Mach's principle and the kinetic dipole

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April 15, 2017

DOI: 10.13140/RG.2.2.20204.56962

As a departure from Einstein's GR, gravity is described as the cumulative effect of all protons and neutrons in the universe acting as self-propelled particles called nucleon kinetic dipoles. They signal to each other their relative positions through the propagation of gravitational information at a superluminal speed.
Mach's principle is interpreted as the reciprocal influence of all masses in the universe because of the propagation of directional information of kinetic dipoles at astronomical distances. Every time we measure big G we find a different value because the gravitational information received by a test mass is changing continuously.
Speed of gravity also shapes the universe, as a consequence of Mach's principle.

A fundamental unanswered question is what makes molecules in a gas to randomly move, similarly to Brownian motion.

Notwithstanding General Relativity is considered the mainstream theory of gravity, an epistemological question is why should we look for the explanation of gravity outside matter itself.

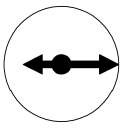
This is unusual in scientific thinking, more particularly in conceptual physics. All other known forces affecting matter are stemming from matter's inner structure and properties. Why gravity would be different?

General Relativity is a beautiful theoretical construction which failed to explain inertia but remarkably predicted gravitational lensing, or at least half of its effect. However, describing gravity as a distortion of space-time equates to explaining it through means outside matter. We can observe matter, we can observe the effects of gravity over matter, but we cannot observe space-time distortion by matter which lays only in our imagination. Physics as a natural science is supposed to be based on observation and experiment in the natural world. For a hundred years we are stuck with a speculation which cannot be reconciled with quantum physics.

We should take a second look at quantum physics and find the explanation of gravity inside matter. At the Planck length scale, space-time breaks down anyway.

The proposed intuitive model for explaining how gravity works starts from the assumption that nucleons are mechanical oscillators capable of self-propulsion. We may call them Nucleon Kinetic Dipoles (NKD).
A kinetic dipole generates an intrinsic force and has a direction of self-propulsion.

A graphic symbol of a kinetic dipole is shown in Fig.1. Unlike the electric and magnetic dipoles, the kinetic dipole's asymmetry is conventionally illustrated by a head and a tail, the head showing the direction of push and the circle suggesting that it can rotate in any direction. The uneven arrows show an asymmetric vibration.

Tail  Head Fig.1

Part of the internal energy of protons and neutrons can be translated into linear motion, dragging atoms and molecules in random directions, causing Brownian motion.
Brownian motion does not occur only in gases and liquids, but in solids too, in various forms.

It has to be noted that Albert Einstein who had a huge intuition was also interested in Brownian motion but only from a thermodynamic point of view. He published a paper [1] in his "miracle year" 1905 without investigating what makes the atoms and molecules move. Otherwise, he may have come to a similar conclusion that gravity is not a geometric property of space-time but a property of matter itself due to nucleons' self-propulsion.

An analogous experiment with an asymmetric stretch linear oscillator [2]-[3] gives an intuitive idea as to how a nucleon can propel itself due to an internal oscillation.

According to the standard model of particle physics, there is an unequal number of up and down quarks in each proton and neutron which may cause the asymmetry of the oscillation. Moreover, the spin of most or all nucleons in a nucleus are said to be aligned, which could make the individual NKDs to also be aligned head-to-tail. It follows that the whole nucleus generates a total net linear force of self-propulsion in a direction that could be changed without affecting the overall energy of the nucleus. Said direction will be further discussed as a component of gravity directly related to Mach's principle.

I wonder whether the theory of quantum chromodynamics (QCD) could explain and quantify the self-propulsion property of protons and neutrons.

It is worth mentioning that Alexander Unzicker pertinently argued that the standard model of particle physics, other than being an excessively complicated theory introducing

too many free parameters and patchy assumptions, is far from describing the physical reality at subatomic scale or accurately predicting anything in particle physics [4].

Whatever the case may be, considering protons and neutrons kinetic dipoles capable of self-propulsion seems a promising route to take in explaining gravity as a fundamental property of matter rooted in the atomic nuclei, a departure from Einstein's theory of General Relativity.

