Gravitation as a Self-Movement of Matter
Due to the Exchange of Gravitons

David A. Roscoe
Arthur A. Larson
E-mail: twistgrav@comcast.net

This paper presents a theory on the mechanics behind the locomotive force of gravitation, attributing it to a well-established attribute common to all matter: the radiant emission of energy. The relationship between the gravitational force and its particulate carrier, the graviton, is established and a self-consistent description is provided to explain how these particles result in apparent attraction. These mechanics also reveal a causal explanation for inertia and the apparent equivalence of gravitational and inertial mass. Finally, it is shown that both the classical and quantum behaviors of gravitation can be described by these mechanics, without modification. Recent experimental results published by the ARCS group led by Dr. Martin Tajmar[1] defy explanation within General Relativity, but find possible explanation within this paper. If these results are confirmed, they lend experimental support to this hypothesis. If this hypothesis is correct, then it is possible to utilize gravity as a propulsive mechanism for air and space vehicles.

1 Discussion

The mechanics of gravitation are described as a ”self-movement” of matter, meaning the locomotive force for the movement comes from the moving mass itself. The catalyst for this movement is a massless particle of radiation, termed the ”graviton”. That the graviton is the hypothetical particulate carrier of the Gravity force is already established in modern physics [2]. All matter, including the electron, emits gravitons continuously, and in every direction. Gravitons are a unit of quantized energy, and the emission of these particles is the primary means by which all matter attempts to reach its’ ground state of minimum energy. The magnitude of graviton emission is proportional to the matter of an object, and the ambient energy conditions. It is sufficient to limit our discussion to a single hydrogen atom, and further still to its nucleus, which contains a single proton.

At the instant a graviton forms, its speed is zero relative to the emitting particle, and must accelerate to its propagation speed within a distance of approximately 5 * 10-9 cm[3] in order to leave the atomic field. As observed in the behavior of gamma photons by Rudolph Ludwig Mossbauer in 1958 [4], this tremendous acceleration force must be coincident with an equal radiation recoil force. This force exerts a ”push” on the atom along a vector opposing the graviton emission vector.

The emission recoils of gravitons being emitted elsewhere around the nucleus counterbalance this recoil force. An atom in free space, emitting gravitons in all directions, and away from other graviton sources (masses), has its own graviton emission recoils continuously counterbalanced by the recoils from the opposite sides, and is considered to be ”at rest”. This is shown in Figure 1.

The impact of a particle by an incoming graviton transfers the momentum of the incoming graviton to the particle, exerting a push upon it. This force transfer also deforms the particle, sending radial elastic deformations along the surface, disrupting the particle’s ability to emit gravitons in an area that is significantly larger than the direct impact site itself, resulting in a null emission zone. Because the null emission zone encompasses an area larger than the impact site itself, the emission recoils occurring in an identically sized area on the opposite side of the particle are no longer counterbalanced, creating a surplus of force acting in direct opposition to the original incoming vector of the graviton that caused this sequence of events to occur. This force surplus overpowers the transferred momentum of the impact event itself, and pushes the particle toward the source of the incoming gravitons, resulting in gravitation, as seen in Figure 2. The null emission zone is short-lived; the particle quickly recovers its original shape and graviton emission will resume until the next impact event.

2 Conservation of Momentum

At first glance, it may seem that this process violates conservation of momentum, but it does not. There are two sources of momentum in the scenario above: the first being the momentum of the impacting graviton, and the second being the recoil forces from graviton emissions that are occurring constantly in all directions from the surface of the particle. The momentum of the impacting graviton is proportional to its incoming velocity, and this force is transferred fully to the impacted particle. All things being equal this would deflect the particle in proportion to the transferred momentum and the mass of the impacted particle. Recall, however that gravitons are con-

