Theory Let $\mathcal{B}$ denote a ball centered at the origin, $\mathcal{O}$, with radius $\mathcal{R} = 4\pi$. Suppose that the ball $\mathcal{B}$ has uniform density and that $\mathcal{B}$ is acted on solely by the force of gravity. No other forces are present. Now suppose that a spatial singularity attempts to collapse the ball $\mathcal{B}$ to a single point. As the radius becomes progressively smaller, it approaches $(4\pi - \pi^{-1})$. The attraction of the singularity generates rotation of the ball $\mathcal{B}$.

Let B denote a ball centered at the origin with radius $R = (4\pi - \pi^{-1})$. Gravitational forces from a singularity generate rotation about an axis. Internal rotational forces form a vacuous prolate ellipsoid, with major axis $(4\pi - \pi^{-1})$ and minor axes $\{\pi^{-1}, \pi^{-1}\}$. The ball B ejects the volume $(4\pi/3)(\pi^{-2})(4\pi - \pi^{-1})$. This equals the volume of the prolate ellipsoid. It is also the volume of an elliptical wedge with curved surface area $4\pi^{-1}$. Moreover this is the volume of an elliptical sector with curved surface area $4\pi^{-1}$.

Up until now we have used numbers without a strict physical meaning. It is not unreasonable to suppose that the electron is a ball of unit radius. Thus, $r_e = 1$ and the volume of the electron is $V_e = (4\pi/3)r_e^3 = (4\pi/3)$. The ratio of the volume of ball B to the volume of the electron is given by $V_B/V_e = (4\pi - \pi^{-1})^3 = 1837.392727\ldots$. Let V_w be the volume of the wedge of ejecta.

$$\frac{V_B - V_w}{V_e} = \left(4\pi - \frac{1}{\pi}\right)^3 - \frac{1}{\pi^2}\left(4\pi - \frac{1}{\pi}\right) \approx 1836.15 \tag{1}$$

Look at V_w. $V_w/V_e = \pi^{-2}(4\pi - \pi^{-1}) \approx 1.24098801$. This ejecta easily supports a *charged unit ball*. The original ball $\mathcal{B}$ only had the property of gravitational attraction. At this point we have the basic two stable particles, namely the proton and the electron. We then look at the mass ratio of the proton to the electron.

$$\frac{V_p}{V_e} = \frac{V_B - V_w}{V_e} = 1836.15$$

There are several expressions that yield the same numerical value as the previous equation. First among equals is

$$(4\pi)\left(4\pi - \frac{1}{\pi}\right)\left(4\pi - \frac{2}{\pi}\right) = 1836.15 \tag{2}$$

Moreover,

$$64\pi^3 - 48\pi + \frac{8}{\pi} = 1836.15 \tag{3}$$

The above equation is the original estimate.

Image of Proton Figure (1) is composed of two geometric figures. This is a three dimensional model in www.secondlife.com. The sphere has a radius of $(4\pi - \pi^{-1})$. It is 50% transparent. The ellipsoid has major axis $(4\pi - \pi^{-1})$ and minor axes $\{\pi^{-1}, \pi^{-1}\}$, with 0% transparent. The two components of Figure (1) are displayed *to scale*. The ellipsoid looks almost like a thin toothpick when viewed with the sphere. Other objects than the "orange" and the "toothpick" are possible. Objects with equal mass to the inscribed ellipsoid include the sector with curved surface area $(4\pi^{-1})$ (ice cream cone) and the spherical wedge with curved surface area $(4\pi^{-1})$ (hard taco shell). The sphere with radius (π^{-1}) also has surface area $(4\pi^{-1})$. This factoid is used in several models.

