The Particle Theory of Gravity

Nicolas Fatio, a friend of Newton, had proposed a theory of gravity that was mechanical in nature. Newton was going to put it in his book but changed his mind. It was Georges L. Le Sage, in 1747, which brought his particle theory of gravity into prominence. It was well received at first, but then fell into disfavor. Today there are reports indicating that it has been totally discredited.

But it hasn't died. Many scientists have picked up the gauntlet and have tried to make it work. This section is about Bob de Hilster's work in developing an equation for gravity based on the Le Sage theory. A technical and historical record of his work can be found in his book titled "Gravity is Not Free"

Le Sage' theory of gravity is stated as follows:

There are Ultra-mundane corpuscles (particles) that come at us from all directions. As these particles pass through an object some of the particles impose a force on the object causing it to move.

Two Body Problem

Le Sage had his own drawing showing how two bodies move towards each other.

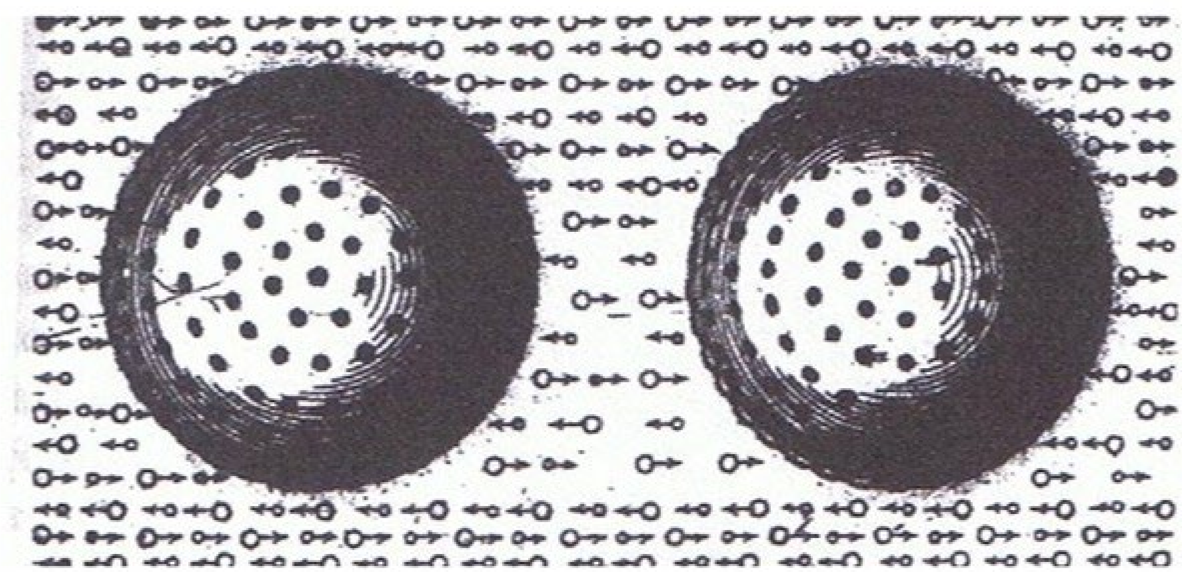

Figure 1 - Le Sage's Model

Particles coming from the right enter the object on the right. A few of them are used to push the object; the remaining ones pass through. This is a reduction of the number of particles moving towards the left object and is defined as single reduction.

In like manner, there are particles coming from the left that enter the left object. There are more particles entering the left object from the left that there are particles entering from the right. This causes a net force on the left object towards the right object. The same process happens sto the right object and so the objects are pushed together.

The Particle Equation

It seems that Le Sage did not develop an equation for his theory. Bob de Hilster developed an equation when he helped his son David with a gravity experiment. The Model used was similar to Le Sage.

