of motion. The result is a zero relative velocity from the perspective of either particle, it experiences no velocity through space. To either particle its antiparticle will appear to be at rest in the bottom of a deep potential energy well. It is exactly this relative potential which is responsible for the electrons apparent mass defect. Now it can be understood that we are not observers in a great laboratory called the universe. Instead we *are* "the experiment", playing the role of

the protons. With this understanding of the world it is possible to calculate ground potential accurately, using a form of Lorenz transformation. The worldview we as observers are seeing, is subject to relativistic effects caused by potential energy and shall agree with special relativity [6]. Figure 4 shows how a Lorenz frame rotation can be used to depict the proton-electron mass relationship. We consider the proton energy to be a constant in the same way c (the speed of light) is a constant in velocity.
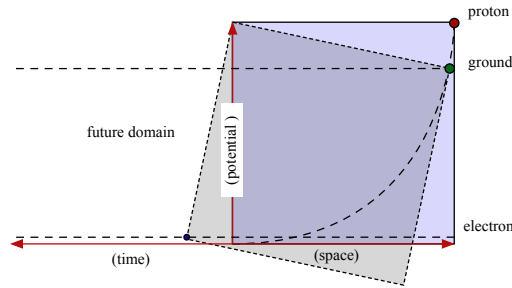

Fig. 4. Schematic (not to scale) showing how the mass of an electron is related to the observers potential, by way of a Lorenz function.

Mathematically this relationship can be expressed more accurately as follows,

$$\phi_e = \frac{\phi_p - \phi_{gnd}}{2}\left(1 - \frac{\phi_{gnd}^2}{\phi_p^2}\right)^{\frac{1}{2}},$$

Eq.3

where ϕ_e is the electron potential, ϕ_p is the proton potential and ϕ_{gnd} is the local observer (ground) potential. As we are working in units of potential rather than mass, the term c^2 does not feature in our equation instead it is the proton potential ϕ_p^2, which is the constant. The expression $\left(1 - \frac{\phi_{gnd}^2}{\phi_p^2}\right)^{\frac{1}{2}}$ is a dimensionless factor, numerically equivalent to the Einstein γ factor. Eq. 3 states that the potential of the

7

electron is equal to half the difference between the potential of the proton and ground potential times the γ factor. We can now insert real numbers and calculate a value for ground potential as follows, using known values,

$$0.510998MV = \frac{938.272\ MV - \phi_{gnd}}{2}\left(1 - \frac{\phi_{gnd}^2}{938.272\ MV^2}\right)^{\frac{1}{2}},$$

which gives us two solutions,

$$\phi_{gnd} = 930.377\ MV,$$

$$\phi_{gnd} = -938.272\ MV.$$

Eq. 5

The positive solution in Eq.5 gives a value for ground potential of 930.377 MV, which as we predicted is very close to the potential of Fe56 (930.412 MV), and Ni62 (930.417 MV) these are the elements with the highest binding energy. This brings us a better understanding as to why the nuclear binding energies peak at Ni62, the reason is simply because we are observing the world from ground potential. See Fig.5

Atomic Mass Table Spreadsheet prepared by Dr. Gordon Gilmore of Nuclear Training Services Ltd. Data taken from the 1995 update to the atomic mass evaluation by G.Audi and A.H.Wapstra
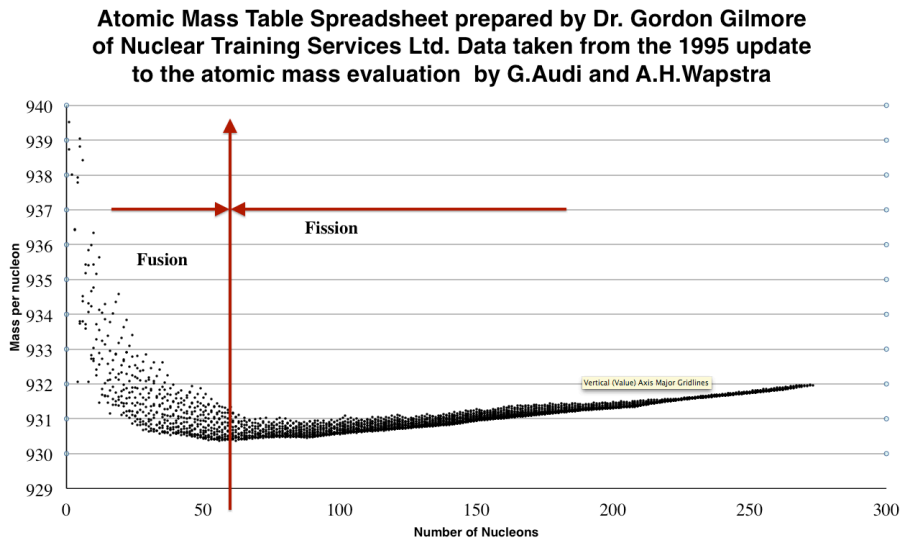
Fig. 5 Table of known elements plotted as nucleons vs. mass per nucleon, data reconstructed from a table [7] prepared by Dr. Gordon Gilmore of Nuclear Training Services Ltd.

