
RESEARCH

A corpuscular space time to explain gravitation

Yvan Claude Raverdy

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ABSTRACT

We want to show here that it is possible to conceive a theory of gravitation built with very simple physical notions derived from the most classical mechanics. This is achieved by making the assumption that physical space is a granular fluid medium, constituted by "corpuscles" with infinitesimal

energy and dimension and endowed with quantified cooperative properties. We will show that such a point of view can explain the principles on which Relativity is based and recover all its results. It also allow us to understand a quantum character for Newton's strength and shed some light on these mysterious "black objects".

Key Words: *Gravitation; Space-time; Quantum fluid vortex; Kinetic momentum*

INTRODUCTION

We formulate the hypothesis that our physical space is constituted by granular fluid. This fluid can be treated as a quantum condensate and thus present several distinct phases, in the thermodynamic sense of the term and according to the dynamic and interactive state of its elementary constituents (QF).

The first phase is a state of order, collective and periodic movement of the QF in a microscopic area of space, it takes the form of a Vortex in the condensate. This phase corresponds to so-called "ordinary" matter and energy in elementary particle shape, it can also be described as the local state of excitation of the fluid to constitute these particles, this state is governed by electromagnetism, and it presents a minimum entropy.

The second phase is, unlike the first, made up of QF subjected to disordered microscopic displacements (Brownian movements), which gives to the whole a static character at macroscopic scales, in a state of maximum entropy. We presume that this phase constitutes the gravitational field of the masses and so-called "black matter"

Finally, the third phase, unlike the first two, is not static, the QF that constitutes it is almost free to move like a real gas, it is therefore a dynamic phase without inertia that we will identify with dark energy. These three phases are interactive and in balance, they cohabit in the same place according to a specific weighting, which implies relations of continuity and balance at the level of their limits.

The second and third phases constitute a Vacuum, as the energy of a QF is a constant regardless of the phase, the vacuum energy density is always measured by a scalar function which is the number of QF per unit volume.

A second hypothesis is the definition of the graviton, this comes from the balance between an elementary particle phase 1 and phase 2 of the

vacuum; we assume that this equilibrium between the two phases is based on the periodic exchange of an action modulus (h , which is Planck constant) due to the absorption of a vacuum QF by the particle. The time interval between two exchanges is equal to the internal period of the particle vortex. This reaction causes a deficit of QF in phase 2, which propagates in a straight line step by step, and according to a solitary wave with a period identical to those of the particle, it is the gravity. The graviton wave is a "free" wave, just like that of the photon, it moves at the speed c (speed of light), and the gravitons all have the same kinetic momentum ($m \cdot c$) which characterizes their corpuscular aspect. This hypothesis can only be justified by their consequences on the interpretation of gravitation, the fact remains that the theories in force of quantum fluids (condensates, superfluid Helium, etc.) can support the very simple interpretation (mathematically and in its representation) which we give here.

Newton's force

This force is interpreted by the impetus exchange of gravitons ($m \cdot c$) emitted by a mass M and the constituent elementary particles of a mass M' , phase 2 is the intermediary. We first calculate the gravitons flow, emitted by the mass M and constant for any directions $\frac{1}{r^2}$ variation if r is the distance between the center of the mass and the measured point, knowing that each of the elementary particles constituting the mass M , emits one graviton per period of rotation which is the inverse of its quantum frequency.

The frequencies being additive, we will write that the flow is proportional to the quantum frequency $\frac{Mc^2}{h}$ which, multiplied by

Ex chemical engineer, Researcher in Fundamental Physics, France

Correspondence: Yvan Claude Raverdy, Ex chemical engineer, Researcher in Fundamental Physics, France. Telephone +0476080443, e-mail: mjraverdy@gmail.com

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the impetus of a graviton (m_0c), will constitute the gravitational pressure P_g exerted at the distance r on the mass M' . It then suffices to multiply P_g by the total mass capture surface of the mass M' , whose value is $N \pi l_0^2$, where N is the number of capture sections of M' ,

$$N = \frac{M'}{m_0c^2} \text{ to obtain Newton's force using identification.}$$

πl_0^2 is that capture section, where l_0 is the amplitude of the graviton wave.

The calculation has been published, it lead to the value of l_0 which was necessary to establish the electron mass formula [1].

$$l_0 = 2\sqrt{\frac{hG}{c^3}},$$

the calculate value is near 810^{-35} m.

This value, close to the Planck length, identifies it with the transverse amplitude of the graviton, which is also the dimension of the QF [1].

We also note the extreme smallness of the energy m_0c^2 , (i.e. approximately 10^{-50} J) which is calculated from $P_g(2)$. Thus the characteristics of the fundamental "grain" (the QF) are infinitesimal and probably inaccessible to any direct experimentation.

These points of view, which are added to the justification of Newton's law, seem to us of great importance because they give, for the first time, a physical meaning to this Planck length, while accounting for the fact that it is a veritable "wall" limiting our perception of the infinitely small because the QF cannot be broken down, and own characteristics fixed.