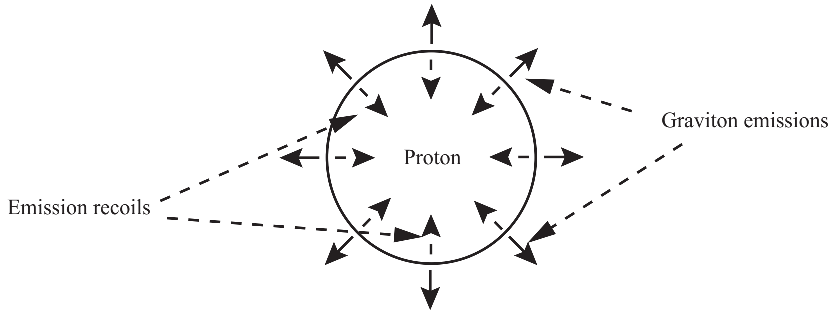

Fig. 1: Particle at rest

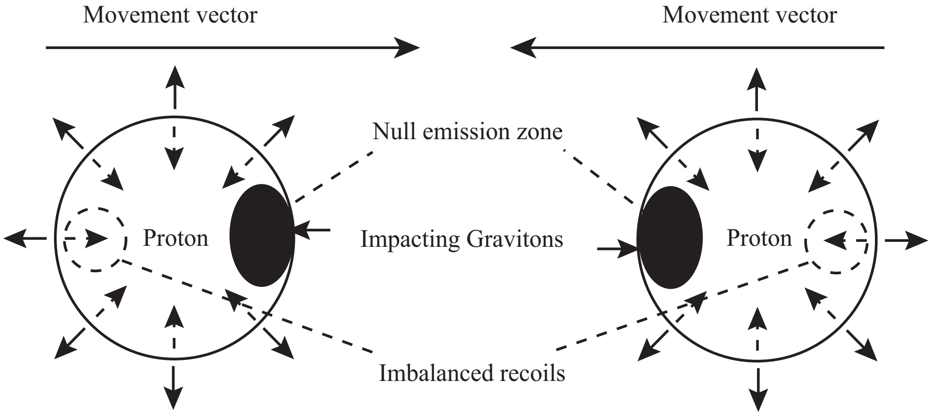

Fig. 2: Recoil imbalance results in gravitation

stantly being emitted by matter, and in all directions. A single graviton emission occurring roughly opposite the impact site is all that is needed to compensate for this transferred momentum, and prevent the momentum of the impact from pushing the particle from its current position. The same holds true for the momentum of emission recoils. The recoil force of a graviton emission is equal to the accelerative force needed for its propagation, and this recoil force is felt fully by the particle. Normally, this would push the particle away, but the graviton emissions occurring elsewhere around the particle present a mounting force, which prevents the particle from being deflected by the recoil force. Momentum is conserved in both situations, despite no appreciable movement from the impact event or the emission recoils themselves. The null emission zone, which results from the impact of an externally arriving graviton, temporarily removes a portion of the surface of the impacted particle from graviton emission activity, and the accompanying recoils. With no counterbalancing force to prevent it, graviton emissions occurring on the opposite side of the particle will now push the particle toward the source of the incoming gravitons. Gravitation occurs because of conservation of momentum, and not the absence of it.

3 Conservation of Energy

Because gravitons are described as quanta of energy that are continually radiated from matter, a common misconception arises that this violates conservation of energy. In all ways that matter, it does not. As you will see later in this document, the mechanics in this theory marry classical and quantum gravity, and quantum field theory applies; in particular zero-point energy (ZPE) and the zero-point-field (ZPF). The graviton, as a virtual particle, can be described simply as a quantum of force with a vector component. Its identity as a particle is due to the fact that this vectored force packet must traverse a propagation medium, which we call a ’vacuum’.

At absolute zero, there remains a small amount of energy in all matter that does not diminish, and in fact cannot diminish, known as its ground state. The observance of zero-point fluctuations begs to question what exactly is being observed. The mechanics in this paper suggest that vacuum fluctuations are the result of graviton propagation through it. The deflection and reflection of the vacuum due to the propagation of gravitons results in the observed zero-point fluctuations and also gives rise to the so-called Casimir force. It is also the source of the equal and opposite law of nature. If these fluctuations are evidence of the gravitons’ existence even at absolute zero, then you cannot answer the question of where this energy comes from without answering the question of where the vacuum energy comes from or whether it is conserved.