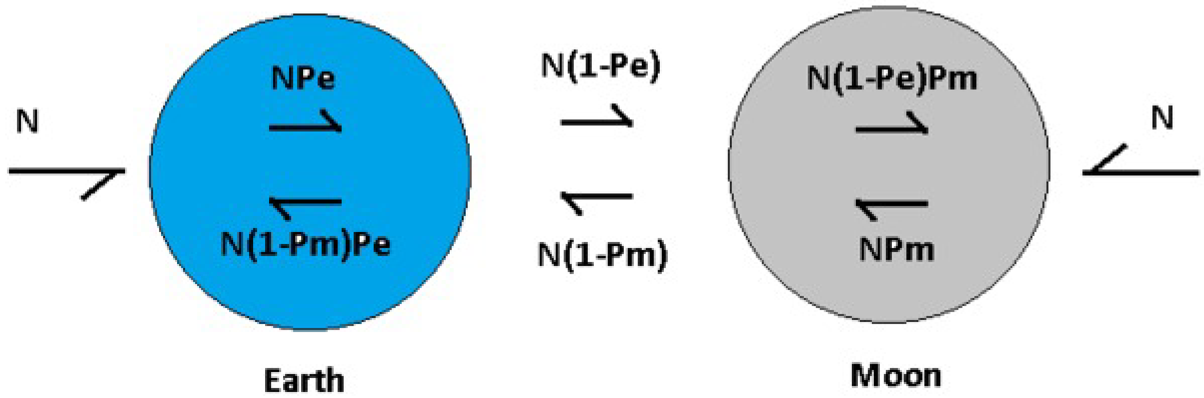

Figure 2 – Two Body Model

N number of particles on the left enter the earth and apply a percentage (P_e) of them to push the earth. The number of particles leaving the earth is N(1-Pe). This reduced number of particles enters the moon from the left and apply a percentage (P_m) to push the moon. The basic equation starts with summing the number of particles pushing the earth (N_e). The same is done for the moon (N_m).

$$N_e = NP_e - N(1 - P_m)P_e \quad (1)$$
$$N_m = NP_m - N(1 - P_e)P_m \quad (2)$$

It is more conventional to have an equation for gravity in terms of force. So, the term f_N, the average force per particle is introduced. Equations 1 and 2 change to:

$$f_e = Nf_nP_e - Nf_n(1 - P_m)P_e \quad (3)$$
$$f_m = Nf_nP_m - Nf_n(1 - P_e)P_m \quad (4)$$

These two equations show the net force on the earth and the moon using only two opposing streams of particles. To have a complete calculation, a three dimensional equation must be made. This is done by selecting 180 planes and 180 pairs of opposing angles. Equation 5 is the final equation for the force on the moon:

$$F_m = \sum_{p=1}^{180}\sum_{a=1}^{180}[N\,f_NP_m - Nf_N(1 - P_e)P_m]\sin a \cos p \quad (5)$$

This equation selects 32,400 pairs of paths or 34,800 total paths. The real number of paths is not known. The number of paths selected is made large enough to obtain a reasonable answer. The sine and cosine terms select the X component of the force. Different selections of sine and cosine will give the Y and Z components.

The Constants

Just as Newton's equation has the gravitational constant G, this particle equation has two constants. The first constant is part of the equation for P, the percent of particles that push the object. The percent applied is proportional to the mass (density times volume) of the path assigned. This can be shown as follows:

$$P \propto DV \tag{6}$$

To obtain an equation a constant of proportionality is added. Since this determines the percent of particles that interact with object it is defined as I_f. The value of P must be non-dimensional and the units for I_f must be 1/Kg. Hence the complete equation is:

$$P = I_f DV \tag{7}$$

As a stream of particles pass though many objects, the number of particles become less and less. When the percent reduction reaches 100, P =1, there can be no further reduction. So the value of I_f tells us the amount of mass that is needed to get this 100 percent reduction. It also indicates that there is a maximum force of gravity. Newton's equation does not have a maximum.

The second constant is not explicitly in the equation. But after many calculations, it was determined that the value of PA (Nf_N) had a consistent value even when P and A were changed. P times A is the number of total paths and Nf_N is the average force per interaction, then this number represents the potential force, in Newtons, for any point in space. Using F_p as the term for this equation we have:

$$F_p = PA(Nf_N) \tag{8}$$

Newton's equation has a constant, but it does not relate to a theory. The units of G do not relate to anything physical. Using the particle theory of g gravity, there are two constants and they relate directly to the theory. Also, equation 5 is a two body equation just like Newton and gives the similar results. It's the three body equation that gets interesting.

Particle Equation for a Three Body Model

The three body model for the particle theory of gravity gets more complicated. See Figure 1