Nucleons as kinetic dipoles may be a special case of self-propelled particles (SPP) which do not need energy from the environment and use their internal energy for sustaining linear motion, even at absolute zero temperature. Because nuclei are surrounded by electron shells generating molecular bonds, the atoms exert a constant pressure at the boundary of a solid body or the containment of a liquid or gas body. When a liquid or gas body is not contained, said pressure makes it flow in the dominant direction of motion of the nucleons. Gas diffusion is a consequence of self-propulsion of gas atoms and molecules. This view provides an answer to the first question of this paper.

Further, we make an attempt to give a mathematical formulation to the impulse or linear momentum of a kinetic dipole.

The gravitational force quanta (GFQ) is estimated at $1.6414122 \times 10^{-26}$ N or 2×10^{-19} a.u. (atomic unit of force) [5]. GFQ should be understood as the effective internal force of a self-propelling nucleon.
GFQ was calculated as the force contribution of each nucleon to the weight of a material body on Earth, provided all nucleon kinetic dipoles are heading to the center of the Earth.

Except for the order of magnitude, it is worth observing the numerical closeness of the GFQ with the CODATA value of the Planck length which is 1.616229×10^{-35} m. It could be just a coincidence or could be not.

There is still no real utility of the Planck length. Why not consider it the amplitude of an oscillation inside nucleons, possibly making them inflate and deflate by this much?

The de Broglie wavelength λ associated with a massive particle is given by:

$$\lambda = \frac{h}{p} \qquad (1)$$

where h is Plank constant and p is the linear momentum of the massive particle.
It follows p is given by

$$p = \frac{h}{\lambda} \qquad (2)$$

Further, we assume the de Broglie wavelength is equal with Plank length:

$$\lambda = l_P \qquad (3)$$

where Planck length is substituted with

$$l_P = \sqrt{\frac{hG}{2\pi c^3}} \qquad (4)$$

and the linear momentum can be written as

$$p = \frac{h}{\sqrt{\frac{hG}{2\pi c^3}}}$$

equal to

$$p = \sqrt{\frac{2\pi h c^3}{G}} \qquad (5)$$

The above formula (5) is intended to express the linear momentum of a massive particle having the de Broglie wavelength equal to the Plank length.

Introducing the numerical CODATA values of constants:

h = 6.626070040 x 10^{-34} J s
c = 299792458 m s^{-1}
G = 6.67408 10^{-11} m^3 kg^{-1} s^{-2}

in formula (5), we obtain the value of

p = 40.99711494 kg m s^{-1}

Alternatively, using the CODATA value of the Planck length:

l_P = 1.616229 x 10^{-35} m

and introducing it directly into formula (2) according to (3), we get a slightly different value:

p = 40.99709905 kg m s^{-1}

Applied to a proton, this result is intriguing and may be very wrong because dividing it by the mass of the proton, we get a superluminal speed:

p/m_p = 2.4510688 x 10^{28} m s^{-1} = 8.1758857 x 10^{19} c

where the CODATA value of the proton mass is $m_p = 1.672621898 \times 10^{-27}$ kg.

However, this superluminal speed may not be the speed of the proton itself but the speed of propagation of directional information of kinetic dipoles in the universe, i.e. the speed of propagation of gravity. For short, let's call it speed of gravitational information.

As a reference, Newton assumed the speed of gravity to be infinite, Laplace concluded said speed is over 7×10^6 times **c** and Einstein contemplated gravitational waves propagating with **c**. From this perspective, the above figure is closer to Newton's concept.

A body in free space would have its kinetic dipoles evenly oriented in all directions, as shown in Fig. 2. As a result, such a body would be at rest in a hypothetical reference system void of any other matter, the push of all kinetic dipoles cancelling each other in all directions.

