# God is Light

## Scope/Contribution:

500 words describing the scope and contribution/novelty of the paper

This paper describes a simple model for gravity using a space-based perspective. We will call this model gm1 recognizing that this model will be refined and extended in subsequent papers.

Gm1 is based on the following novel concepts:

1. Space is distinct from a featureless void. In other words, space has features /attributes. The space attributes introduced in this paper are used to model gravity.
2. Space-based symmetry. This symmetry states that a particle cannot distinguish whether it is moving through space - or if space is moving through it. In other words, the laws of physics are identical for the case of the particle moving through space - or the case of space moving through the particle. This symmetry results in the equivalence between inertial and gravitational mass, and results in relativistic effects between objects which are stationary relative to each other in the presence of gravity.
3. Space is quantized. Space exists in discrete volumes.
4. Space moves. All space quanta move at the speed of light away from their source. And the space within a space quanta moves towards the source of the space quanta.
5. The velocity of a space quanta is constant. This is the external velocity of space quanta.
6. The velocity of the space within a space quanta is constant. This is the internal velocity of space. This is the velocity of space in the volume of the space quanta.
7. Energy is defined as the ability to create space quanta.
8. Momentum is defined as the energy required to alter the (internal) velocity of the space surrounding a particle. The (internal) velocity of space (within the space quanta which surrounds the particle) accelerates the particle in the direction of the (internal) velocity of space – during the time that the particle is within the space quanta.
9. This acceleration is due to space-based symmetry. The acceleration of a particle results from the (internal) velocity of the space quanta which contains the particle.

This model is intended to provide correct results for all gravitational systems of all sizes. It is also intended to facilitate intuitive understanding of gravity – and other forces. This model is also intended as a blueprint for software systems (see URL) to simulate gravitational systems reflecting the appropriate level of detail from Planck scale to cosmic scal. This model may also provide insight into poorly understood phenomena from black holes to quasars to gamma ray bursts to quantum jitters. Gm1 is intended as a template for similar models of other forces.

## Abstract:

This paper will describe a model of gravity based on the foundational perspective of quantized space. This perspective includes definition of a symmetry of space based on Einstein’s equivalence principle. The model uses Planck-scale interactions which aggregate to yield the gross effects of gravity which we observe.

### Keywords:

Gravity, Space, Symmetry, Model

### Audience:

This paper is intended for students, academics, practitioners, and all individuals interested in the field of gravitational physics. A unique perspective is presented for understanding and modeling gravity with all relativistic effects intrinsically accounted for.

### Context:

*A paragraph which sets your contribution in the context of the canonical work in this outlet and cite canonical references (listed in loose format)*

Einstein’s general relativity (Einstein 1917) provides a mathematical framework for understanding the physical effects of gravity. This theory is based on a concept of space-time as a continuous, malleable entity which is curved by the presence of energy/matter. Einstein’s General Relativity supports the perspective of space-time as an entity with attributes which are modified by the presence of energy/matter. These modifications to the curvature attributes of space emanate from energy/matter at the speed of light, c. This concept of a single type of continuous, malleable space is the foundational perspective on which general relativity is based. This paper will suggest an alternate foundational perspective whereby space exists in quanta which emanate from energy/matter at c.

This paper is divided into the following sections:

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Attributes of Space – Quantized volumes with external and internal velocity.

Space-based Symmetry – The basis of equivalence principles and therefore inertia and the gravitational “force”.

*Divide the paper into sections and name them after the Section Topic. Do NOT commit yourself to section headings, list only topic headings outlining the general structure of the paper and the contents of each section*

*Bullet-list the general contents of each section*

## Attributes of Space

Gm1 employs quantized space. This model is based on small volumes of space. Each unit has the following attributes :

Length, width, height, and therefore volume.

External velocity and an internal velocity. Both of these have speed c – in opposite directions. The external and internal velocity of a space quanta is constant. It is not affected by matter, energy, or any force.

Gm1 is based on space quanta which are generated by energy/matter. Space quanta emanate from energy/matter at regular intervals based on the magnitude of the energy. Space quanta travel away from their source at speed c. The length, width, and height of a space quanta define the boundaries of effect for the space quanta’s internal velocity. A particle which finds itself within this volume is affected by the internal velocity. The internal velocity vector has speed c and direction pointing toward the source of the space quanta. A particle which is within a space quanta, but is not moving (at velocity c) in the direction of the internal velocity will be accelerated toward the source of the space quanta. The magnitude of the acceleration of the particle is dependent on the mass/energy of the particle.