At its ground state, the particle is pumping energy into the vacuum, and receiving energy from the vacuum in equal proportions. Energy is conserved. From this point of minimal energy, any energy added to the system will result in an increase in the rate at which vacuum energy is pumped into the particle, which will also increase the rate at which the particle will radiate this energy, in the form of gravitons, back into the vacuum as it tries to reach its ground state with respect to ambient conditions. Again, energy is conserved. For the mechanics described above, this increase in graviton emissions also increases the gravitational and inertial potential of the thusly-energized matter particle. Therefore, it is a prediction of this self-movement theory that gravitational and inertial forces are not fixed for a given mass, but variable with respect to the ’true mass’ (the matter of the particle, divorced from inertial and gravitational references) of the particle, and the ambient energy conditions. Evidence of this has already been observed in experiments involving the Casimir-Polder force [5], as well as the anomalous results of Dr. Tajmar and his group. The true mass of a particle determines only the upper and lower limit in which this variability can occur.

4 Inertia

The emission of graviton particles from matter requires a tremendous acceleration within an extremely short distance. As mentioned previously, this acceleration must be coincident with an equal radiation recoil force, which propagates directly opposite the vector of emission. The application of an accelerative force causes the emission recoils to become ’compressed’ along the vector of acceleration. In order for gravitons to accelerate to their propagation speed in relation to the emission source, these propagations must occur with greater force than when at rest. The increase in the force needed for emission results in an increase in the generated recoil force, pushing back on the particle under acceleration. This is inertia. Because gravitation is the result of a reduction in a particle’s ability to emit gravitons along the vector of self-movement, there is a reduced number of graviton recoils to develop inertial forces against this motion. Therefore, it is a prediction of this theory that acceleration due to gravity occurs with reduced inertia. This should be of great interest to propulsion experts, and has serious implications with regard to the apparent equivalence of gravitational and inertial mass.

5 The Equivalence Principal

Consider an object in free fall. We can assume a perfect vacuum for the purposes of this discussion. According to this self-movement theory, the force responsible for locomotion of a free-falling mass comes from the falling mass itself, in response to the gravity (graviton) field it is falling within. The amount of force that develops is proportional to the amount of graviton-emitting material in the falling mass and the amount of graviton-emitting material responsible for the gravity field in which it is falling.

Figure 3 shows the force progression of the self-movement theory as mass increases in a free fall. The mass values themselves are unimportant, except in a relative sense, and the doubling and tripling is shown as multiples of the original mass for clarity. By doubling the mass, there is twice the original probability that a graviton from Earth will strike a particle of the falling mass. This doubled impact probability doubles the self-movement force that develops as a result of these impacts, because they happen twice as often. Applying twice the original force to twice the original mass will result in an acceleration that is identical to that of the original mass(g). The same holds true for tripling the mass as well. This is why all objects fall at the same rate in a gravity field.

As mentioned previously, inertia is the compression of graviton emission recoils due to acceleration of the emitting particle, which acts against the force causing the acceleration. With purely inertial accelerations, unlike gravitation, there is no mechanism by which graviton emissions are reduced. Therefore inertial accelerations require more force to overcome more inertial mass, to achieve the same accelerations that are observed in gravitation. It is a prediction of this theory that gravitational and inertial mass are not equivalent.

The exact relationship between gravity and inertia has eluded science for centuries. Einstein considered the apparent equivalence of gravitational mass to inertial mass a coincidence of nature. It is assumed that gravity and inertia are two separate attributes of matter. The mechanics of gravitation, as presented here, suggest that gravity has a causal relationship to inertia, and that the two are not separate. Any process that interferes with the emission of graviton particles, then, will have an equal effect on inertia. Torsion balance experiments and their variants measure the torque on a torsion wire to determine how much force is at work. By indirectly inferring force in this way, it is impossible to see that the acceleration due to gravity occured with reduced inertia. Therefore, the observed torque is achieved with less force than an equivalent inertial acceleration. The gravitational constant is then computed, resulting in a value that is unknowingly inflated to ensure that all attempts to find a difference between gravitational and inertial mass fail. It is a prediction of this theory that the gravitational constant G is less than its current accepted value. A method must be devised to directly measure the force at work to move a mass gravitationally. It may be possible to determine this force in space, outside the influence of a significant gravity field. By placing two identical spherical masses in a tube containing a piezoelectric sensor at its center, it should be possible to measure the pressure that each mass exerts on the sensor, and determine the force at work. Applying this force to the same mass in a purely inertial acceleration will result in a lesser rate of acceleration, proving that the two are not equivalent.