Isotopes with higher potential than ground potential release energy by fusion, while isotopes with lower potential than ground give up some energy when undergoing fission. In this way we may look at both fission and fusion reactions as a decay process, the isotopes simply do as they do to reach ground potential, which is the local rest frame.

E. INTRINSIC PARTICLE VELOCITY

In the following discussion we shall consider how there is an intrinsic velocity associated with a body of any potential, and how differences in electric potential translate into relative velocity. In equation Eq. 6, we first show how γ equals the classic Einstein Lorenz factor, which in turn equals to the new potentiality factor. Note that both the classic Lorenz factor and the new potentiality factor are, in their standalone form, dimensionless numbers. When combined, these two factors allow us to solve for velocity as follows:

$$\gamma = \left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}} = \left(1 - \frac{\phi_{gnd}^2}{\phi_p^2}\right)^{\frac{1}{2}},$$

which reduces to,

$$\frac{v}{c} = \frac{\phi_{gnd}}{\phi_p},$$

and then solve for velocity,

$$v = c\left(\frac{\phi_{gnd}}{\phi_p}\right).$$

Eq. 6

Equation 3, shows how there is an absolute velocity associated with a body of any electrical potential, ranging from zero to the speed of light, therefore arises a relative velocity between any two bodies of unequal potential. This relative velocity explains not only gravity, but also every other force of nature, with this simple equation,

$$v_{rel} = c\left(\frac{\Delta\phi}{\phi_p}\right).$$

Eq. 7

In the case of a proton vs. the observer at ground potential the relative velocity becomes,

$$v_{rel} = c\left(\frac{930\ MV - 938\ MV}{938\ MV}\right),$$

for which the solution is,

$$v_{rel} = -2.557 \ast 10^6\ meters\ per\ second.$$

Eq. 8

Equation 8, tells us that a proton observed from Earth ground potential has an intrinsic velocity in the order of the galactic escape velocity from Earth. The negative sign indicates that the velocity is inwards directed, meaning the proton is approaching the observer from the past.

A. The arrow of time

Due to the constant decay of the naturally occurring radioisotopes in the Earth, and the constant fusion reactions taking place in the stars, it is reasonable to assume that the

observer's ground potential is in a state of constant decline. This constant change in potential albeit small, is responsible for time itself. In other words, bodies of higher potential than the observer are in the observer's past, and bodies of lower potential than the observer lie in the observer's future. To demonstrate this we can literally borrow an apple from Newton, and state that an apple falling from a tree never fails to arrive at a destination in its future. Therefore we can state that the arrow of time points in the direction of lower potential. Now we can see from Eq. 6 above, that the proton being a high potential body (in the past) with respect to the observer has a relative inwards directed velocity, i.e. approaching the observer from the past. Now if we were to reverse the situation and state that the proton was the observer, we switch the terms in Eq. 6 and see that velocity now becomes positive. At first this might appear contradictory, but we realize in this case that the body of lower potential than the proton is approaching it from the future, hence the velocity becomes positive. However, the direction of travel is always inwards thereby eliminating any possibility of antigravity.

B. Gravity

We can now explain gravity in terms of relative velocity. The Earth being a body of lower potential than an apple on a branch will therefore lie in the apple's future. We can say that the Earth must be approaching the apple with a relative velocity from the future, or the apple is approaching the Earth with a velocity from the past; it is simply a matter of choosing a frame of reference. So let us attempt to find the potential difference per meter

elevation at sea level, knowing that gravitational acceleration is $\sim 9.8 \ m/s^2$

Eq. 9

$$\frac{\Delta v}{\Delta t} = c \left(\frac{\Delta \phi}{\phi_p} \right)$$

$$\frac{9.8 \ meters}{1 \ second} = c \left(\frac{\Delta \phi}{930MV} \right),$$

$$\left(\frac{9.8 \ m/s}{299,800,000 \ m/s} \right) = \frac{\Delta \phi}{930,000,000 \ Volts}$$

$$\Delta \phi = \frac{30.4 \ Volts}{9.8 \ meter}$$

So in order for the apple to fall 9.8 meters in one second, it has to fall through a potential of 30.4 Volts. We can therefore say that potential gradient at sea level is approximately 3.1 Volts per meter.

IV. CONCLUSION

To summarize the above findings we shall go back and look at how this new understanding may solve some of the current problems in physics.