## Space-based Symmetry

Space symmetry can be understood intuitively in the context of a particle in a box.

A particle on the floor of a closed box cannot detect whether the box is moving at a uniform velocity through deep space – or whether the box ix stationary in deep space ans space is moving through the box at a uniform rate.

Similarly, a particle on the floor of a closed box cannot distinguish whether it is accelerating through space due to the effects of a rocket engine on the box - or if space is accelerating through the box due to the gravity emanating from a large planet nearby. In other words the laws of physics are identical in the case of a particle moving/accelerating through space – and in the case of space moving/accelerating through the particle - assuming that the two motions/accelerations are identical.

Space symmetry results in Einstein’s equivalence principle. Space symmetry results in an equivalence between

1. A stone moving or accelerating through space , and
2. Space moving or accelerating through a stone.

This symmetry states that all physical laws are unchanged for a stone in:

1. A gravitational field (space accelerating through the stone)
2. A rocket in deep space (the stone accelerating through space)
3. Attributes of space are a.) the size of space quanta, b.) the velocity of space quanta, c.) the velocity of the space within a space quanta. This model is based on very small space quanta (~10ee-40 cc). Space quanta move at velocity = c away from their source. The space within a space quanta moves at velocity = c towards its source.
4. Because space quanta are very small we will find it usefull to aggregate the average velocity of space within larger volumes for more efficient modeling at the level of detail required for a specific application.
5. Formula for escape velocity is the first derivative of the formula for the acceleration of space.
6. Then the average velocity of space at different altitudes falls out of the r squared rule - using the assumption that some percentage of the space quanta emanated from the  planet.
7. Points to realistic modeling of the interior of black holes – and interactions between black holes and other massive objects - testable with observable results such as gamma ray bursts

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## Energy/Matter, Space Quanta, and Gravity

### Qualitative description

Assume a potentially large region in space having a potentially large amount of energy/matter. Call this region object X. This object could be the earth, the sun, a galaxy, a black hole, or possible a photon.

Object X will emit space quanta at a rate proportional to its mass. For large objects the direction of space quanta emissions will be random. Small objects such as electrons and photons will be discussed in directions for future investigation or in a later paper. For objects such as the earth the number of space quanta will be large (O10\*\*40 per second). The size and number of space quanta generated by an object is :

Number of nucleons \* frequency of a similar-energy gamma ray

Use G to back out the size of a space quanta.

### Quantitative Description and Comparison with Newtons Gravity

The escape velocity from object X in Newtons gravity is :

Ve =

This velocity is also the velocity of a particle which has fallen from an (near) infinite distance and was subjected to no forces other than the gravity of object X.

This velocity also represents c times the percentage of space quanta in a small region which originated from object X.

Ve = c \* pct of space quanta from object X

The position of a particle relative to Object X is :

The velocity of this particle is :

The acceleration of this particle is :

The change of acceleration of this particle relative to its distance from object X is :

These formulas are equivalent to the following discrete model based on space quanta.

The acceleration of space at a height h above object X is defined as the difference between the average velocity of space at h and at h+~. This can be calculated at a desired level of detail. Here is an example where ~ = 1cm\*\*3.

### Model Description

GM1 can be downloaded from URL.

The downloadable spreadsheet contains workbooks for a variety of objects of various masses. Results include time and space dilation factors based on special relativity.

An n-body simulation program can be downloaded at URL.

The simulation allows you to set the number of objects and their masses. Object spacing is random and the initial velocities of the objects are 0.0. The level of detail can be set to reduce the number of space quanta modeled.

## Quantum Space and Known Results

### Gravity-based space and time dilation

### Quantum jitters

## Quantum Space and Unsolved Problems

### Black Hole Structure

### Gamma Ray Bursts

### Spin drag

## Directions for future Investigation

### Photon – Matter – Space Quanta Relationship

### Space Quanta Model of other Forces

## Summary

## Appendix

### Definitions

A particle is defined as a point location in space-time having energy such as an electron, photon or possibly a neutrino. A particle may be inside of one or more space quanta.

Space quanta is a volume of space with two opposite directional velocity vectors. One for the external velocity of the space quanta and the other for the internal velocity of space within the volume.

## References