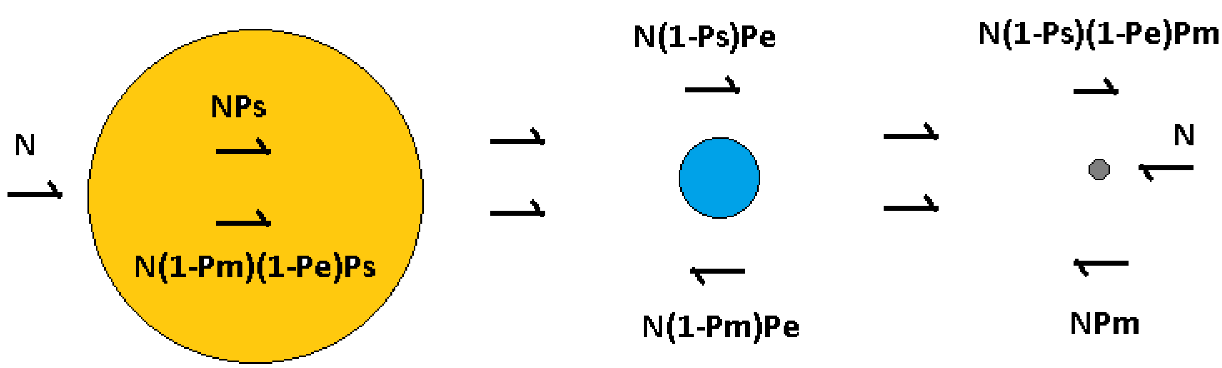

Figure 3 – Three Body Model

In Figure 3 the terms in between the sun, earth, and moon are not included. The pushing terms are there and the three basic equations can be developed. The force on each of the three objects is:

$$F_m = \sum_{p=1}^{180}\sum_{a=1}^{180}[N f_N P_m - N f_N (1-P_s)(-1-P_e)P_m]\sin a \cos p \quad (9)$$

$$F_e = \sum_{p=1}^{180}\sum_{a=1}^{180}[N f_N (1-P_{m)} P_e - N f_N (1-P_s)P_m]\sin a \cos p \quad (10)$$

$$F_s = \sum_{p=1}^{180}\sum_{a=1}^{180}[N f_N P_s - N f_N (1-P_s)(1-P_e)P_m]\sin a \cos p \quad (11)$$

Single and Double Reduction

Figure 2 shows a two body model where each object has a single reduction. The second term of equation 3 and 4 show the same single reduction. This single reduction provides the force of gravity just as Newton's equation. Figure 3 and equations 9-11 show a double reduction. The particles entering the sun and the moon also pass through the earth before reaching the final object. The stream of particles are reduced twice.

Newton does not have an equation for three bodies. The calculation of three bodies with Newton's equation requires the use of three two body equations. Double reduction is not there. The result is that equations 9-11 will give a slightly higher force that Newton can give. Some scientists have suggested that the reason some calculations do not match measured results is that there must be a very small fifth force. Is this the source of that possibility?

Conservation

Many scientists have used the principle of conservation as a basis of their work. Unfortunately, the conservation of any physical feature is an effect, not a cause. Scientists should start with a physical model and then show how that model and the equations conserve force or energy, or momentum. The worst part is that most theories of gravity totally ignore the principles of conservation.

Gravity pushes the universe around with the greatest of ease and does not use up any energy. All other motion uses up something. To move a car you use gas; to move a rocket ship you use rocket fuel; to lift up your coffee cup you use up calories. So if you do not include the idea that something is being used up, gravity violates the principle of conservation.

Figure 3 and equations 9-11 clearly show that the number of gravity particles are being used up as they push the sun, earth, moon and galaxies all around the universe. In fact the number of particles entering the object is equal to the number used to push plus the number leaving the object. This theory does not violate the principle of conservation.

Examples

Here is a list of examples where the particle equation for gravity could help solve the discrepancies between calculations and measured values.

1. Dark Matter
2. Perihelion Advance
3. Pioneer Slowdown
4. Bore Hole Measurements
5. Motions of the Moon

Explanations of these discrepancies and their solution is given the Appendix

Mass Distribution

Newton's equation assumes that all the mass is located at the geometrical center of the object. Of course, you can make the effort to split the mass into different parts and get a better answer. But not many people do that. The particle equation forces the user to calculate the volume of the path that the stream of particles uses. This is found the equation 7 where $P = I_f DV$. So, mass is not a point mass in the geometric center, but it is a distributed mass. This helps with calculating the force of gravity at certain latitudes and altitudes. This might also be useful when modeling the tidal bulge of the moon.

The Three Main Objections

The Le Sage theory of gravity has been discredited for three main reasons and maybe more. These three reasons are drag, heat, and aberration. There is drag when the force of a head on collision is greater than a rear end collision. The amount of drag however is not as bad as reported. Heat is definitely hard to defend. But when using a mechanical model of heat it can be shown that the heat increase is probably minimal. There is no aberration of light, gravity, or colors (dispersion is explained in the section light). The reason there is no aberration is that:

"NATURE DOES NOT ABERRATE"

More detail concerning the three main objections can be found in the appendix.