6 Classical and Quantum Gravity

According to the self-movement theory of gravitation, the force responsible for locomotion originates from the gravitating mass itself (i.e. a self-movement). The expression of this force is the result of graviton particles arriving from external vectors. This means that the amount of locomotive force generated by any mass is proportional to the incoming graviton density, and the density of its own graviton emissions. The inverse square law applies to gravity due to geometric constraints of radially vectored graviton propagations. As distance decreases the likelihood of graviton interaction increases geometrically, and the amount of self-movement force increases, as described in my mechanics. Due to the relatively low impact rate, the transferred momentums of the incoming gravitons are greatly overpowered by the emission recoil forces from the opposite side of the impacted particle and the result is gravitation. As distance decreases, the probability of impact increases geometrically, which also increases the the amount of transferred momentum from graviton impacts. These increased incidents of graviton impacts means that null emission zones cover an increasing surface of the particle facing the incoming gravitons. When the surface of a hemisphere of the particle is completely suppressed, the particle has reached it maximum gravitational potential. The concept of maximum gravitational potential is a prediction of this theory. The particle cannot generate any more force toward the source of the incoming gravitons. We are now at the limits of classical gravitation. Only quarks are able to get close enough to cause the scenario presented above. Electrostatic forces of macroscopic matter kick in long before this behavior can be observed at larger scales.

We start from a state of maximal self-movement force, meaning that the entire hemisphere of the particle is effectively suppressed from graviton emission. As the particles continue to move closer, the temporal rate of graviton interactions increases. Because we've reached the maximum self-movement force toward the source, the increased rate of impacts will transfer momentum that cannot be counterbalanced. For the same mechanics that was responsible for an apparent attraction, a force acting against the apparent attraction emerges. The transferred momentum will increase as the particles continue to move together, until the two forces balance out, and the particles hover a short distance from each other. From this point of apparent non-interaction, pulling them apart will reduce the temporal incidents of graviton impacts, and the self-movement (attractive) force will appear to increase up until the point that the particle is no longer completely suppressed on the hemisphere facing the incoming gravitons. The force will then start to drop off again as the square of the distance, just as in the classical description.

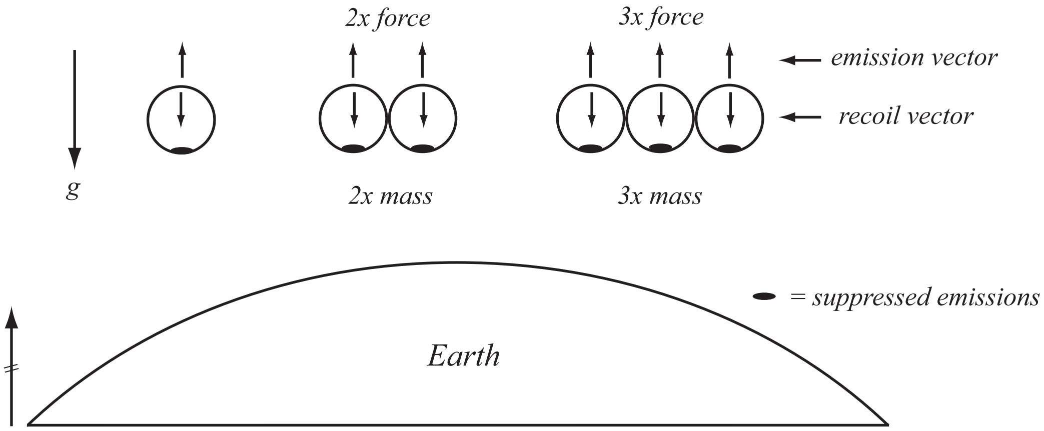

Fig. 3: Self-movement behavior in a free-fall

7 The ’Tajmar Effect’

In the ARCS groups’ experimentation, it was noted that no effect was measured in the liquid nitrogen temperature range. It was not until the superconductors were cooled to within the liquid helium range, that any effect was measurable. I suspect that an effect was present in both cases; however, the Cooper pair density was not high enough in the liquid nitrogen setup to produce an effect that was discernible within the resolution of the measurement apparatus.