The previous development shows that Newton's force derives from a quantum interaction which is the exchange of impetus between a graviton emitted by the mass M and an elementary particle (m , mass) of the mass M' , as this reaction occurs a very large number of times in the same moment for macroscopic masses, this quantum character does not appear to us; it nevertheless exists on the most infinitesimal possible scale, in length and time, which is that of Planck.

Principle of equivalence

This corpuscular interpretation of Newton's law also provides a demonstration of the principle of equivalence. Indeed, as we have seen, the flow of gravitons emitted by a mass defines its gravitational field as "grave mass", this flow is determined by the sum of the quantum Frequencies (F) of all the particles m_0 constituting this mass, well, but this sum also measures the totality of the energy-matter "heavy mass" by the relation $Mc^2 = hF$, we have, here, the demonstration of the principle of equivalence for the two ways of considering and defining the mass.

The fundamental principle of dynamics

This effect, applied to Newton's force (F), directs the movement of the stars.

Here too, the exchange of kinetic momentum between the gravitons emitted by the mass M , considered fixed, and the elementary particles (of mass m) of the mobile mass M' , causes a differential displacement (dl) at the speed $\frac{dl}{dt}$ of these, which is accumulated by the sum of the

differential deviations of the time dt between two pulses.

It is the very definition of acceleration (γ) for the mass M' , which is therefore proportional to the force of Newton.

This acceleration is also inversely proportional to M' because we have

$$\frac{dl}{dt} = \frac{m_0c}{m}, \text{ according kinetic momentum exchange, and the}$$

mass M' obviously has the same kinetics as m , which is a constituent of it.

This demonstrates the principle that results in the formula:

$$F = M'\gamma$$

Curvature of space

The kinetic momentum exchange of a graviton is not limited to static elementary particles, it can take place between the gravitons themselves and static QF, which leads to a deviation of their trajectories or positions. It is this exchange which gives phase 2 its "Brownian" character due to the jerky movements of the QF which constitute it and are caused by the passage of gravitons which are only mobile gaps in this "sea" of QF.

We postulate that this kinetic momentum exchange between gravitons is quantized and causes a trajectory shift of value $2l_0$, we have seen that l_0 is the diameter of the section of the graviton.

Thus, when a graviton passes close to a mass M , it undergoes a certain number of attractive "shocks" due to the gravitons flow emitted by this mass which each brings it closer to $2l_0$ from the center of mass M .

In an element of length dl of its trajectory, this graviton will undergo several shocks n proportional to the flow, thus bringing its trajectory closer to $2n l_0$, which results in a different angle of curvature

$$d(a) = \frac{2n l_0}{dl}$$

The total angle of curvature A will be obtained by integration over all the elements of length dl of the hyperbolic trajectory, utilizing the l_0 value obtained in Newton's force paragraph; the calculation leads to the value:

$$A = \frac{4GM}{(c^2r)}$$

where r is here the smallest distance from the trajectory to the center of mass M .

We can associate this result with the local curvature:

$$C = \frac{4GM}{(c^2r^2)}$$

It shows that the curvature is equivalent to the gravitational field, it thus intersects the result of General Relativity [2,3].

From this new point of view, the local curvature of space is due to the mutual interaction of the gravitons which are the fundamental dynamic constituents of this space, it is directed by the asymmetry inside their density in phase 2, produced by the proximity of a mass.

Elongation of time in a gravitational field

The curvature of space, as we have demonstrated, is accompanied by the elongation of local time; indeed, the image of the "arc and arrow" illustrate the small elongation of light trajectory from one end to the other.

It corresponds to a lengthening of the proper time dt because it is the

frequency (and not the speed) of light that varies slightly under the effect of the gravitational field (gravitons flow), this is shown by the spectral shifts.

The calculation, starting from the previous formula gives;

$$\frac{dt}{t} = \frac{GM}{(c^2 r)},$$

r is the smallest distance to the center of mass.

Mercury perihelion advance

It is, more generally, the influence of the curvature of space on the orbit of the planets.

We know that the orbit of the planets is elliptical, most often approaching the circle, only Mercury has a notable eccentricity (0.21) with a minimal perihelion (less than a third of the Earth-Sun distance). In addition, it is the planet whose period of revolution is the lowest (88 days).

The influence of the space curvature, due to the sun, on the planetary orbits is very weak, the data relating to Mercury allow, nevertheless, to account for the secular advance of the position of the perihelion of its orbit.

The same calculation principle as for space curvature can be applied to the determination of this value. It is obtained by considering the curvilinear integral of the differential curvature offset $\frac{dr}{r^2}$ all along the

elliptical orbit which is known with precision.

Let us consider, first, the simple case of a circular trajectory which, as we know, is a particular ellipse and moreover quite usable (in good approximation) for the calculation of the advance of the perihelion of most planets.