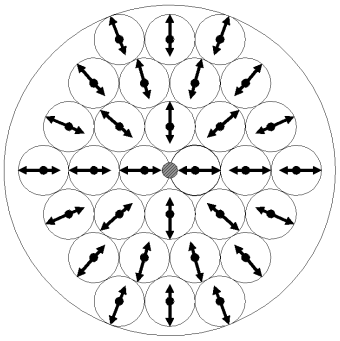


Fig. 2

The phenomenon of matter accretion observed in all surrounding universe is an indication that nucleons are capable to signal to each other their presence, giving a preferred direction to their otherwise random Brownian motion and pushing themselves towards each other.
The left and the right solid bodies in Figs. 3a and 3b are pushing themselves towards each other dragged by the internal kinetic dipoles. The closer they get, the more kinetic dipoles are oriented towards each other.

When two objects come close to each other, the gravitational field may act on the NKDs of both objects in a similar manner as the magnetic field acts on the magnetic dipoles in soft ferromagnetic materials.

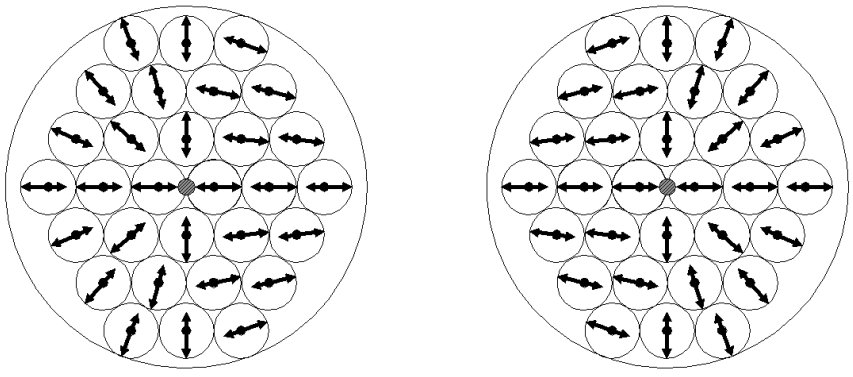


Fig. 3a

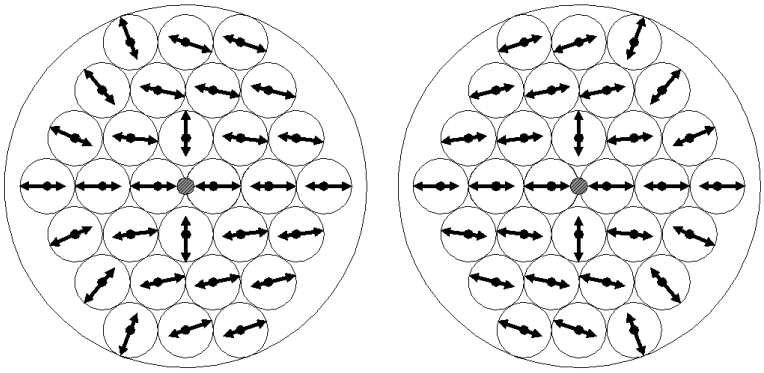


Fig. 3b

Therefore, the so-called gravitational pull is actually a gravitational push from within matter. Each body is self-propelled by the sum of kinetic dipoles oriented to surrounding bodies. The gravitational field could be just an action at a distance between atomic nuclei acting as kinetic dipoles.

Newton's anecdotal apple fell on the ground not because it was attracted by the Earth but because it was self-propelled by its kinetic dipoles oriented to the center of the Earth.

However, this description of gravity would not be complete without answering the big question of what makes the kinetic dipoles in a body to be headed to surrounding matter.

The information on the position of surrounding matter seems to be transmitted through space, undisturbed, in straight line, at astronomical distances with an unknown speed. We call it gravitational information.

Provided the standard model of particle physics is correct, we may look for a particle capable to carry this information, at the speed of light. The best candidate could be the neutrino in all its flavors and energies, including antineutrinos. Not coincidently, stars are said to be huge generators of high energy neutrinos. Very likely, planets, moons and all other celestial bodies and structures are also emitting neutrinos, possibly with energies well below the sensitivity of our neutrino detectors or in flavors which are still to be discovered. The fact that neutrinos and antineutrinos are the byproducts of the transformation of neutrons into protons and vice versa may be very much related to gravity.

Any atomic nucleus, in any energy state, should spontaneously emit neutrinos and/or antineutrinos of some sort, working like a transceiver transmitting and receiving directional information in the same time.
Of course, all this is just speculation.