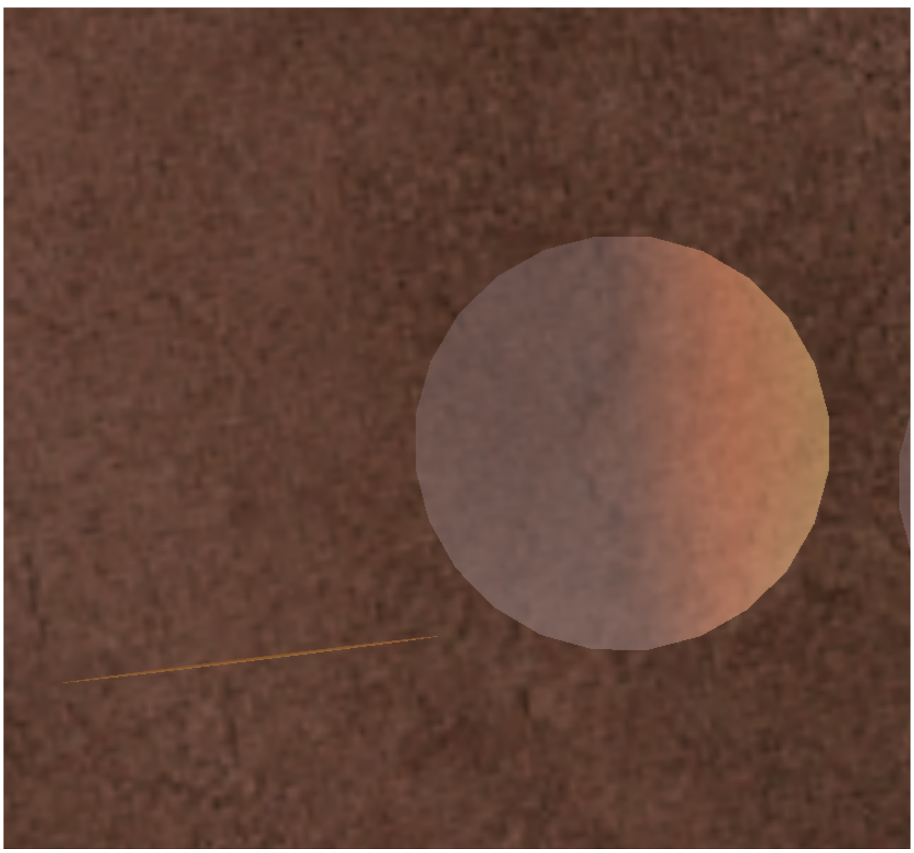

Figure 1: Sphere & Ellipsoid (from SecondLife)

Mass Ratio Function Let $[0,1]$ be a number interval and let $A : [0,1] \to \Re$ such that

$$A(t) = \left(4\pi - \frac{t}{\pi}\right)^3 - \frac{t^2}{\pi^2}\left(4\pi - \frac{t}{\pi}\right)$$

Note that $A(0) = (4\pi)^3$ and

$$A(1) = \left(4\pi - \frac{1}{\pi}\right)^3 - \frac{1}{\pi^2}\left(4\pi - \frac{1}{\pi}\right) = 1836.15\ldots \tag{4}$$

Compare with the recommended CODATA value for the mass ratio of the proton to the electron.

$$\frac{M_p}{M_e} = 1836.15267245$$

We use a spreadsheet to see the approximation of the value of $A(1)$ to the recommended value.

```
0.999990 1836.15320
0.999991 1836.15305
0.999992 1836.15290
0.999993 1836.15276
0.999994 1836.15261 1836.15267
0.999995 1836.15247
0.999996 1836.15232
0.999997 1836.15218
0.999998 1836.15203
0.999999 1836.15188
1.000000 1836.15174
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Multiply the term $(4\pi - \pi^{-1})^3$ in Equation (1) by $(4\pi/3)$ to obtain the volume of a ball having radius $(4\pi - \pi^{-1})$; multiply the term $(\pi^{-2}(4\pi - \pi^{-1}))$ in Equation (1) by $(4\pi/3)$ to obtain the volume of an inscribed, prolate ellipsoid having major axis $(4\pi - \pi^{-1})$ and minor axes $\{\pi^{-1}, \pi^{-1}\}$.

We model the simultaneous contraction of the radius of the ball having radius approaching $(4\pi - \pi^{-1})$ with the expansion of the inscribed prolate ellipsoid. The two events are related by the defined function $A : [0,1] \to \Re$. It is plausible that a gravitational singularity may be the causal factor. We observe that the volume of the ellipsoid is the same as an elliptical wedge whose curved surface area is $4\pi^{-1}$ and a elliptical sector whose curved surface area is also $4\pi^{-1}$. These three structures have the same volume. Note that for a ball of radius of (π^{-1}), its curved surface area is $4\pi(\pi^{-1})^2 = 4\pi^{-1}$

Comments The rotation induced by a singularity gives rise to the accretion disk for black holes in space. With rotation induced by the singularity in the proton model, the creation of a vacuous region is plausible. Is the prolate ellipsoid (spheroid) a good choice for the model? If there is a tiny residual left inside the vacuous region, could it prevent the radius of the ball B from attaining its limit? What about the two points of tangency between the ball B and the inscribed ellipsoid? In this model electromagnetism is not considered until a volume is expelled. The fractional portion of V_w is kinetic energy dissipated by the electron in creation of gravitational and electromagnetic fields.

The ejection of mass from the ball B having charge (negative) clearly imparts an opposite charge to the remaining mass. That is $V_p = V_B - V_w$.

Where did the value of the volume of ball $\mathcal{B}$ come from? It is $(4\pi/3)(4\pi)^3$. There are a variety of models employing such notion as the *Inversion of The Spheres* that start from an initial assumption of a unit ball of mass unity and generate the ball. Here we assume that the entity exists to begin with. Of course there is the concept of density. Fixing the density does not affect the proton-electron mass ratio.

The ratio of the volume of ball $\mathcal{B}$ to the volume of the electron is given by $V_{\mathcal{B}}/V_e = (4\pi)^3 = 1984.401708\ldots$. If one starts with a ball of unit radius and "unwraps" a band of 4π, this might explain the formation of the ball $\mathcal{B}$.