Let us take the formula giving the differential angle of deviation due to gravitons shocks:

$da = 2l \frac{dn}{dl}$, this value is the differential curvature of space due to the sun at r distance

i.e $da = \frac{2MGd(\theta)}{(rc^2)}$ where $\theta = dl / r$

It is applied to the circular trajectory whose Cartesian equation is $x^2 + y^2 = R^2$, which we translate into polar coordinates (origin at the center of the circle) by the very simple function:

$$r(\theta) = \text{constant} = R.$$

The integration of

$$da = \frac{2MGd(\theta)}{(rc^2)}$$
 between 0 and 2π (one period of revolution) gives

easily;

$$a = \frac{4\pi MG}{Rc^2},$$
 this is the periodic perihelion advance

$$x^2/a + y^2/b = 1$$
 where a and b are the semi-axes of the ellipse.

The equation in polar coordinates is a little more complicated than the previous one; if we take the origin at the center of the ellipse, we obtain:

$$r(\theta) = b / \sqrt{1 - e^2 \cos^2 \theta}$$

The integration of the function

$$da = \frac{2MGd(\theta)}{(rc^2)}$$
 between 0 and 2π

(one period of revolution), gives them,

$$a = \frac{4\pi MG}{(c^2 b(1 - e^2))}$$

for the periodic perihelion advance angle, this formula is very near the old result of General Relativity [4]. The numerical application, for Mercury, gives a=39 arc seconds per century, which is within the range of the measurements corrected by the influence of other planets [5]. The margin of an experimental error (3%) remains high due to the sum of the other parameters which concern the influence of the nearest planets and which is more than 10 times greater than that of the relativistic effect [6-10].

DISCUSSION

The main purpose of the publication is to show that we can approach the problem of Gravitation from a new angle, through its simplicity and its connection to proven and concrete knowledge. Moreover, we have shown that it is then possible to explain some fundamental principles. The idea of a Universe made up of space-time granules is currently making its way from the work of Carlo Rovelli who deduced it from the evolution of a mathematical analysis towards reconciliation of current theories (Relativity and Quantum Field theory). Our path of ideas, completely independent, leads us to consider the constitution of Space in a non-abstract framework; that of the quantum condensates family which prevails in the interpretation of mediums known as "cold atoms" or superfluid Helium. Our main hypothesis, original and fundamental, is that of Graviton as a dynamic particle (both wave and corpuscle) emitted by the concentration of energy that is Mass inside this medium.

CONCLUSION

The hypothesis of a fluid Universe made up of indivisible corpuscles of infinitesimal dimension and energy is fundamental. Indeed, we have shown that this environment can define matter and energy, in their different forms, as well as the Vacuum and its properties. For example, in phase 1, the notion of synchronous periodic motion of the QF would be treated by studying the vortices of the quantum fluid from its fundamental state, these are all derived wave functions which would each define an elementary particle of so-called "ordinary" matter by all the elements of multiplicity and symmetry of the complex periodic motions of the QF. We also believe that the interactive balances between the different phases of this fluid, in particular, vacuum phases 2 and 3 which we attribute to "dark matter" and "dark energy", are likely to explain the global dynamics of the Universe and the evolution of the different forms of energy that it contains. In this paper, our objective was to indicate by a theoretical outline, an overview of all the physical interpretations that could be given from our starting hypotheses; in addition to Newton's law, this set contains all the results of Relativity but also it gives a simple explanation of the principles on which this theory is based.

Maybe more important is a link with Quantum Physics which lead to conceive a quantum granular fluid medium for the universe space-time. It would remain to support these hypotheses with a real formal theory of this new space-time, this will likely require heavy conceptual work, maybe in the development of quantum thermodynamics.

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I hope publication in your journal will allow even wider dissemination of these ideas to lead to further studies of the Quantum Granular Medium which, possibly, constitute our Universe.

REFERENCES

1. Y-C Raverdy. A formula for electron mass calculation based on new fundamental concepts and depending only on four fundamental constants. ViXra, 2023.
2. Nottale L. Scale relativity and cosmology. *Heaven Earth*, 1998. 114 (2), 63-71.
3. Ernst Cassirer. *Substance and Function & Einstein's Theory of Relativity*. 1910.
4. Barrel MA. Frequencies in general relativity: theoretical definitions and experimental verifications. *IHP*. 1964; 1(1): 79-115).
5. Urbain Le Verrier. *Presentation to the Academy of Sciences*. 1859.
6. Carlo Rovelli. *Quantum Gravity*. 2004
7. Castro C. String theory, scale relativity, and the generalized uncertainty principle. *Foundations of Physics Letters*. 1997; 10: 273-93.
8. Benoit Mandelbrot. *Les objets fractals: forme, dimension, hazard*. 1975.
9. Einstein A. *The Basis of the General Theory of Relativity* *Annals of Physics*, 49. Reprinted in English translation in *The Principle of Relativity*. Dover Publications. 1916
10. Wang SJ, *The Higgs boson Turns Ten*. ArXiv. 2022.