A second hypothesis concerning the propagation of gravitational information is that this information is generated in nucleons and is transmitted like a wave at a superluminal speed of 8.1707075×10^{19} c, as discussed above.

Nucleons seem to generate the whole package contributing to the phenomenon of gravity: the self-propelling force and the gravitational information, as defined above.

This concept also infers that gravity is a very complex and dynamic quantum phenomenon due to the continuous change in direction of the nuclear kinetic dipoles inside matter and because each atomic species has a specific gravitational signature due to its unique way of assembling protons and neutrons. For these reasons I argued big G is not constant [6].

I also have to clarify the fact that while big G is not constant, we may still consider it a universal constant and use it in our calculations.

Therefore, we can say that gravity, as a fundamental property of matter, has two components: a nucleon self-propulsion force and the gravitational information giving a direction to that force.

Since every single atom on Earth seems to "know" where the moon, the sun and the center of our galaxy are, we may also think said gravitational information leads to a form of entanglement.

A hypothetical situation in which a solid body would be placed in a space devoid of any other matter would lead to the conclusion that said body should be stationary due to an isotropic distribution of the direction of all kinetic dipoles cancelling each other (Fig. 2). However, such a situation does not exist because matter is everywhere in the universe, influencing the direction of action of the intrinsic force of each kinetic dipole. This observation further leads to other two conclusions:

a) there is no stationary body in the universe (no static universe), and

b) Mach's principle is correct in the sense of reciprocal influence of all masses in the universe because of the propagation of directional information of kinetic dipoles at astronomical distances. For this reason, big G is not constant since every single time we try to measure it, the relative position of all mater in the universe in respect to a test body is different compared to preceding measurements, as discussed in [7]. Said relative position affects the instant direction of kinetic dipoles inside the test body. This situation was experienced by all experimenters, casting doubts on the fact whether big G is a constant after all.

I think this interpretation provides an intuitive explanation as to why big G is not constant and why Mach's principle is unlikely to be put in a mathematical formula. It appears to be impossible to calculate all the gravitational information that each kinetic dipole receives from all surrounding matter in the universe. It may be a very subtle influence in terms of order of magnitude, but it's there!

The speed of gravity also shapes the universe, according to the above interpretation of Mach's principle. In itself, this is a remarkable thing.

A universe in which gravity propagates with the speed of light should be very different from a universe in which it propagates with 19 orders of magnitude faster. It is very likely that many cosmological anomalies are misinterpreted because of this discrepancy and dark energy and dark matter are not necessary to be invented.

Simply put, supposing we see now through a telescope Proxima Centauri exploding, the gravitational influence of this event has been already sensed on Earth over four years ago, possibly changing our planet's trajectory through space in a very subtle way.

Newton's universe is literally light-years away from Einstein's universe.

Gravity propagating at a different speed than light, let's say 10^{19} faster, poses a big problem to the future of the LIGO experiment claiming to have detected gravitational waves (GW). Even building more detectors for being able to pinpoint the direction from which such a signal would be received on Earth, correlating gravitational waves detection with electromagnetic detection (optical, gamma rays bursts, etc.) is out of question. What we detect today as a gravitational wave could be electromagnetically observed many years later!

Gravitational wave astronomy would be the first blind astronomy ever, literally.
However, this does not seem to be a concern. The detected signal GW150914 appears to provide enough information as to determine that the event was a collision between two black holes which were not visible anyway.
I wonder who coined the term "blind injection" because the next logical one is "blind astronomy".

As an end note, the starting assumption that each nucleon is a kinetic dipole may not be that far from reality.
Asymmetric stretch molecular vibrations are known and proved through IR spectroscopy in some gases such as carbon dioxide [7]. Possibly, the molecular asymmetric stretch vibration mode of the carbon dioxide molecule is caused by the nucleons kinetic dipoles. The CO_2 molecule is linear with a carbon atom in the middle which may reciprocate like the magnetic piston in the analogous experiment [1]-[2]. Possibly, because of this particular structure and asymmetric oscillation, CO_2 has a unique role in the Earth's atmosphere and climate.

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