Here are some key points of the Tajmar results, and their explanation within the self-movement theory of gravitation.

The effect is orders of magnitude greater than predicted by General Relativity. The predictions of General Relativity are based on the assumption that gravitational and inertial forces are fixed for a given mass. The self-movement theory predicts the variability of these forces under the right circumstances. Acceleration induces inertial forces which impede graviton propagation, causing them to aggregate in proportion to the acceleration rate and the graviton emission rate of the accelerating particle. This aggregate then propagates as normal but at a higher density than would normally occur. When this aggregate interacts with another mass, the effect is the same as temporarily being in the presence of a larger mass, and acts as a sort of gravitational amplification.

The accelerometer effects are in the opposite direction to the applied angular acceleration. The inertial compression of gravitons from the superconducting ring occurs in the direction opposing the applied acceleration, resulting in a graviton aggregate that propagates tangentially from the source. Upon interaction with the matter of the accelerometers, the imbalanced recoils of the graviton emissions from the accelerometers generate a self-movement force toward the source of the incoming gravitons, in proportion to the aggregate density of the incoming gravitons. The aggregate density is a function of the mass of the disc, the rate of acceleration and the Cooper pair density.

The effect scales with angular acceleration. By increasing angular acceleration, the inertial envelope that develops also increases, resulting in greater graviton aggregate density. When the acceleration stops, the aggregate density stabilizes and becomes homogeneous once more. I refer to this above as an example of gravitational ’amplification’. Technically speaking, amplification is not accurate, but it does demonstrate a key prediction of the self-movement theory; gravitational and inertial forces are variable for a given mass.

The effect scales with Cooper pair density The electrons which orbit atoms are matter. As matter, these particles emit gravitons, and are subject to the same self-movement mechanics as macroscopic matter. Normally, the probabilistic paths of the electrons in their orbits are effectively random. This results in a homogeneous graviton field contribution, by the electrons, to the whole. The presence of Cooper pairs limit the probabilistic paths the electrons of the superconductor will take, and represents an abnormal or asymmetrical matter distribution around the atoms of the superconductor. The paired electrons will also emit twice the number of gravitons in a local area, where they would normally have been evenly distributed. The application of an acceleration force introduces inertial forces which impede graviton propagation, and results in a minor aggregation. Due to the unequal distribution of matter as a result of the Cooper pairs, the result is a graviton field that is not homogeneous, but periodic, with cycles of higher density followed by lower density graviton field densities. This is analogous to the ’gravity waves’ of

General Relativity. The higher the Cooper pair density, the greater the graviton aggregate density, resulting in the development of greater self-movement forces on any matter which interacts with this field.

8 Conclusion

Utilizing the same basic mechanics without modification, this paper presented a possible mechanism behind the locomotive force responsible for gravitation, the force of inertia, the equivalence of gravitational and inertial mass and a reconciliation of classical and quantum gravity. The results of Dr. Martin Tajmar and the ARCS group suggest not only that the self-movement mechanics may be correct, but also that it may be possible to utilize gravity itself as a propulsive mechanism for aircraft and space vehicles. By artificially causing the suppression of graviton emissions from matter, it is possible to affect propulsion along any vector of our choosing. Based on these mechanics, there are many ways in which this may be accomplished.

Submitted on March 3, 2008
Accepted on Month Day, Year

References

[1] M. Tajmar, F. Plesescu, B. Seifert, K. Marhold Measurement of Gravitomagnetic and Acceleration Fields Around Rotating Superconductors, arXiv:gr-qc/0610015v3.

[2] Van Nostrand's Scientific Encyclopedia, Forth ed., *Graviton*, 794, 1968.

[3] Henry F. Holtzclaw & William R. Robinson. General Chemistry. Lexington, MA: Heath, 1988: 98.

[4] Bueche F. J. Physics for Scientists and Engineers, McGraw-Hill New York, 790, 1969.

[5] J. M. Obrecht, R. J. Wild, M. Antezza, L. P. Pitaevskii, S. Stringari, E. A. Cornell Measurement of the Temperature Dependence of the Casimir-Polder Force, v. 1, 2006, arXiv:physics/0608074.