A. Matter over antimatter

Understanding how every proton was created along with an electron, explains what happened to antimatter, so it is no longer a problem. Antimatter is right here, every atom is made from both protons and electrons, we as observers just happen to be potentially biased towards the proton. Symmetry dictates that there must be a complete identical and equally valid antiworld as seen from electrons potential. This prospect opens up a new question about the topology of an atom, in this scenario a seamless transformation from a

12

positive state to a negative state is required. Such a seamless transformation is easy to visualize for a Hydrogen atom, but it would be mindboggling to understand for the heavier nuclei.

B. The nature of force

As shown above, it is no longer necessary to postulate any forces; we can explain the natural movement of any body or particle by understanding that there is an intrinsic velocity associated with a body of any potential. What we experience as force, is simply the difference in velocity between two bodies of unequal potential.

C. Protons and electrons

The apparent numerical equality of protons and electrons is no longer a puzzle because if they were created in pairs they must appear in exactly the same numbers. The electron to proton mass ratio is now understood and it is no longer a puzzle why the proton is 1836 times heavier than an electron. Last but not least, explaining why protons all appear in the same size remains a puzzle to solve. We can speculate that matter in our universe is created by some standard mechanism, which consistently makes pairs of exactly 938 MeV, and such a "machine" might turn out to be a black hole.

D. Neutrons

Until now it has been understood that neutrons are particles without charge. Now we need to rethink the concept of no charge, because for the neutron to be unaffected by charge it must have the same potential as ground potential ie. +930 MeV so it can hardly be considered charge less. Inside the nucleus of Ni62, a neutron may be indistinguishable from a proton, and the constant presence of transient electrons passing through the

nucleus maintains the charge balance. Once free from the nucleus, the neutron finds itself at the wrong potential where it instantly takes on its intrinsic velocity, eventually causing it to disintegrate into the individual particles.

E. Ground potential

We now understand what is meant by ground potential; it is the observers electrical potential, and by knowing the mass of the proton and electron we can calculate the exact potential. We also understand that ground potential is in a state of decay, and that this is the mechanism by which time flows. The continuous processes of nuclear decay are responsible for the decay over time, meaning the electrical potential we call ground potential is constantly falling. Fortunately the process is slow in terms of human life span, and since the beginning of time the potential has only fallen by 8 MV, resulting in today's electron mass of $\frac{0.511\ MeV}{c^2}$. Regardless, we can project forward and solve the above equation for a ground potential of zero, which would signify the end of time, as follows:

$$\phi_e = \frac{\phi_p - 0}{2} \sqrt{1 - \frac{0^2}{\phi_p^2}},$$

which simply reduces to

$$\phi_e = \frac{\phi_p}{2}.$$

Eq. 10

What Eq. 10 tells us is that ground potential goes towards zero as the potential of the electron approaches half the potential of the proton. This may be seen as the energy equivalent of the Schwarzschild radius, and the end of time for this particular particle one may further speculate that annihilation takes place at that moment, possibly starting a

new world cycle.

V. CONFIRMATION OF THEORY

Due to the relatively slow decay of ground potential, it could take some time before we are able to confirm a drift in the proton to electron mass ratio. An alternative way would be to construct a laboratory in a faraday cage, artificially charge it to a high potential, and carry out comparative measurements of the proton to electron mass ratios. Recent studies conducted at the VU University Amsterdam [8] has set a stringent limit on a drifting proton to electron mass ratio by comparing transitions in methanol observed in the early universe. Their published results are consistent with a null value. This is what one would expect when conducting the experiment from ground potential on Earth. The state of the universe including its age, its size and the mass of its electrons, is a function of the observer's potential. Amazing, as it may seem, one could practically obtain all this information from a single drop of water. The implications of this theory are that every single particle in the universe is destined to annihilate simultaneously when the observers potential reaches ½ the protons potential. A very big bang indeed.

VI. ACKNOWLEDGEMENTS

professional scientists who are members of The Open Source Fusor Research Consortium.

Thanks!

REFERENCES

[1] J. Ellis, Nature (London) 424.6949 (Aug 7, 2003): 631-634.

[2] P. A. M. Dirac, *Proc. R. Soc. London, Vol.* **117**, No. 778 (Feb. 1, 1928), pp. 610-624

[3] I. Newton, philosophiae naturalis principia mathematica: 3rd. Edition (1726)

[4] R. Hirsch et al., US Patent Filed (April. 24 1968). Ser. No. 723,825

[5] P. A. M. Dirac, Proc. Phys. Soc. London, Vol. **126**, No. 801, (Jan. 1, 1930)

[6] A. Einstein, *Ann. Phys. (Berlin)* (1905), Vol. **322**, p. 891

[7] G. Gilmore (gammaspectrometry.co.uk) (July 10 2014)

[8] J. Bagdonaite, P Jansen, Christian Henkel, H. L. Bethlem, K. M. Menten, W. Ubachs, Science Vol. **339** (2013): 46-48